Apparatus Catalogue.



RICHARDS & CO. Ltd.

NEW YORK

AND

CHICAGO.

ESTABLISHED 1870. INCORPORATED 1890.

ILLUSTRATED

CATALOGUE

OF

Chemical and Physical Apparatus

AND

ASSAY GOODS,

MANUFACTURED AND IMPORTED

BY

RICHARDS & CO., Limited.

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INTRODUCTION.

To our Friends:—

In presenting this latest addition of our Apparatus Catalogue for your consideration, we take pleasure in stating that we have enlarged our warerooms both in New York and Chicago, to meet the requirements of advanced science; and will be pleased to have patrons and intending purchasers call and examine our very complete stock at either of our houses.

We have accepted the suggestions of some of our leading chemists in the arrangement of this book so as to suit the different kinds of work, making it a "VADE-MECUM" of the Chemist. The parts being:

Part I.—GENERAL LABORATORY SUPPLIES. Page 1 to 168.
(Containing articles for general use.)

Part II.—SPECIFIC ANALYTICAL & PHYSIO-CHEMICAL APPARATUS. Page 169-262.
(For advanced and special analytical work.)

Part III.—LECTURE APPARATUS AND COLLECTIONS. Page 263-288.
(For Professors in illustrating their lectures by either apparatus or collections.)

We also issue:

CATALOGUE OF MICROSCOPES.
LIST OF CHEMICALS.

which we will be pleased to furnish on application.

We take this occasion to inform our friends that we are the sole American agents for the following well-known manufacturers.

Becker's Son's, Balances and Weights of Precision.
R. Jung's, Celebrated Microtomes and Bacteriological Apparatus.
Dr. Heinrich Koenig & Co.'s Fine C. P. Chemicals.
L. Laurent's Polariscopes and Accessories.
Morgan Crucible Co.'s Furnaces, Crucibles, Muffles and Scorifiers.
G. Siebert's Superior Platinum Ware.

We are also the sole agents for the following special goods:

Hoskins' Assay Plants for Gasoline.
Taylor's Ore Crushers.
Buck's Standard Ore Grinding Mortars.
Chaddock's Laboratory Apparatus.
Stoddard's Burette and Test Tube Holders.
Chapman's Filtering Pumps.

We believe that our stock is the largest and most complete of any house in the apparatus business in America, and we invite a comparison also of our prices with those of any other reputable firm in this line.

We guarantee to our customers best goods, prompt shipments, and careful packing.

Thanking our friends for past patronage and trusting to be favored with a continuance of the same, we beg to remain,

Yours respectfully,

RICHARDS & CO., Limited.



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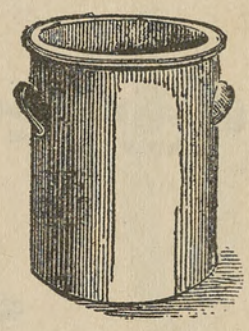

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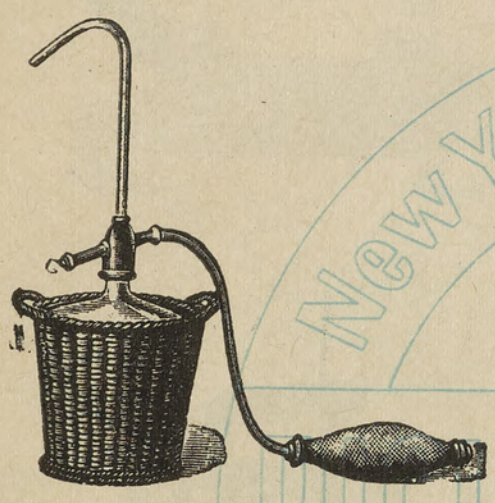

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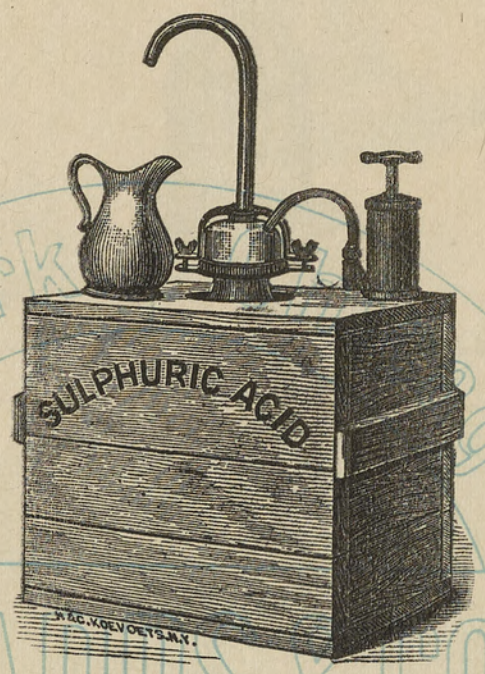

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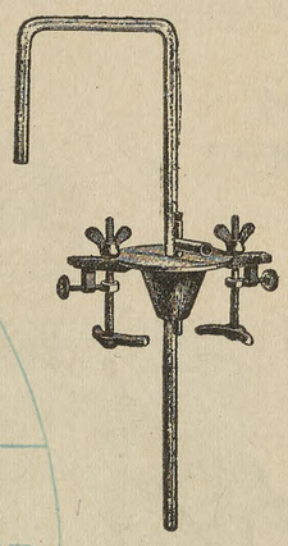

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New York Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

PART I.

GENERAL LABORATORY SUPPLIES.

No.

100. **Acid Measures.** of Lead

Capacity	qt	½	1	2 gal.
Each	$2.50	3.50	5.25	7.00

101. **Acid Pitchers,** of Stoneware, with handles.

Capacity	qt	½	1	2	3	4	5 gal.
Each	.25	.35	.50	.80	$1.00	1.25	1.50

102. **Acid Pots,** of Stoneware, with or without faucet holes.

Capacity	2½	4	5	6	7½	10 gal.
Each	.90	$1.40	1.70	2.10	2.60	3.40

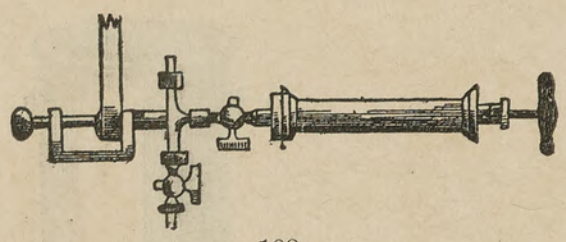
103. **Acid Pump,** for drawing liquids from carboys, operated by a large rubber bulb $10.00

104n. —— Matthew's form 15.00

105. —— latest form, very effective for drawing acids or other liquids from carboys 5.00

105a.n. —— **Footblower,** to operate the pump 5.00

(See also Carboy Rockers.)



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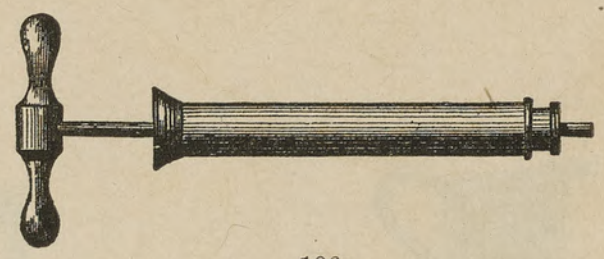

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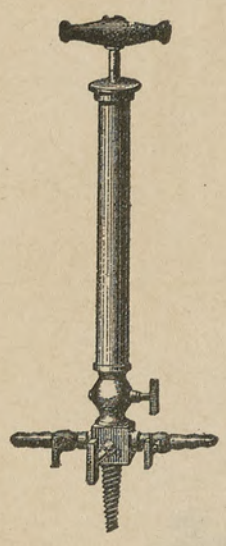

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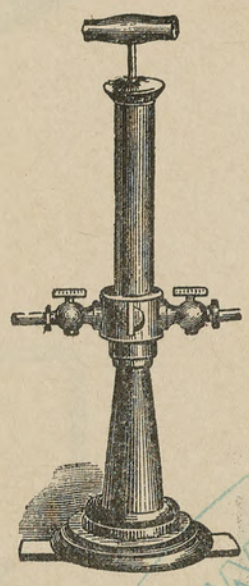

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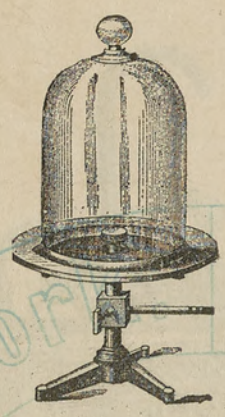

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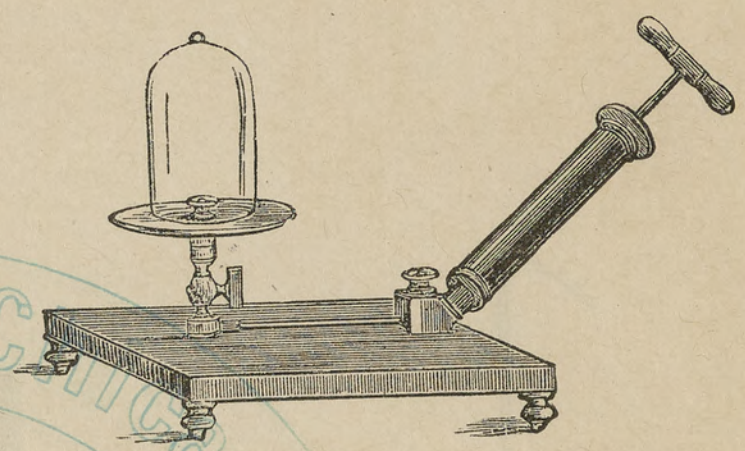

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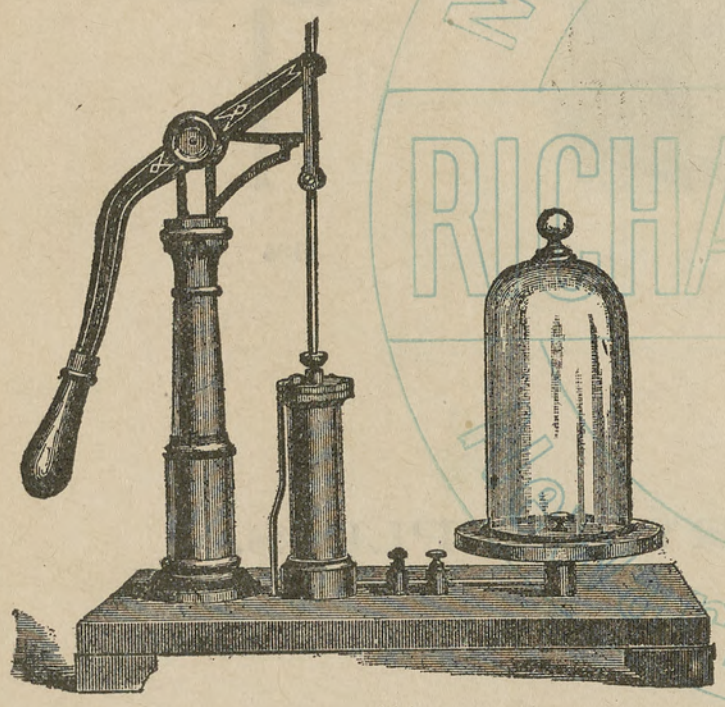

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115

No.

106. **Air Pump,** for exhausting or condensing, with reversible valves; brass barrel 9x1⅜ in..... $6.00

107. —— as No. 106 with stopcock..... 7.00

108. —— **Liebig's,** for organic analysis with table clamp; brass barrel 7x1¼ in..... 12.00

109. —— — with cross stopcock and 2 connecting stopcocks; brass barrel 10x1¼ in..... 16.00

110. —— or **Transferer,** with 2 brass stopcocks, on iron base; brass barrel, 8x1⅜ in..... 10.00

111. —— **Plate,** on triangular base, with stopcock (without receiver).

Dia. of plates	8	10	12 in.
Each	$8.00	10.00	12.00

112. —— on polished mahogany base, brass barrel 8x1½ in., with quart receiver..... 13.50

113. —— same as No. 112, with stopcock..... 15.00

114. —— on polished walnut base, with single vent and extra valves, plate 8 in. dia., brass barrel 7½x2 in. with ½ gal. receiver..... 26.00

115. —— plate 10 in. dia., brass barrel 8x2½ in. In this pump we have substituted an ornamented iron pillar for the usual mahogany one, thus giving greater stability, and, by a new arrangement, not liable to get out of order, relieved the cylinder and piston of all strain..... 38.50

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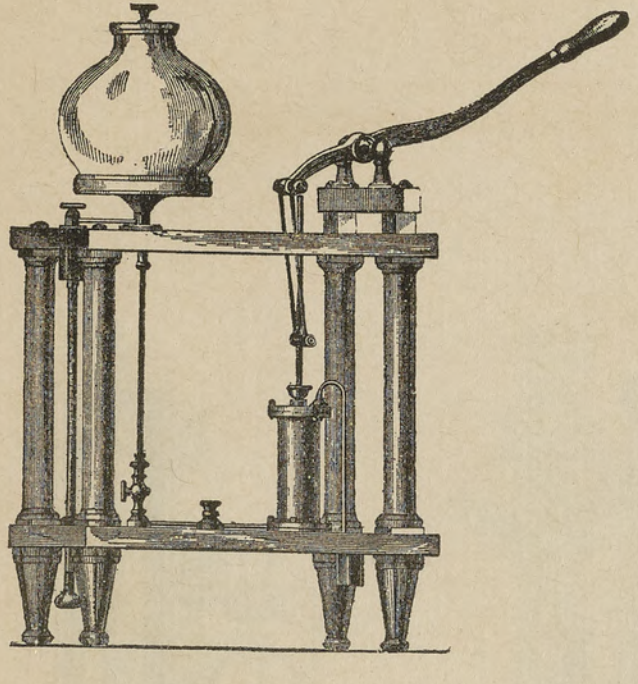

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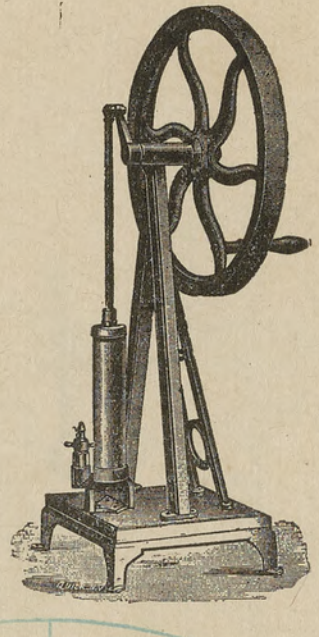

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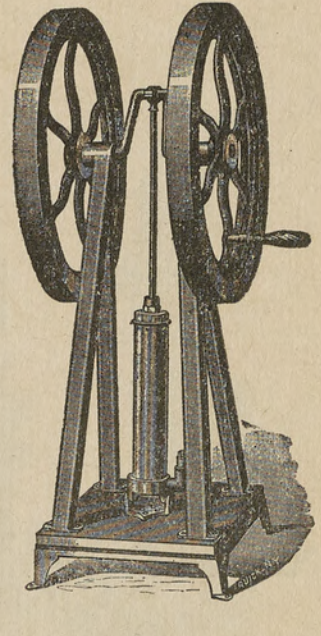

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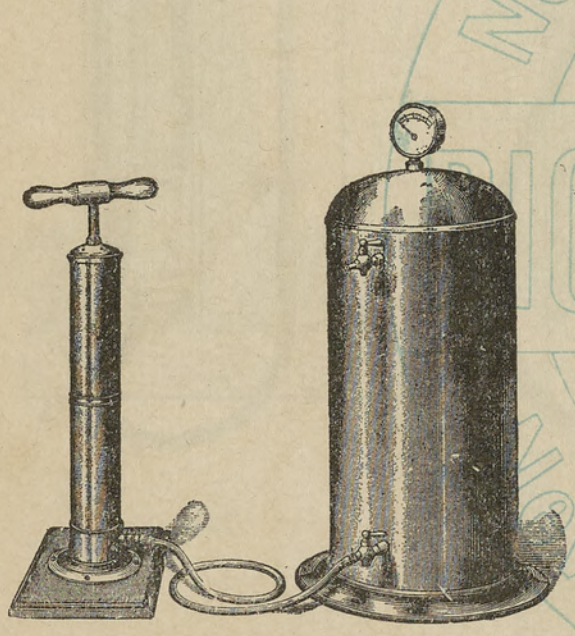

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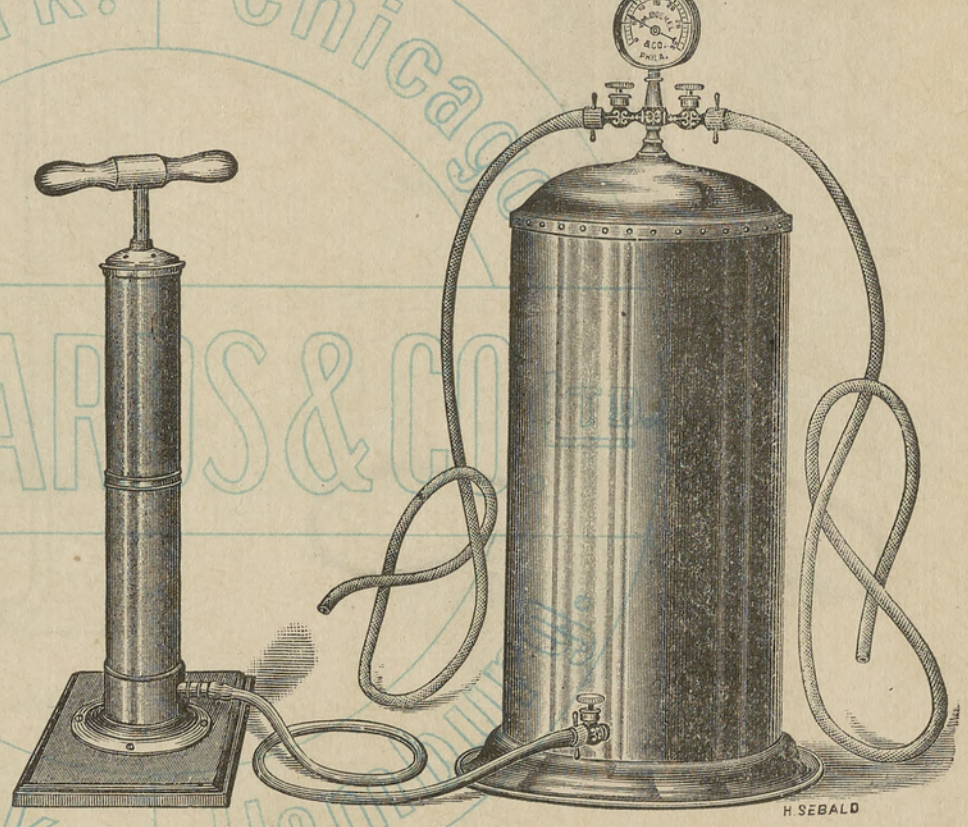

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No.

116t. **Air Pump,** with lever handle, frame of solid mahogany, highly polished, 31x19 in., brass cylinders 12x4 in. brass tubes and stopcock, heavy brass plate 12 in. dia., the plate is elevated 43 in. from the floor **$125.00**

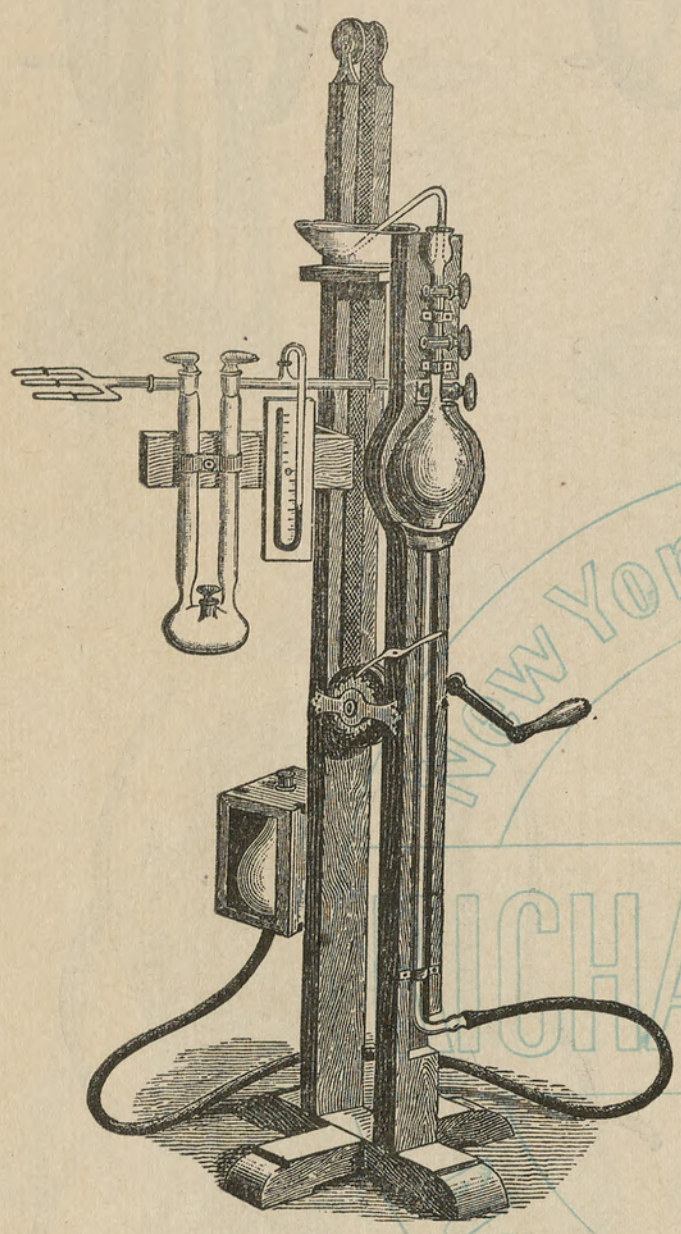
116a. —— **Manometer Gauges,** for above air pumps **5.00**

117t. **Air Pump, Rotatory,** for compressing and exhausting gases. The construction of the pump is such that a pressure of 100 lbs. to the square inch can be obtained with comparatively little effort. Height of the pump from floor to top of wheel 40 in., size of base 14x14 in., dia. of wheel 20 in., dia. of chamber 6½x2 in. stroke. Weight of pump 90 lbs..... **35.00**

118t. —— **Rotatory, double wheel.** Height of pump from floor to top of wheel 43½ in., size of base 14x14in., dia. of wheel 20½ in.; dia. of chamber 8x2 in. stroke. Weight of entire pump 150 lbs... **50.00**

119t. —— **with Receiver,** for compressed air, No 1. The receiver is 22 in. high and 10 in. in dia., tested to 100 lbs. hydraulic pressure, and warranted to stand the maximum pressure of 50 lbs. Air pump is 21½ in. high. Both are nickel-plated and well finished. Complete, with test-gauge and 4 feet lined rubber tubing and 4 feet silk covered rubber tubing..... **30.00**

120t. —— **with Receiver,** as above, but the receiver having 2 exhaust valves and two pieces of 4 feet silk covered rubber tubing **35.00**



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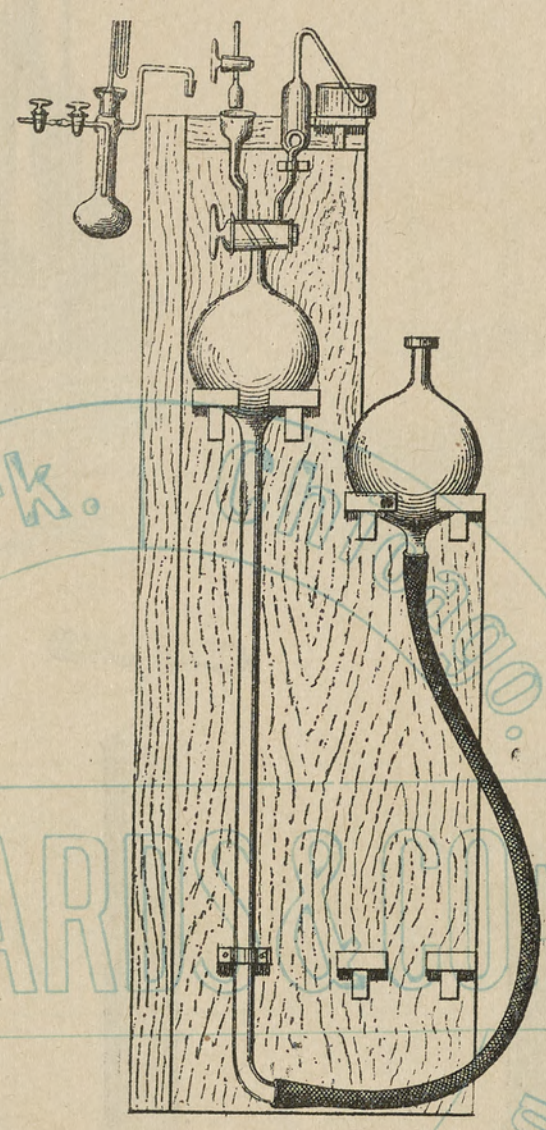

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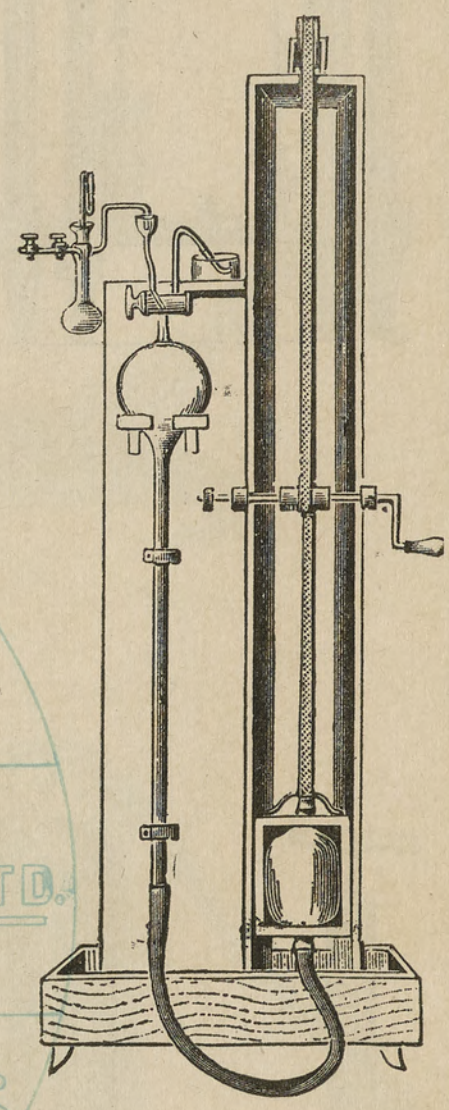

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No.

121t. **Air Pump, Mercurial** after **Geissler,** the most recent form, with 3 stopcocks by which all traces of air can be expelled, complete with manometer, dessicator, forked glass piece, ground on and mercury trough, on polished wooden stand..... **$70.00**

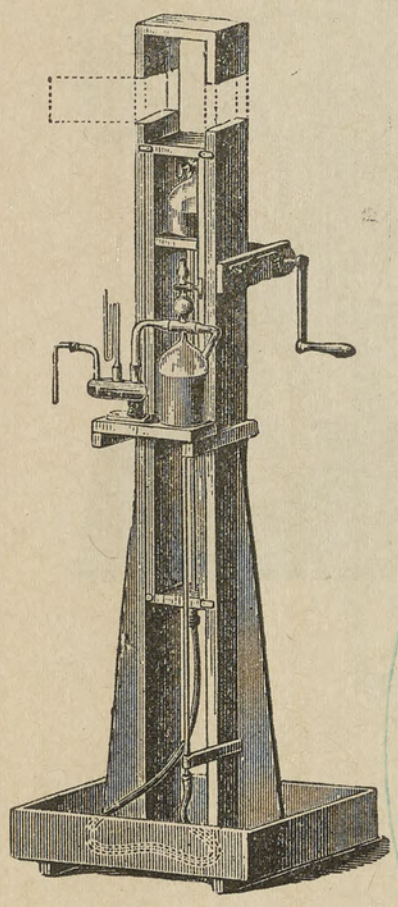
122t. —— **Mercurial,** with crank for elevating the mercury reservoir, otherwise the same as No. 121..... **82.50**

123. —— — after **Greiner and Friedrichs**, arranged to fasten to the wall, a new pattern with improved stopcock..... **40.00**

124. —— **Mercurial,** same as No. 123 with base to set on the floor..... **50.00**

125. —— — same as No. 124, with additional crank for elevating the mercury reservoir, medium size for 35 lbs. mercury..... **80.00**

large size for 45 lbs. mercury..... **104.00**



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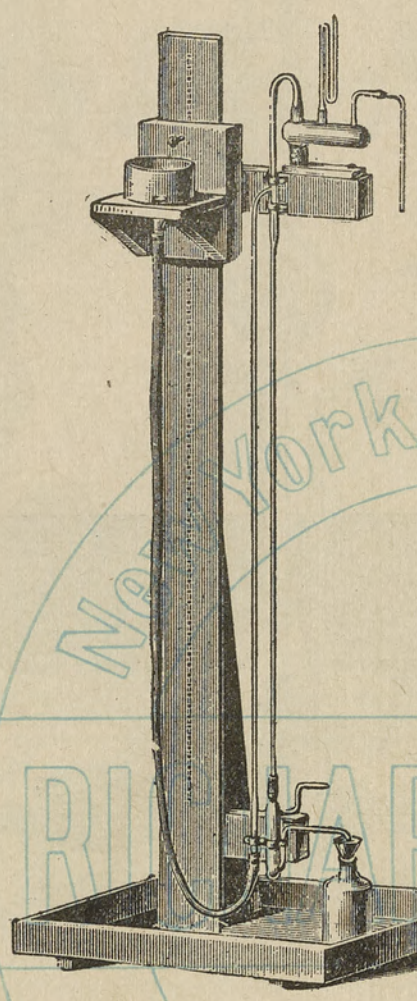

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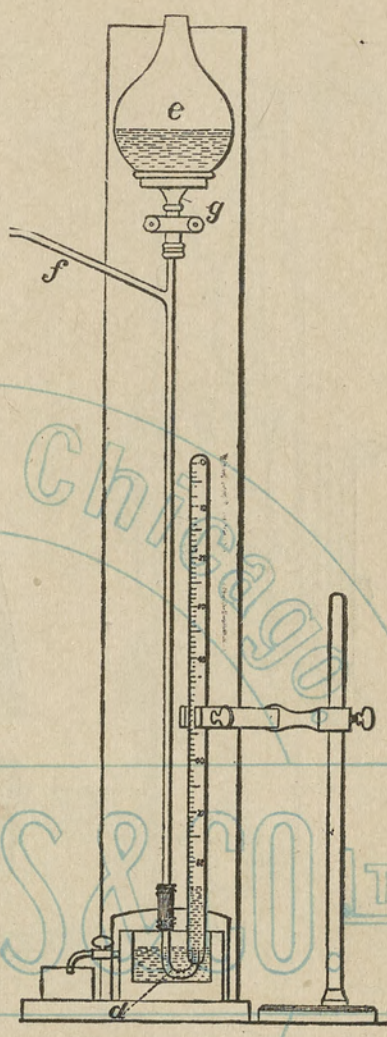

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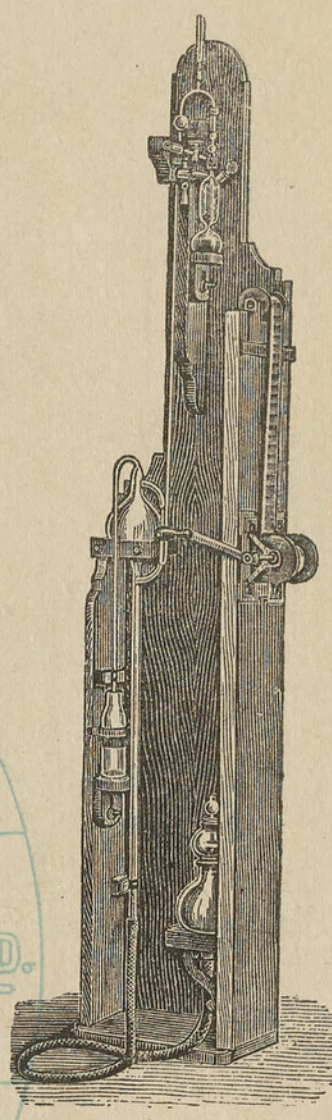

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New York. Chicago RICHARDS & CO. LTD. Newark. Hamburg.

No.

126. **Air Pump, Mercurial, Geissler's** modified by **Weinhold,** with drying apparatus, adjustable mercury reservoir; mounted on stand, with elevating crank..... **$96.00**

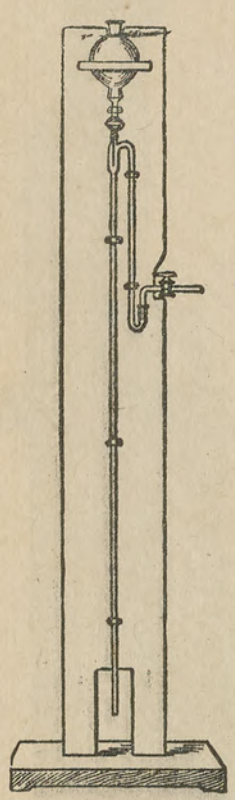
127. —— **Mercurial, Sprengel's** modified by **Weinhold,** mounted on stand..... **36.00**

128. —— **Mercurial, Sprengel's,** with support and scale..... **10.50**

the glass parts only..... **6.00**

129. —— — **Toepler-Hagen** using 25 to 30 lbs. mercury on wooden support..... **105.00**

the glass parts only..... **60.00**



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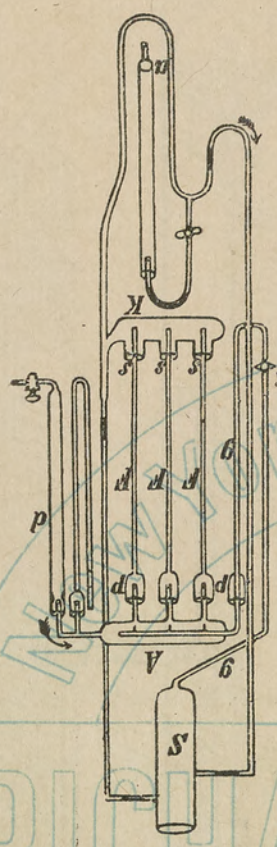

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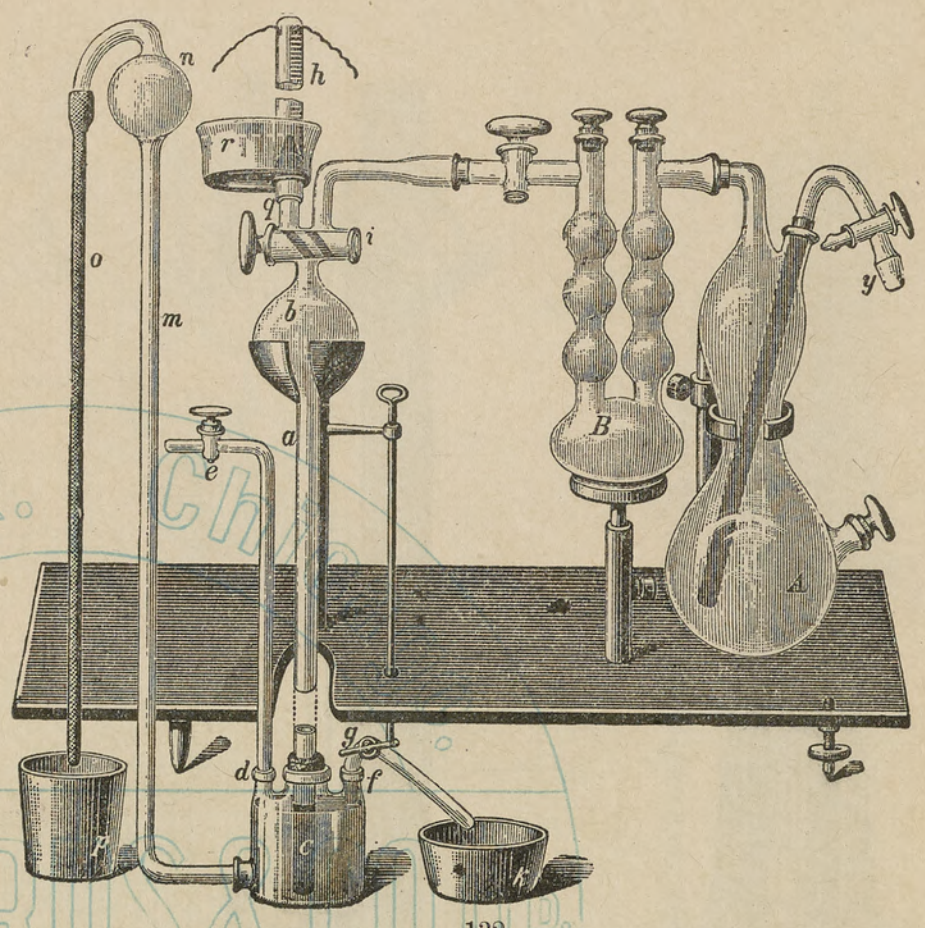

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New York. Chicago. RICHARDS & CO. LD. Newark. Hamburg.

No.

130. **Air Pump, Mercurial, Sprengel's,** modified by **Greiner,** on wooden support..... ..... **$21.50**

the glass parts only..... **16.00**

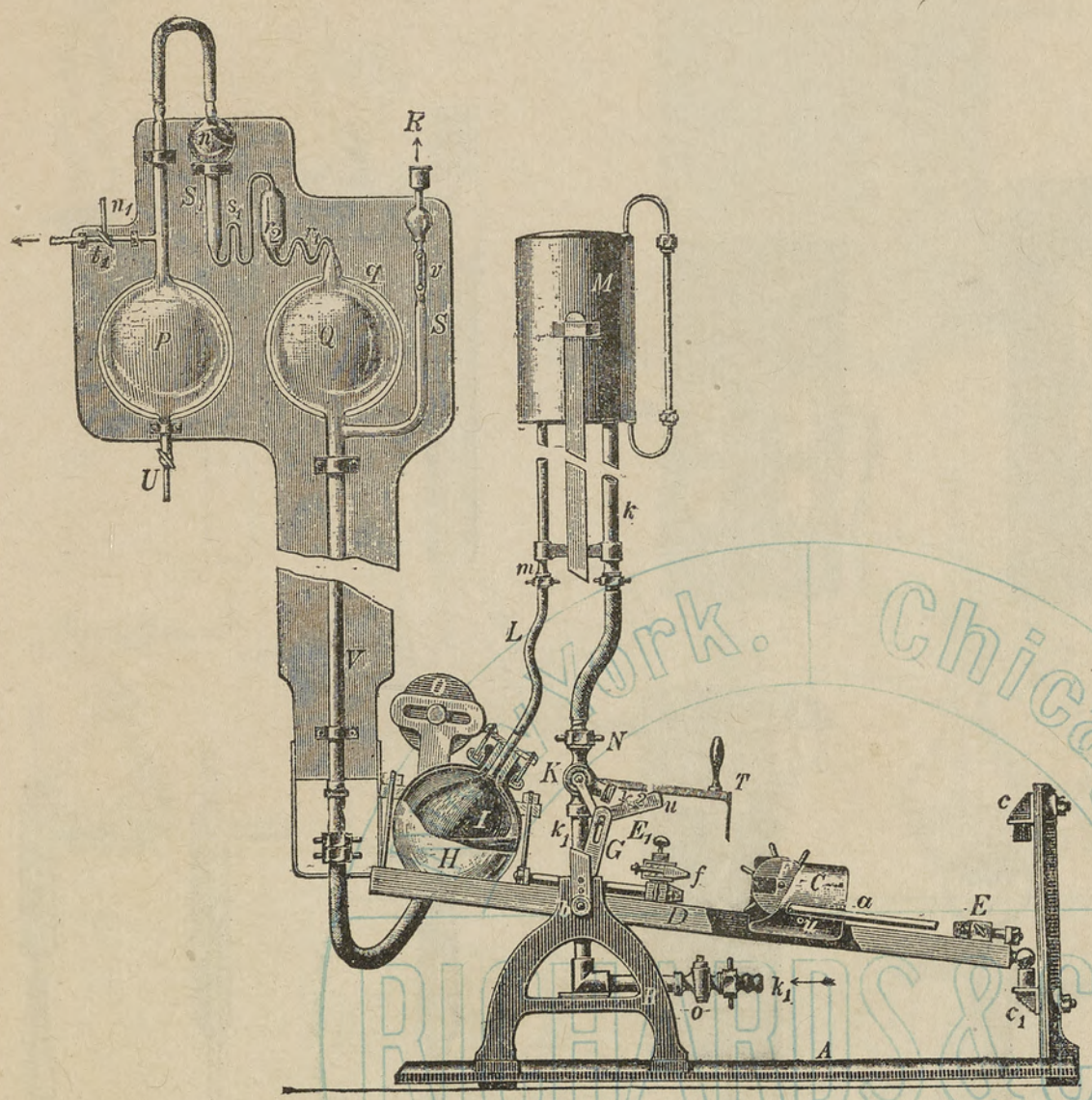
131. —— " **Sprengel's latest design,** with 3 fall tubes, and special distributor by W. W. J. Nicol, requiring only 300cc. of mercury; on wooden support. **66.00**

(See Jl. of Soc'y of Arts 87—XXXVI. P. 827).

132. —— **Mercurial, Kronecker's,** specially adapted for physiological researches, mounted..... **66.00**

the glass parts only..... **54.00**

(See Fischer's Zeitschrift '89, P. 523)



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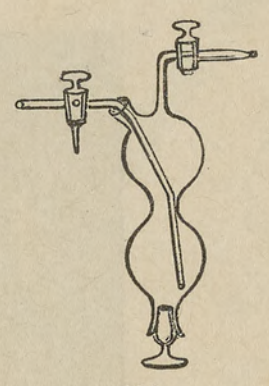

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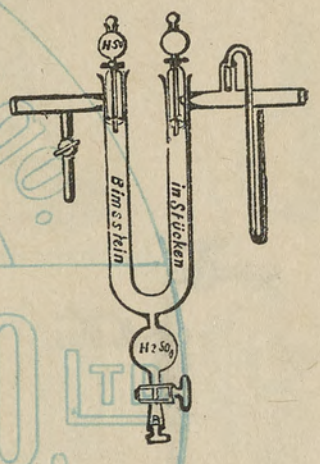

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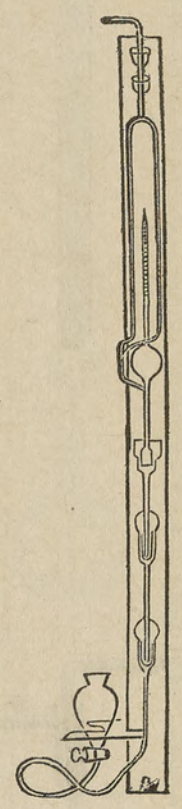

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New York. Chicago. RICHARDS & CO. LTD. Hamburg.

No.

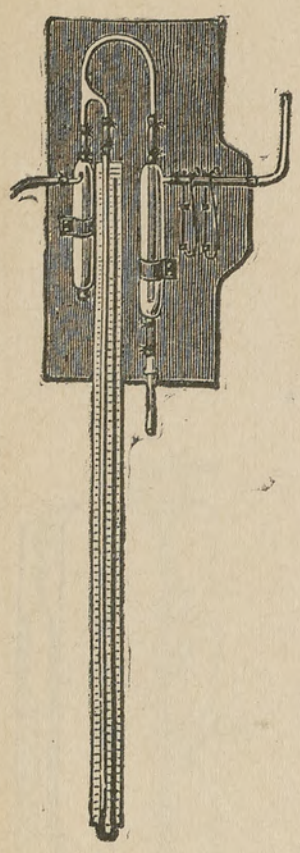
133. **Air Pump, Mercurial,** working **automatically** by hydrostatic pressure, same as used in Prof. Raoul Pictet's laboratory and others; a full description will be sent on application..... **$225.00**

NOTE.—The different construction of Mercurial Air Pumps have the disadvantage that much time is wasted moving the mercury vessels continually up and down. These disadvantages are avoided in the above pump. By simply opening the crane of a water conduit, to which the pump is joined by a rubber tube, the automatic apparatus begins to work and goes on without further attendance.

134. —— **Dessicating Apparatus, Pflueger's** with 2 funnels ground on, and acid receiver, filled with beads..... **30.00**

135, —— **Blood-Receiver, Pflueger's,** to be used with mercurial air pump for physiological investigations..... **8.00**

136. —— **Gauge, MacLeod's** for measuring pressure down to $\frac{1}{10}$ million of atmosphere, mounted on wooden board..... **31.50**



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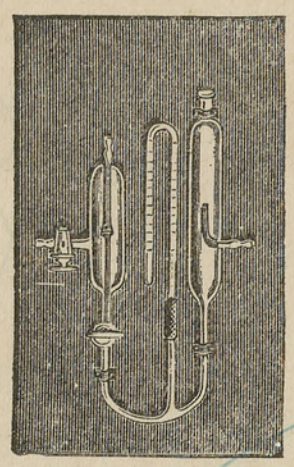

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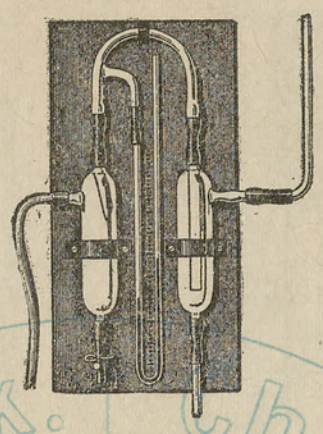

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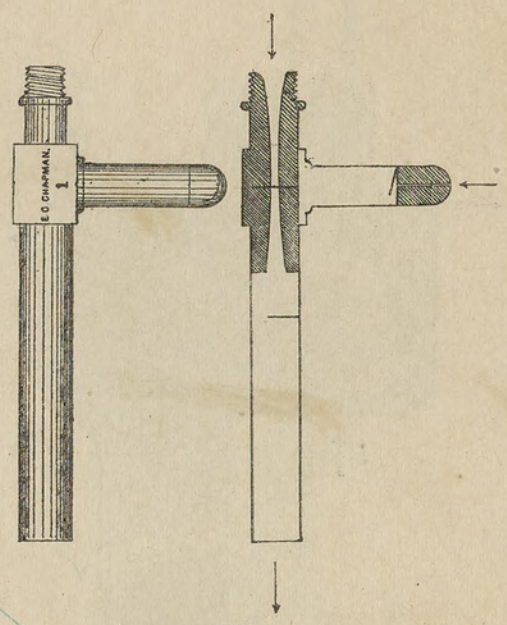

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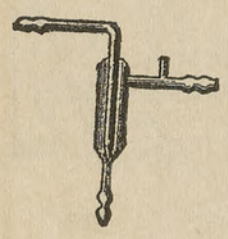

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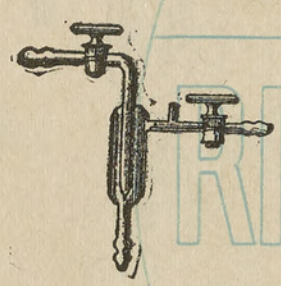

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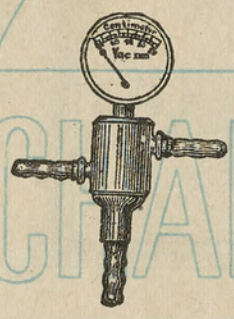

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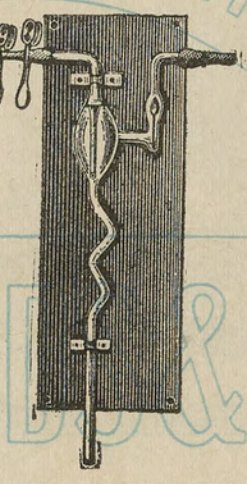

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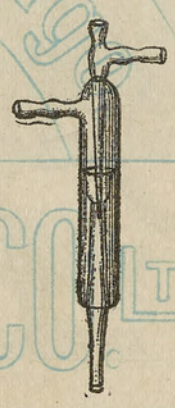

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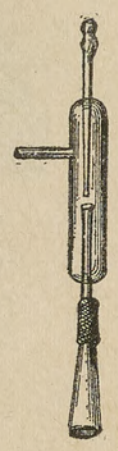

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No.

137. **Air Pump, Water** or **Filtering Pump,** after **Arzberger & Zulkowsky,** with 2 stopcocks, mounted on polished board $6.00

the glass parts only 4.00

138. —— **Bunsen's,** for quick filtrations or evaporations in vacuo, improved construction with screw-clamp and manometer, mounted 7.50

the glass parts only 2.00

139. —— **Bunsen's,** improved by **Zulkowsky,** with shortened barometer gauge 8.00

140. —— **Chapman's,**

No.	1	2	3
Each,	$1.50	3.00	5.00

141. —— " Couplings for above:

For No.	1	2	3
Each,	.50	.60	.75

NOTE.—We sell only the genuine Chapman Pumps, which are made especially for us by him, and as an inferior imitation of it has lately been put in the market, buyers should see that each pump be stamped E. C. Chapman, as a guarantee.

142. —— **Finkner's** 1.25

143. —— **Fischer's,** of glass, plain 1.10

144. —— " of glass, with 2 stopcocks 3.00

145. —— " of brass 2.50

146. —— " of brass, with vacuum gauge 8.00

147. —— **Geissler's,** with valve, mounted 3.00

the glass parts only 1.50

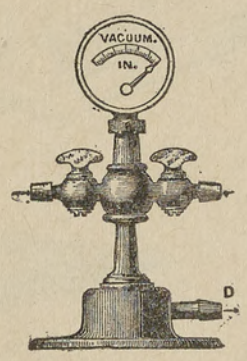
148. —— **Muencke's,** of glass 1.25

149. —— " of glass with 2 suction tubes 1.50

New York. Chicago
RICHARD & CO. LTD.
Newark, Hamburg.



150



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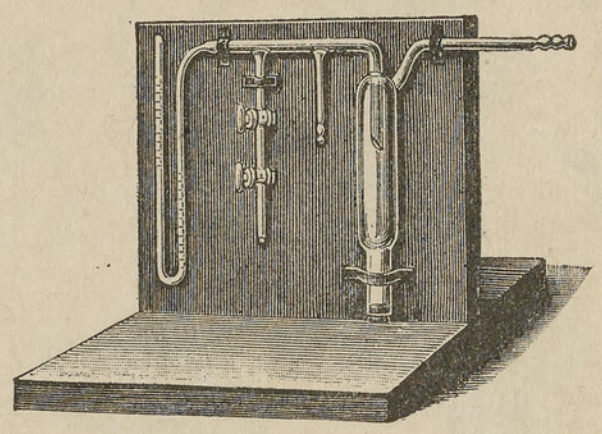

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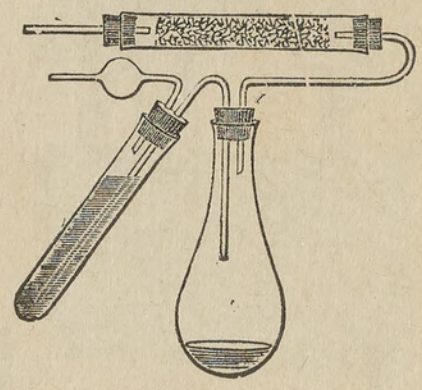

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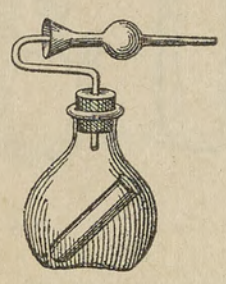

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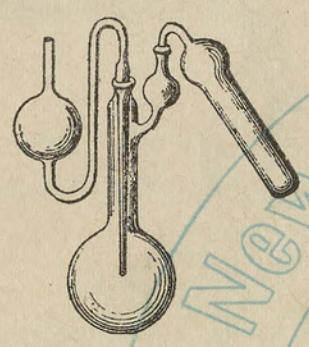

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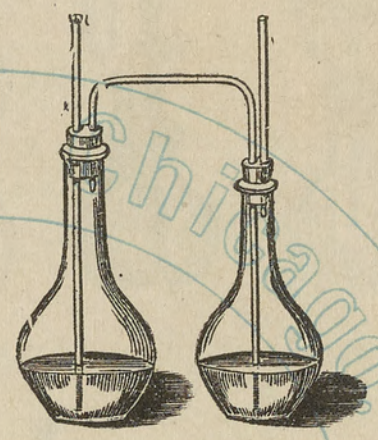

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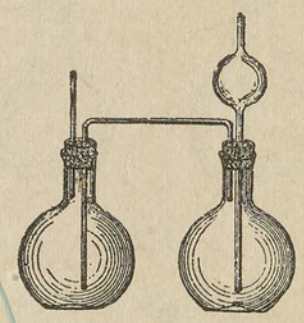

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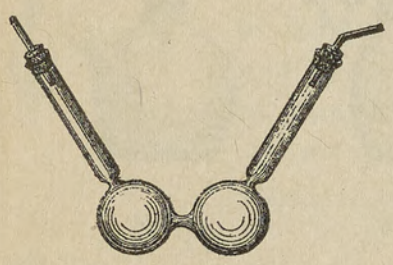

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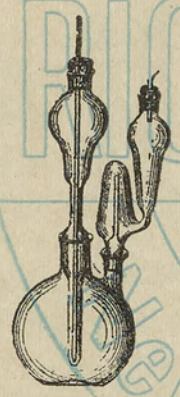

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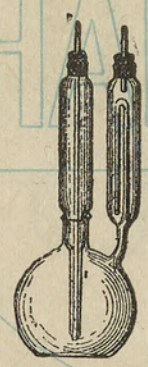

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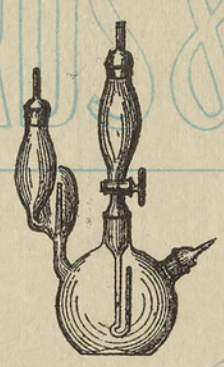

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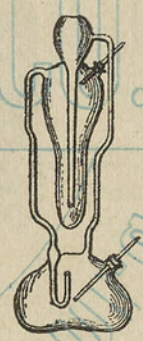

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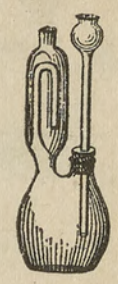


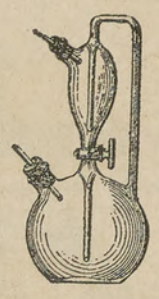
165

No.			
150.	**Air Pump, Water, Prof. Richard's,** of brass		$1.75
151.	—— ——	On base with 2 stopcocks and vacuum gauge, giving an absolute vacuum, with 14 feet head of water, or corresponding pressure	12.50
152.	**Air Pump Water Regulator,** with receiver manometer, and 2 stopcocks, mounted on polished base		6.50
		the glass parts only	4.00
153.	**Alkalimeter, Berzelius**		.70
154.	—— **Berzelius & Rose**		.60
155.	—— **Bunsen**		1.00
156.	—— **Cochius** (Chem. Zeit'g, '87, P. 850)		3.00
157.	—— **Fresenius & Will**		.45
158.	—— ——	improved	.50
159.	—— **Fritsche**		.50
160.	—— **Geissler**		1.40
161.	—— **Geissler & Erdmann**		1.50
162.	—— **Geissler,** with stopcock		2.00
163.	—— —	for 1 acid	1.60
164.	—— —	for 2 acids	1.80
165.	—— **Jones**		.70

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



166



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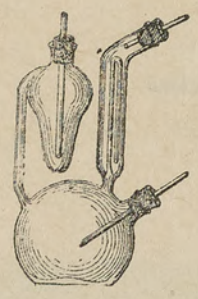

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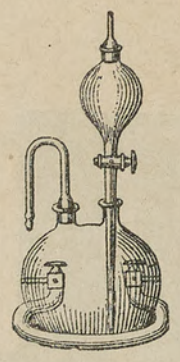

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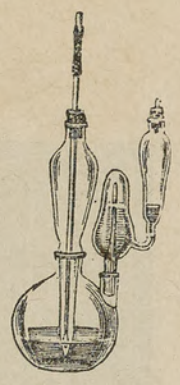

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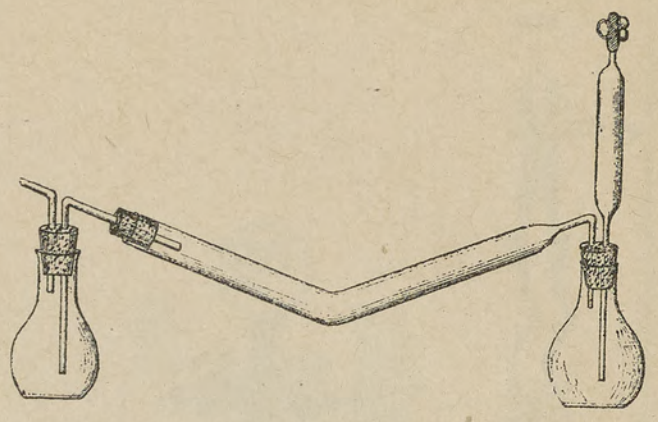

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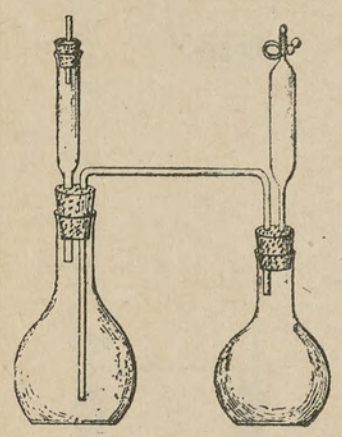

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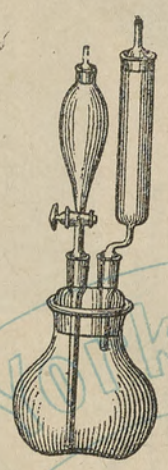

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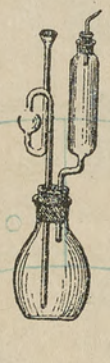

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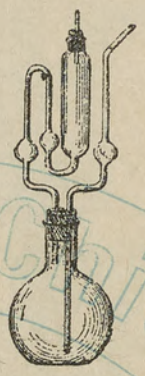

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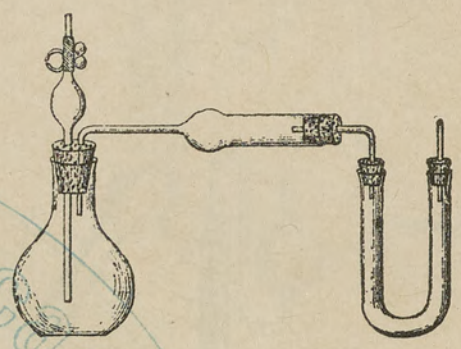

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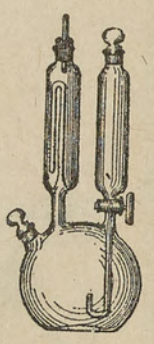

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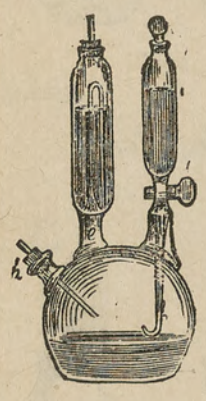

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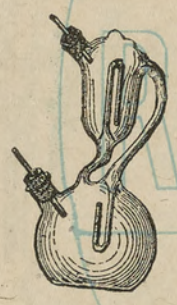

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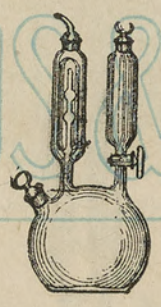

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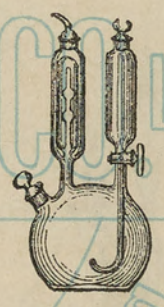

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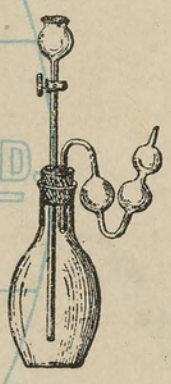

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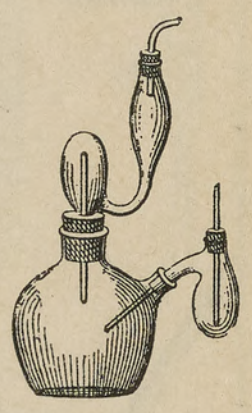
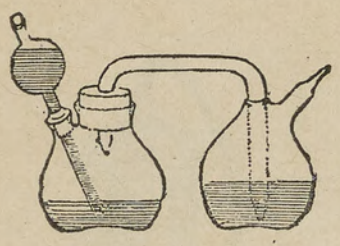


186

166. **Alkalimeter, Kipp** ..... $ .70
167. —— — with stopcock 1.70
168. —— — improved form 1.40
169. —— **Ludwig** 3.20
170. —— **Miller,** used in Sugar analysis 1.50
171. —— **Mohr,** with long tube ..... .90
172. —— — with short tube 1.25
173. —— — with bulb tube ..... .75
174. —— — with stopcock 3.00
175. —— — with safety tube ..... .70
176. —— — with three bulbs ..... .70
177. —— **Mohr & Brunner** ..... .85
178. —— **Rohrbeck** 1.80
179. —— — with tube 1.80
180. —— **Rose** 1.40
181. —— **Schaffner** ..... .45
182. —— — on foot ..... .60
183. —— **Schroedter** 1.80
184. —— — with tube 1.90
185. —— **Sonnenschein** 1.60
186. —— **Townson** 1.40

RICHARDS & CO. LTD. New York. Chicago. Newark. Hamburg.



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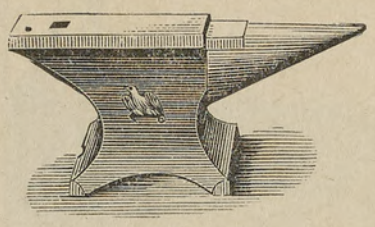

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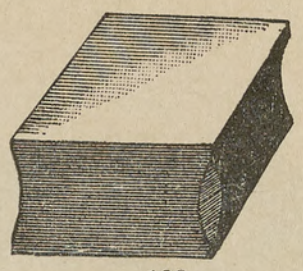

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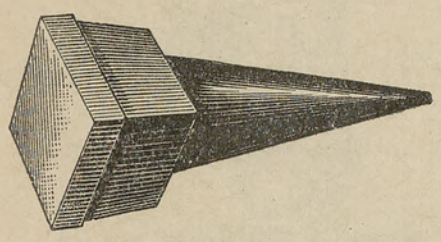

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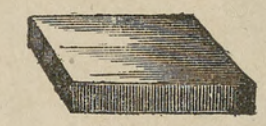

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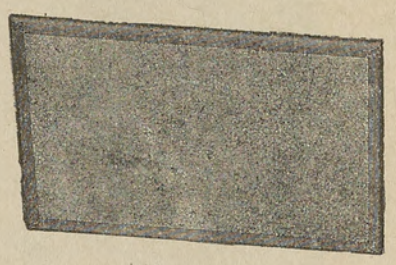


197

No.

187. **Alkalimeter, Wetherill** **$1.20**

188. **Annealing Cups, Battersea**

No.	A	B	C	D
Dia.	$1\frac{1}{8}$	$2\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$ in.
Doz.	**$1.05**	**1.05**	**1.05**	**1.05**

188a. **Covers** Doz. **.30** **.30** **.30** **.30**

189 **Anvils, regular** shape, steel face,

Weight	$\frac{1}{2}$	4	10	15	20	30	50 lbs.
Length of face	$2\frac{1}{4}$	$3\frac{3}{4}$	$4\frac{3}{4}$	$5\frac{1}{2}$	$6\frac{1}{4}$	$7\frac{1}{4}$	$8\frac{3}{4}$ in.
Each	**$1.20**	**2.20**	**2.80**	**3.40**	**4.00**	**5.00**	**6.25**

190. —— solid steel, **square,** mirror polished face.

Size	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3 sq in.
Each	**.70**	**$1.00**	**1.30**	**1.75**	**2.50**

191. —— solid steel, **square with point,** mirror polished face.

Weight	$\frac{1}{2}$	1	2	3	4	6 lbs.
Each	**.60**	**.75**	**$1.40**	**2.20**	**2.90**	**4.30**

192. —— for **Lead Buttons,** 6x6 in. **1.25**

—— And **Vise** combined, see Vises.

193. **Asbestos Board,** fire and acid proof, in sheets 40x40 in. from $\frac{1}{32}$ to $\frac{1}{2}$ inch thick, weighing from $1\frac{3}{4}$ to 28 lbs. to a sheet, ... per lb. **.30**

Approximate weight per sheet 40x40 in.

Thick	$\frac{1}{32}$	$\frac{1}{16}$	$\frac{3}{32}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$ in.
Weight	$1\frac{3}{4}$	$3\frac{1}{2}$	$5\frac{1}{2}$	8	$10\frac{1}{2}$	14	21	28 lbs.

194. —— **Board,** cut in squares, $\frac{1}{16}$ in. thickness.

Size	4x4	5x5	6x6 in.
Doz.	**.60**	**.90**	**$1.20**

195. —— **Cloth,** unaffected by acids, fire, etc.

	Fine	Medium	Heavy
To 1 sq. ft.	$3\frac{1}{3}$	$4\frac{2}{3}$	$6\frac{1}{4}$ ozs.
Wide	25	36	36 in.
Per yard	**$1.90**	**3.00**	**3.50**

196. —— **Cord** and **Twine,** in 1 lb balls ; valuable for suspending metals, retorts, crucibles, etc., in contact with fire.

Dia.	$\frac{1}{24}$	$\frac{1}{15}$	$\frac{1}{8}$ in.
Per lb.	**$1.50**	**1.20**	**1.00**

—— **Asbestos Fibre,** see Chemical Price List.

197n. —— **Pads,** suggested by Dr. H. H. Boswell. For protecting the table during blow-pipe operations. These are made from Asbestos board, about one-fourth of an inch thick, and edged with iron.

No.	1AP	2	3
Size	$6\frac{1}{2}$x10x$\frac{1}{4}$	10x13x$\frac{1}{4}$	13x20x$\frac{1}{4}$
Each	**.50**	**.85**	**$1.50**

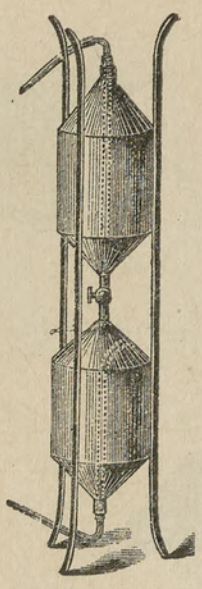
198. —— **Paper,** of pure, white, long fibred Asbestos, ... per lb. **.30**

199. —— **Wick Packing** in $\frac{1}{2}$ and 1 lb. balls, ... " **.50**

New York. Chicago. Richards & Co. Ltd. Hamburg.



200



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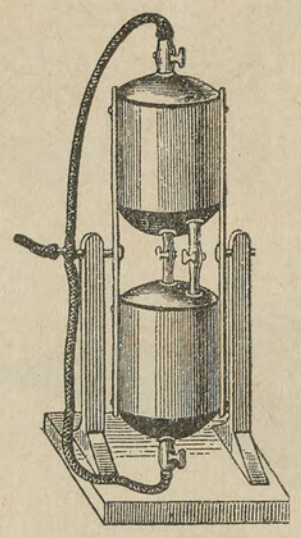

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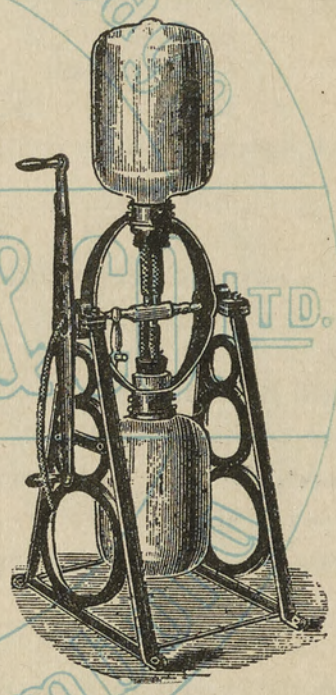
203



204

Newark. Chicago. RICHARDS & CO. LTD. Hamburg.

No.

200. **Aspirator** of japanned zinc, with brass stopcock and tubulature.

Capacity	$2\frac{1}{2}$	5 gall.
Each	**$5.00**	**9.00**

201. —— **double,** for reversing.

Capacity	$2\frac{1}{2}$	5 gal.
Each	**$9.00**	**13.50**

202. —— **Magnus,** with 3 way stopcock and gauge, for continuous use without change of tube.

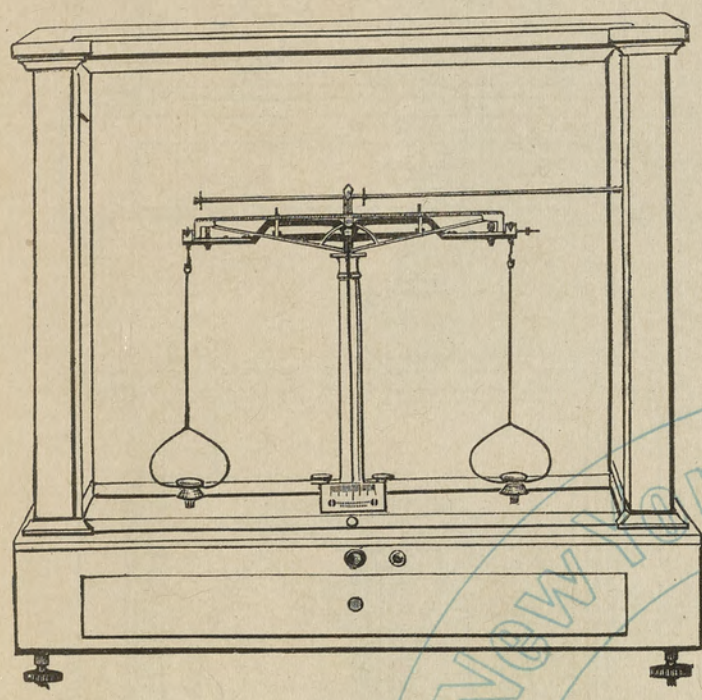
Capacity	$2\frac{1}{2}$	5 gal.
Each	**$25.00**	**35.00**

203. —— **Winkler's,** of zinc..... **$15.00**

(See Techn Gas. Anal : Winkler & Lunge, P. 16.)

204. —— **Muencke's;** uninterrupted exhaustion without changing tubes, two glass receivers of $1\frac{1}{4}$ gal. each ; iron frame; complete..... **55.00**

Aspirator Bottles, see Bottles.



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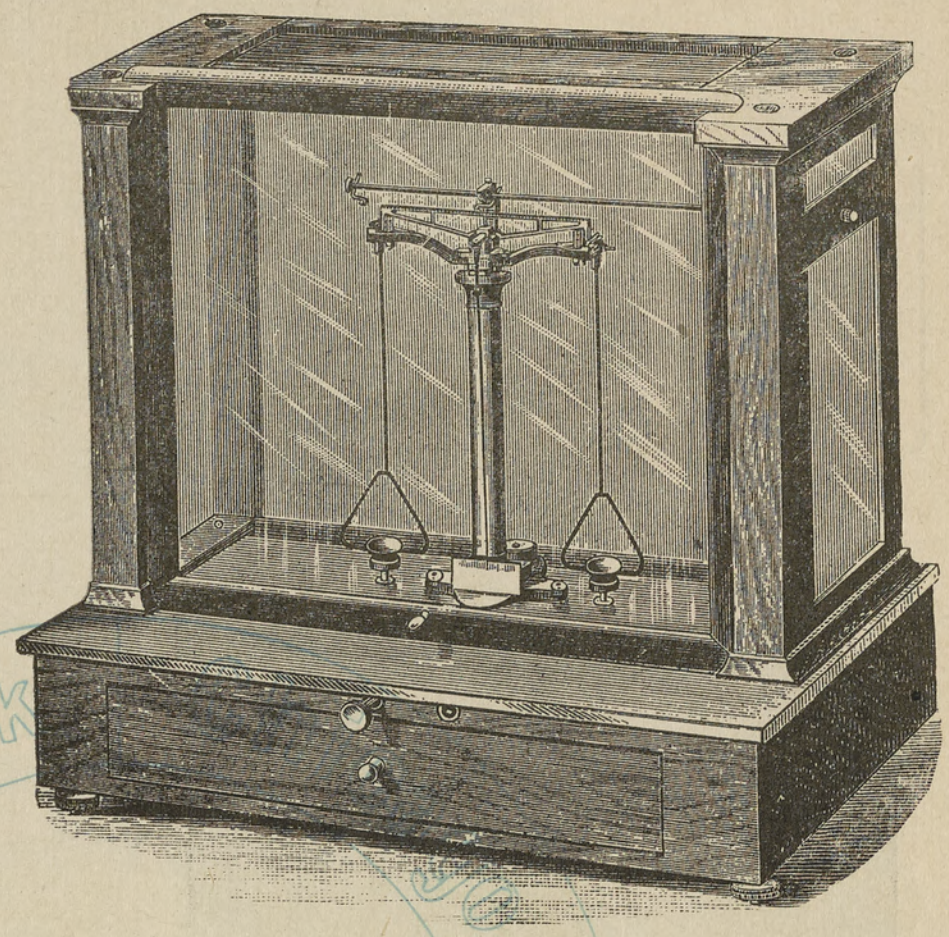


207

RICHARDS & CO. LTD.
New York Hamburg.

BALANCES AND WEIGHTS.

For Assaying, Analytic and Other Scientific Work.

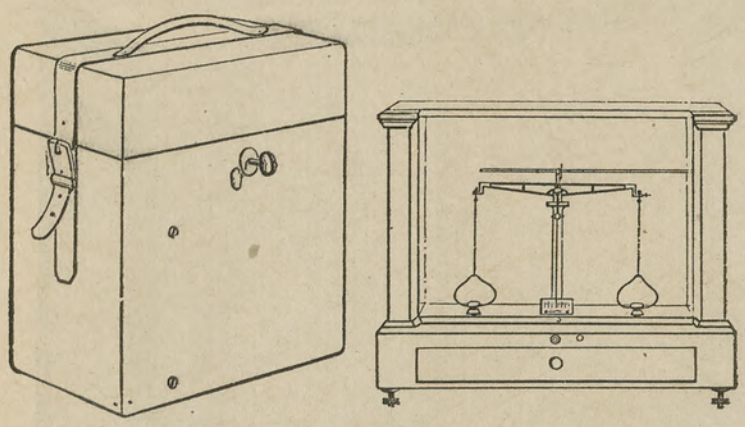
No.

205. **Assay Balance, Becker's** Improved. In French polished mahogany glass case, sliding frame counterpoised; can be charged up to 25 grammes in each pan; with apparatus for rider; rider can be placed on the center of beam and used from the O point; needle deviates 20 divisions on the scale for 1 milligramme; steel knife edges with agate bearings..... **$65.00**

206. **Assay Balance, Becker's Portable.** In French polished mahogany glass case, 13 in. long, 10½ in. high, 4½ in. deep; sliding frame counterpoised; packed in a light box with straps for carrying, weighing all boxed, 4½ lbs.; needle deviates 20 divisions on the scale for 1 milligramme; with apparatus for rider, set of weights, 1 platinum gramme to $\frac{1}{10}$ milligramme. (see cuts on page 14)..... **75.00**

207. **Assay Balance, Becker's, Short Beam.** In French polished mahogany and glass case; front sliding frame counterpoised; with glass top to admit more light on rider; all parts of the balance are mounted and fastened on plate glass $\frac{5}{16}$ in. thick, so that nothing can get out of order through warping of the wood; beam 5 in. long; all bearings are agate planes with agate knife edges, and the beam is graduated in $\frac{1}{50}$ milligramme, and in such a manner that the rider can be placed on the center of the beam and used from the O point to either end of the beam; needle deviates 50 divisions on the scale for 1 milligramme..... **135.00**

208. —— **Becker's Short Beam.** Same as No. 207, but with aluminium beam, bows, pans, etc..... **145.00**



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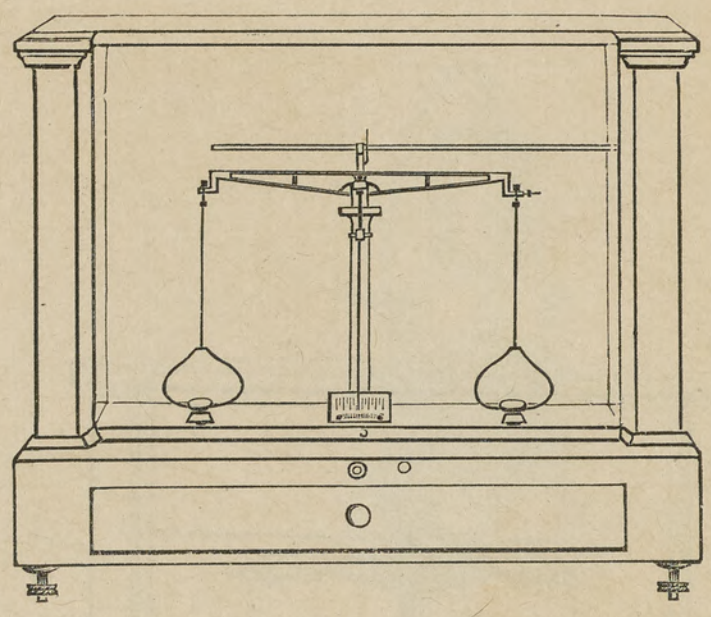

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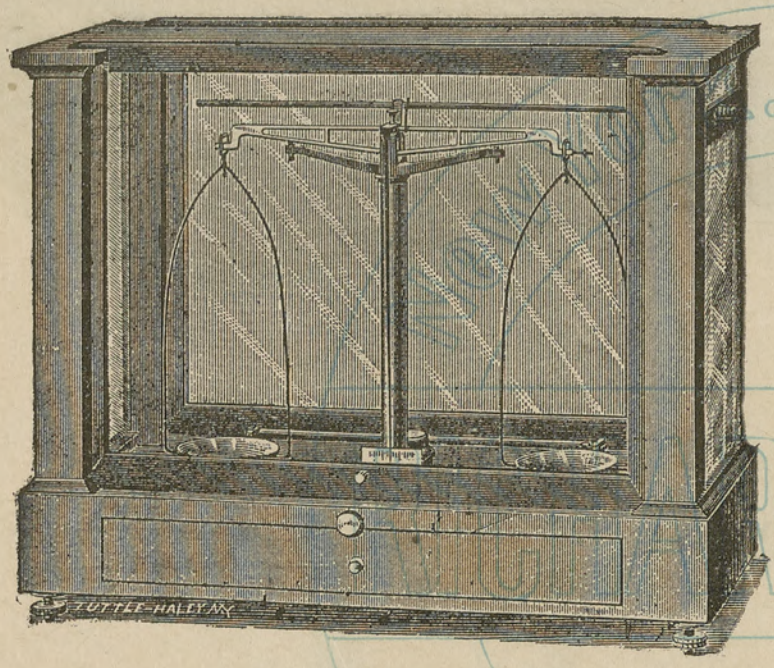

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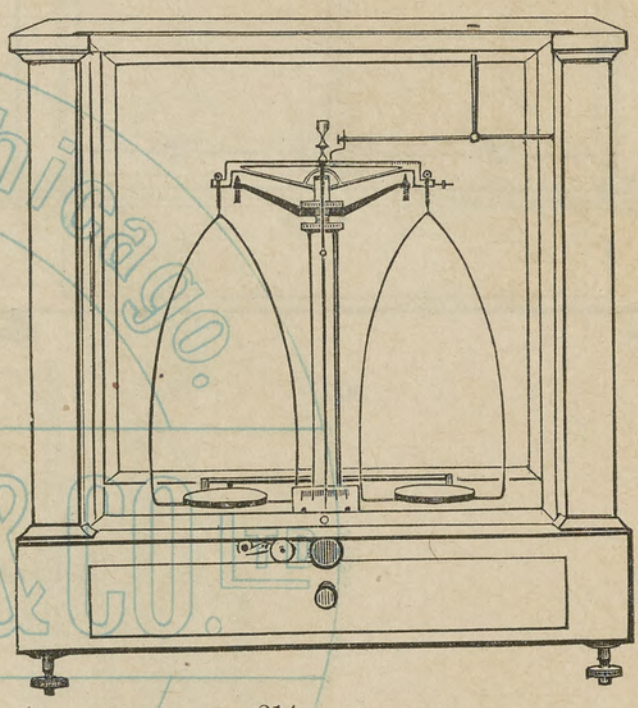

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No.

209. **Assay Balance, Becker's Improved Construction.** For a charge of 10 grammes in each pan, with apparatus for rider; needle deviates 20 divisions on scale for 1 milligramme; glass top to admit more light on rider..... $ 95.00

210. — **Becker's Improved Construction.** Same as No. 209, but with agate knife edges..... 105.00

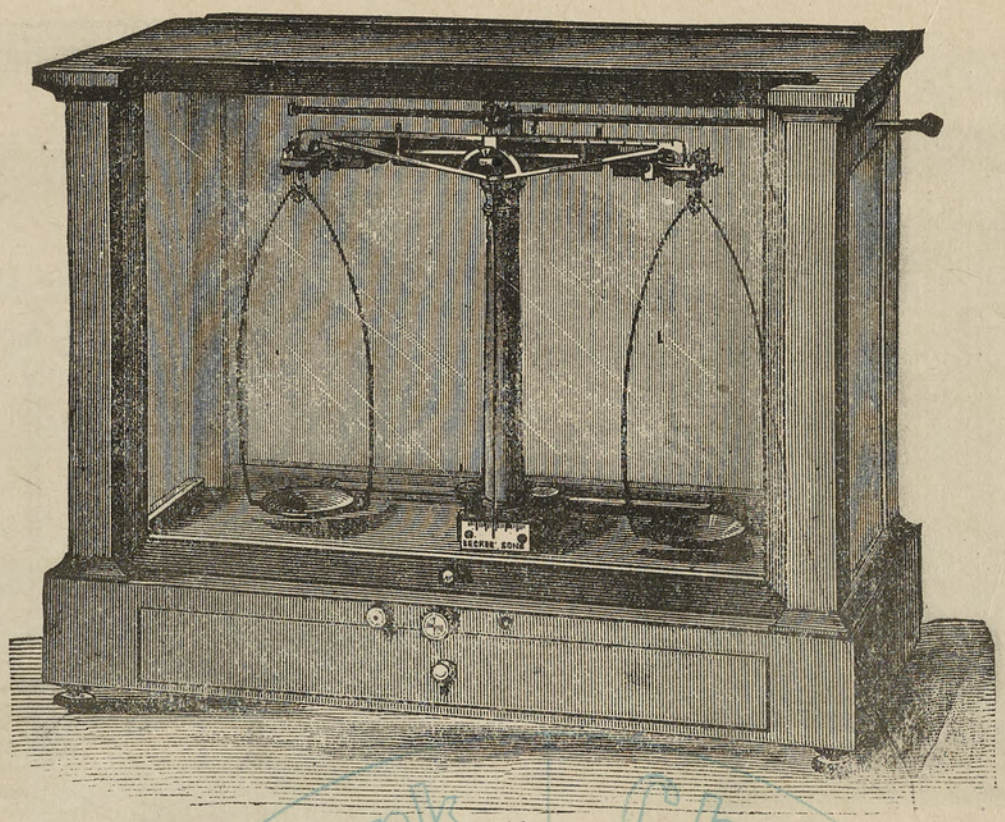
211. **Assay Balance, Becker's.** Both arms of beam are divided in $\frac{1}{50}$ part of milligrammes; needle deviates 30 divisions on the scale for 1 milligramme; glass top to admit more light on rider; with agate knife edges..... 110.00

212t. **Assay Pocket Scale,** for traveling, when closed up, measures 6x2$\frac{3}{4}$x1$\frac{1}{4}$ in. Including weights, 10 grammes, down to 1 milligramme, neatly fitted in box. Shows 4 divisions for 1 milligr..... 18.00

213. **Analytical Balance, Becker's.** For a charge up to 50 grammes in each pan; in French polished mahogany glass case; with glass top to admit more light on rider, front sliding frame counterpoised; beam divided in $\frac{1}{5}$ parts of milligrammes, with new improved arrangement for arrest of pans; provided with wood stand for taking specific gravity; agate bearings; sensible to $\frac{1}{5}$ part of a milligramme with its full charge; pans 6 centimetres in diameter; pans and bows nickel, provided with rider apparatus..... 50.00

214. **Analytical Balance, Becker's Short Beam.** For a charge up to 100 grammes in each pan; in French polished mahogany glass case; with glass top to admit more light on rider; front sliding frame counterpoised; beam 6 in. long; divided in $\frac{1}{5}$ parts of milligramme with new improved arrangements for arrest of pans; provided with wood stand for taking specific gravity; agate bearings; sensible to $\frac{1}{10}$ part of a milligramme; pans 6 centimetres in diameter; pans and bows nickel, provided with rider apparatus..... 60.00

215. — **Becker's Short Beam.** Same as No. 214, but with agate knife edges..... 70.00



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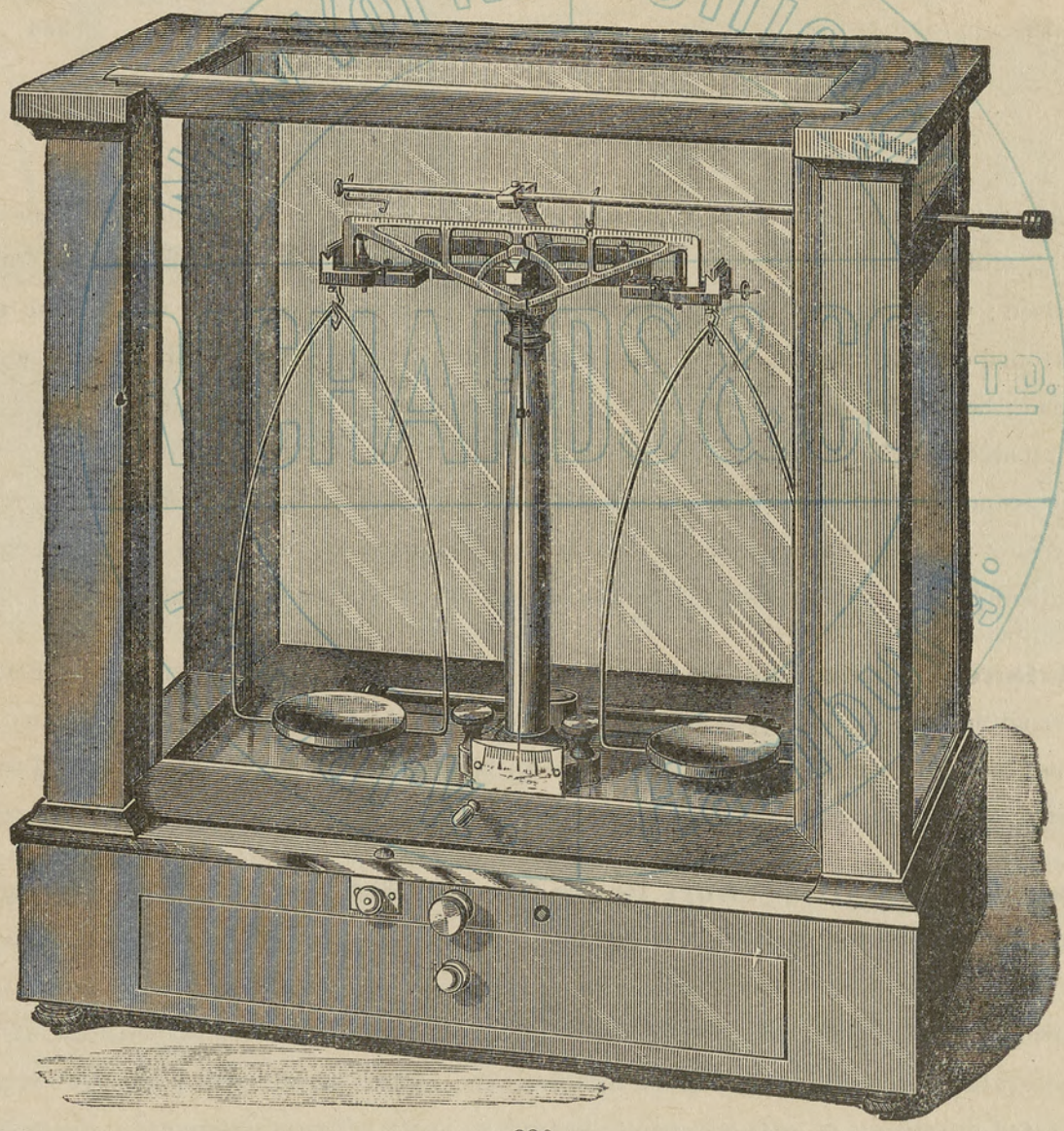

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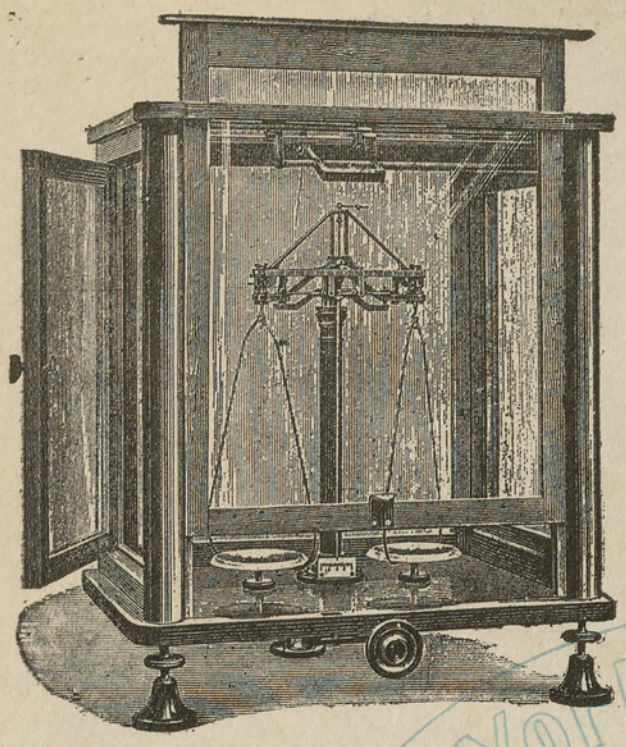
No.

216 **Analytical Balance, Becker's.** For a charge up to 100 grammes in each pan ; in fine French polished mahogany glass case ; with glass top to admit more light on rider, front sliding frame counterpoised ; all bearings agate planes, with new improved arrangement for arrest of pans and beam ; sensible to $\frac{1}{20}$ milligramme with its full charge ; provided with apparatus for specific gravity, rider and weighing tubes ; beam divided in $\frac{1}{10}$ part of a milligramme ; pans 7 centimetres in diameter $85.00

217 —— **Becker's.** Same as No. 216, but with agate knife edges 95.00

218 —— **Becker's.** For a charge of 300 grammes in each pan ; otherwise same as No. 216 ..... 104.00

219 —— **Becker's.** Same as No. 218, but with agate knife edges 114.00



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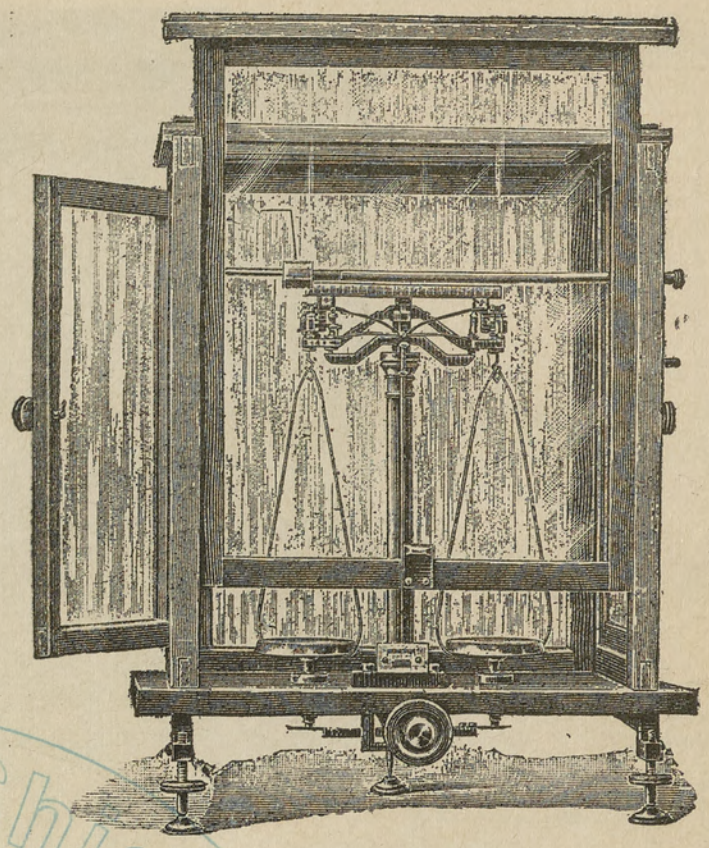

223

No.

220. **Analytical Balance, Becker's Short Beam.** For a charge up to 220 grammes in each pan; sensible to $\frac{1}{10}$ milligramme; in French polished mahogany and glass case; front sliding frame counterpoised; with glass top to admit more light on rider; all parts of the balance are mounted and fastened on plate glass $\frac{5}{16}$ in. thick, so that nothing can get out of order through warping of the wood; beam 6 in. long; all bearings are agate planes with agate knife edges and the beam is graduated in $\frac{1}{10}$ milligramme and in such a manner that the rider can be placed on the center of the beam and used from the O point to either end; provided with new improved arrangement for arrest of pans and beam, riders, apparatus for specific gravity, and for weighing tubes; pans $2\frac{3}{4}$ in. in diameter; width of bows 4 in., can be made wider if desired. (See cut page 15) **$125.00**

221. **Analytical Balance, Sartorius' Short Beam No. I.** With aluminum beam, platinum pans, axes adjustment and compensating hangers; axes and edges of carneol; mahogany and bronzed brass case with sliding frame counterpoised; base of black glass plate; beam $5\frac{1}{2}$ in. with rider arrangement. For a charge up to 200 grammes in each pan; sensible to $\frac{1}{10}$ milligramme..... **200.00**

222. **Analytical Balance, Sartorius' Short Beam No. II.** With triangular gilded beam of phosphorus bronze; case polished mahogany with sliding frame counterpoised, base of black glass plate. Axes and edges of carneol; pans platinum plated, compensating hangers, axes adjustment with a circular movement which provides for the release and arrest of the beam and suspensions, and which possesses with the central knife edges a common axis. Thus, at whatever point the swinging may be arrested, no change of axis can result; beam 6 in., with rider arrangement. For a charge up to 200 grammes in each pan, sensible to $\frac{1}{10}$ milligramme..... **130.00**

223. **Analytical Balance, Sartorius' Short Beam No. III.** With a straight lined beam of phosphorous bronze, which forms the scale for the rider; also a circular movement which provides for the release and arrest of the beam, and which has with the central knife edge a common axis, compensating hangers, axes adjustment, platinum plated pans, axes and edges of carneol; and a parallelogramme arrangement for moving the rider; beam $5\frac{1}{2}$ in. For a charge up to 200 grammes in each pan, sensible to $\frac{1}{10}$ milligramme..... **80.00**

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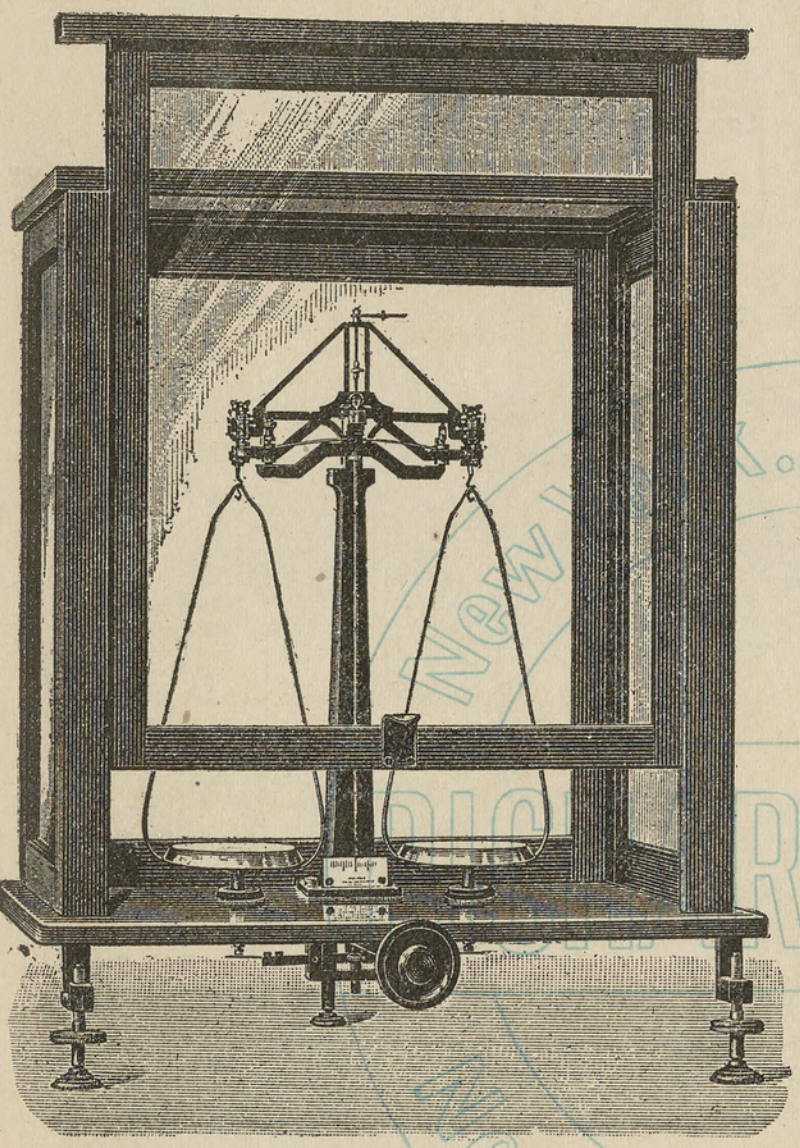

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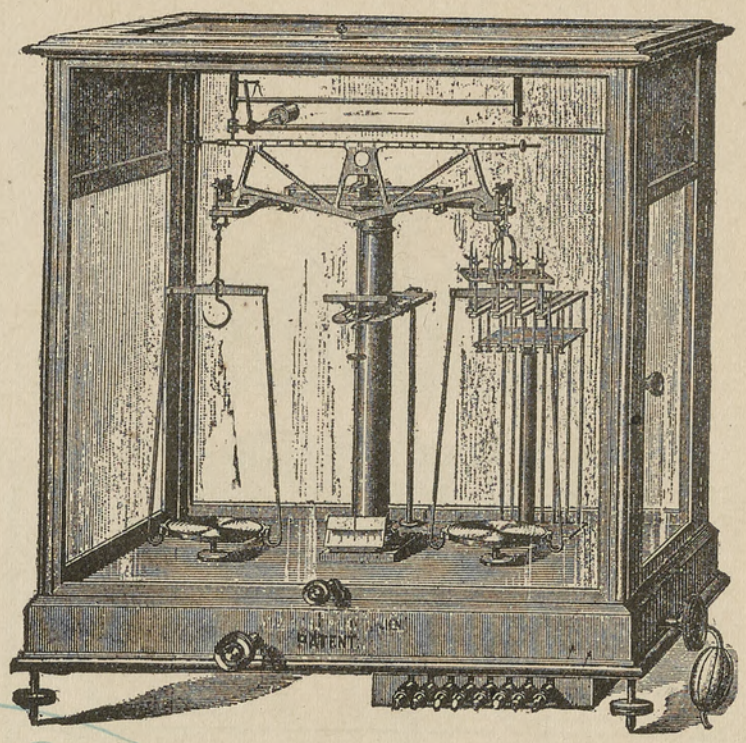

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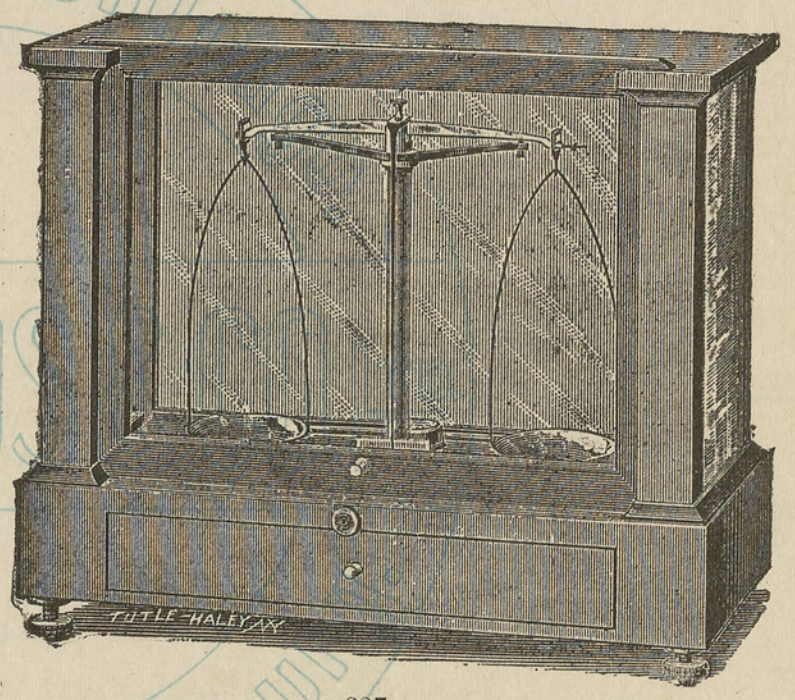

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No.

224. **Analytical Balance, Sartorius' New No. IV.** With triangular beam and rider arrangement, platinum plated pans ; axes and edges of carneol. The beam, hangers and pans are provided with supports; case with sliding frame counterpoised. For a charge up to 200 grammes in each pan, sensible to $\frac{1}{5}$ milligramme **$70.00**

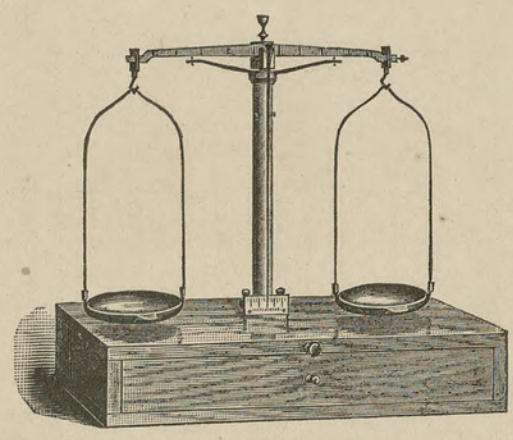
225. **Analytical Balance, same as Sartorius' No. IV.,** but for a charge up to 500 grammes in each pan, sensible to $\frac{1}{5}$ milligramme **95.00**

226. **Analytical Balance, Automatic,** with arrest for beam, hangers and pans. With automatic mechanism for varying the sensibility and handling the weights, when case is closed. Capacity 200 grammes, sensible to $\frac{1}{10}$ milligramme. Complete, including weights of platinum from 1 gramme down. **250.00**

227. **Diamond Balance, Becker's.** In glass case; sliding frame counterpoised; for a charge up to 100 carats in each pan; sensible to $\frac{1}{500}$ carat with set of weights 100 carat piece down to $\frac{1}{64}$ carat; dimensions of case, 16 x 7 x 13½ in..... **30.00**

228. Same as No. 227 but provided with set screws and level..... **34.00**

229. **Diamond Balance, Becker's Pocket.** Complete with set of weights, 64 carat piece to $\frac{1}{64}$ carat; steel knife edges. Each weight is fitted in a separate compartment..... **15.00**



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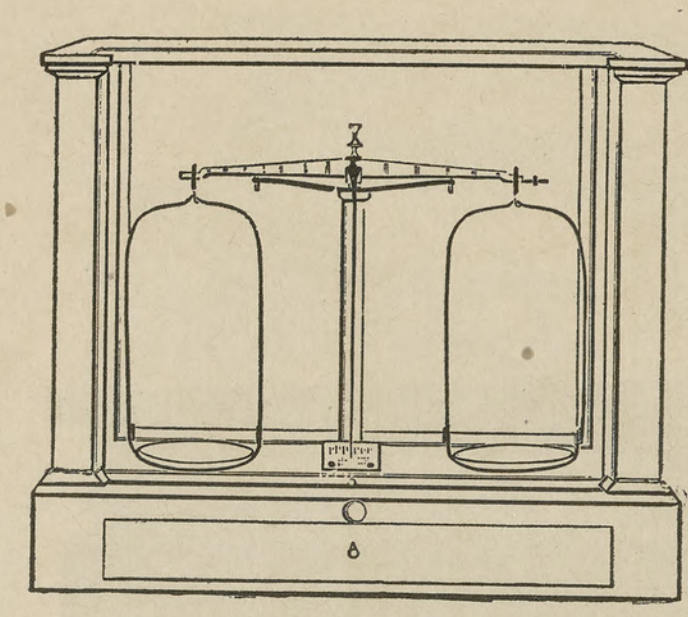

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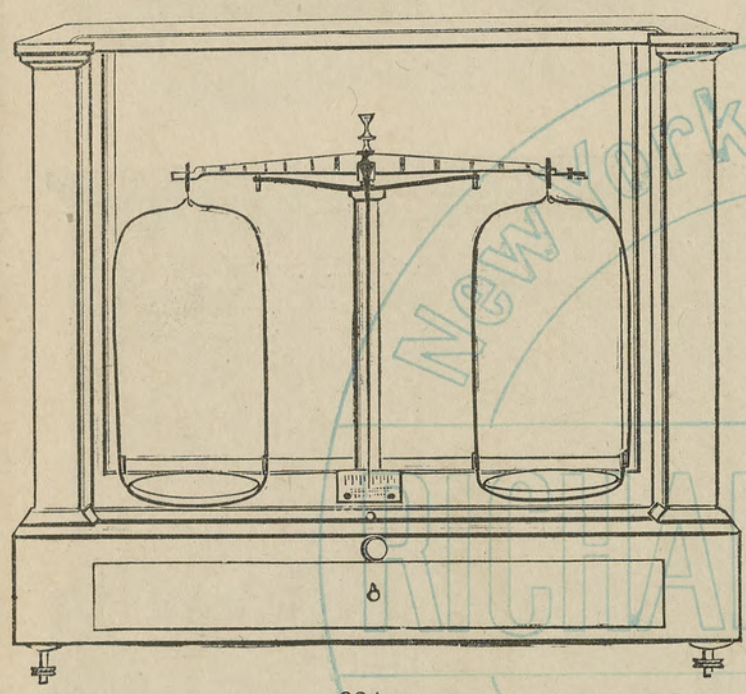

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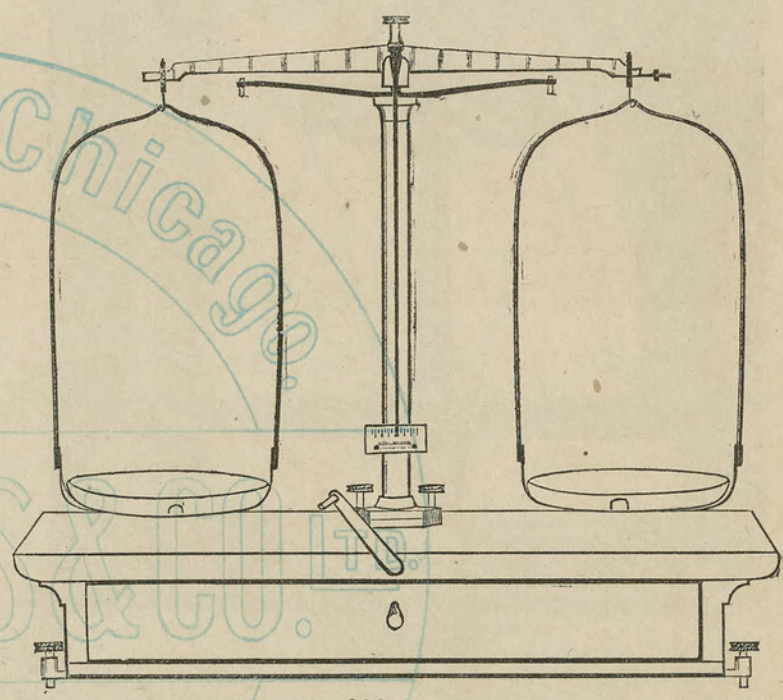

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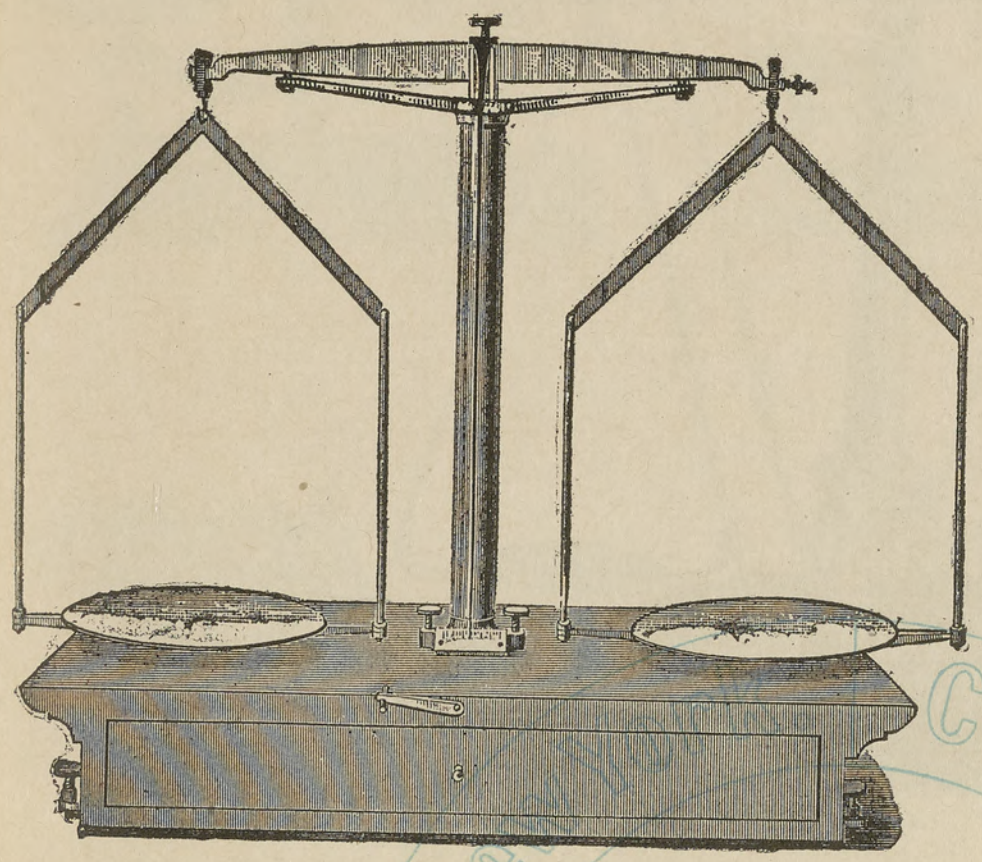
BALANCES.

FOR PHARMACEUTICAL, GOLD, PULP, AND OTHER PURPOSES WHERE ACCURACY IS REQUIRED.

ALL BALANCES FROM NO. 230 TO 244 HAVE IMPROVED BEAM ARREST, WHICH RELIEVES THE CENTRE KNIFE EDGE WHEN NOT IN USE.

No.			
230.	**Balance, Becker's.**	On French polished box with drawer, eccentric for lifting beam; movable pans; can be charged up to 2 oz. in each pan; sensible to $\frac{1}{50}$ grain with its full charge	$11.00
231.	——	Same as above for 5 oz. in each pan; sensible to $\frac{1}{30}$ grain	15.00
232.	——	In French polished mahogany glass case; with counterpoised front sliding frame, movable pans, for a charge up to 2 oz. in each pan; sensible to $\frac{1}{64}$ grain with its full charge	22.00
233.	——	Same as above for 5 oz. in each pan; sensible to $\frac{1}{30}$ grain	26.00
234.	——	In French polished mahogany glass case; with counterpoised front, sliding frame; movable pans, for charge up to 2 oz. in each pan; beam arrest; screws and level; sensible to $\frac{1}{64}$ grain	26.00
235.	——	Same as above for a charge of 10 oz in each pan ; sensible to $\frac{1}{30}$ grain	35.00
236.	——	Same as above for a charge of 20 oz. in each pan ; sensible to $\frac{1}{20}$ grain	42.00
237.	——	Same as above for a charge of 50 oz. in each pan ; sensible to $\frac{1}{4}$ grain	55.00
238.	——	Same as above for a charge of 100 oz. in each pan ; sensible to $\frac{1}{4}$ grain	76.00
239.	——	On French polished box with drawer, for 10 oz. in each pan; provided with eccentric for lifting beam, movable pans ; beam arrest ; set screws and level ; sensible to $\frac{1}{10}$ grain	22.00
240.	——	Same as above for 20 oz. in each pan ; sensible to $\frac{1}{10}$ grain	27.00
241.	——	Same as above for 50 oz. in each pan ; sensible to $\frac{1}{2}$ grain	35.00
242.	——	Same as above for 100 oz. in each pan ; sensible to $\frac{1}{2}$ grain	49.50



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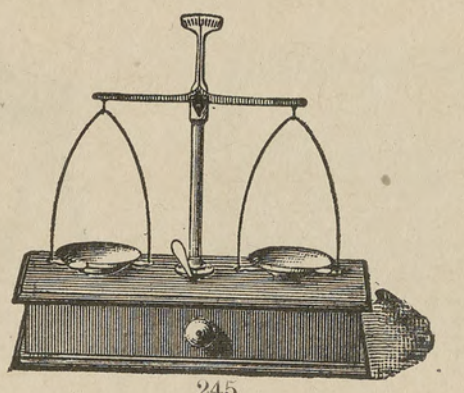

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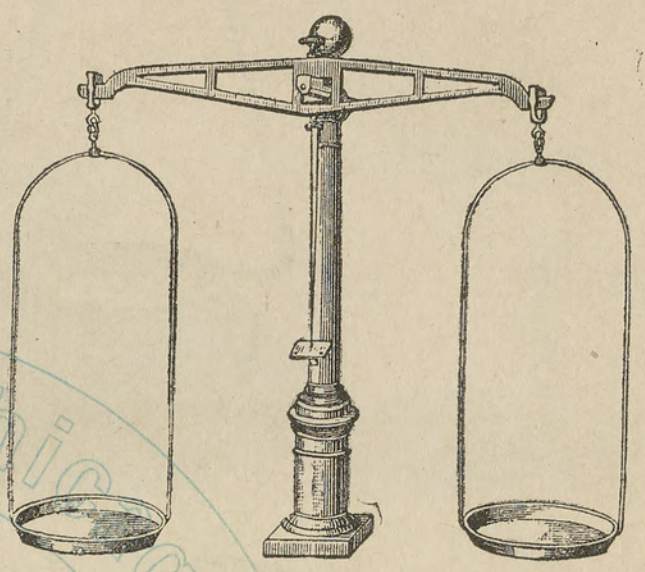

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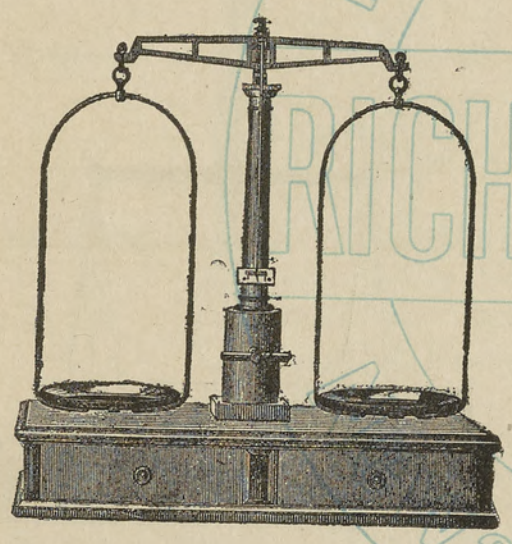

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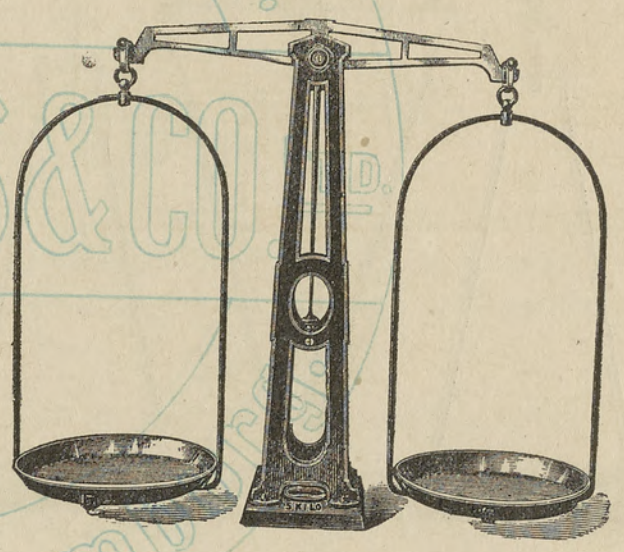

248

243. **Balance, Becker's,** same as No. 242 for 300 oz. in each pan; sensible to ½ grain **$66.00**

244. —— Same as No. 243, in glass case; sensible to ½ grain..... **100.00**

245. **Balance,** on polished walnut or oak box, all parts nickel-plated; including a set of *weights from 2 drams to ½ grain.*

Length of beam	6	7	8 in.
Each	**$3.50**	**5.00**	**6.00**

246. **Balance,** for **assaying, laboratory** and **prescription** work; all brass, beams with prismatic steel bearings; movable pans; capacity 2 lbs, sensible to $\frac{1}{20}$ grain..... **15.50**

247. **Balance,** for **laboratory** and **technical use;** on fine polished case with drawers, open beam adjusting screws, prismatic steel bearings; eccentric for lifting; has movable pans; capacity 5 lbs, indicating $\frac{1}{100000}$ of the full charge.

Capacity	5	35 lbs.
Each	**$40.00**	**75.00**

248. **Balance,** for weighing larger vessels, etc.; movable pans.

Capacity	10	20 lbs.
Each	**$16.00**	**18.00**

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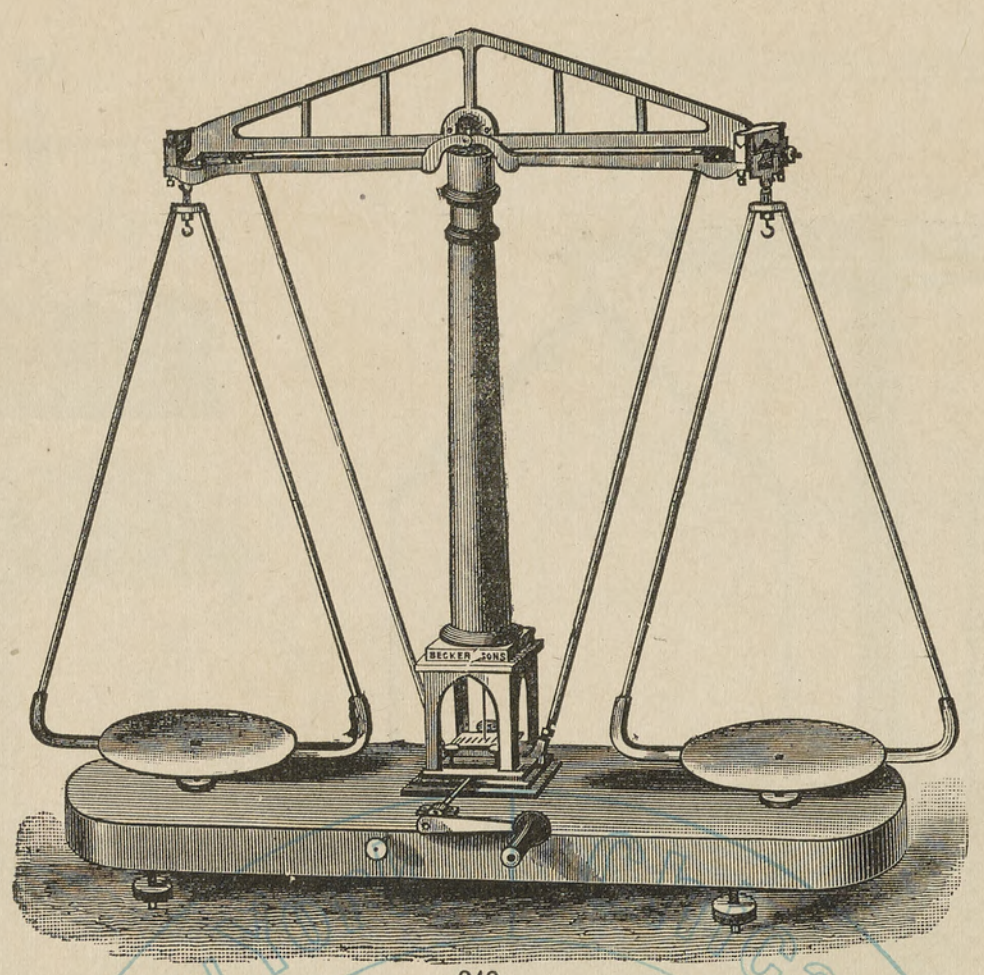

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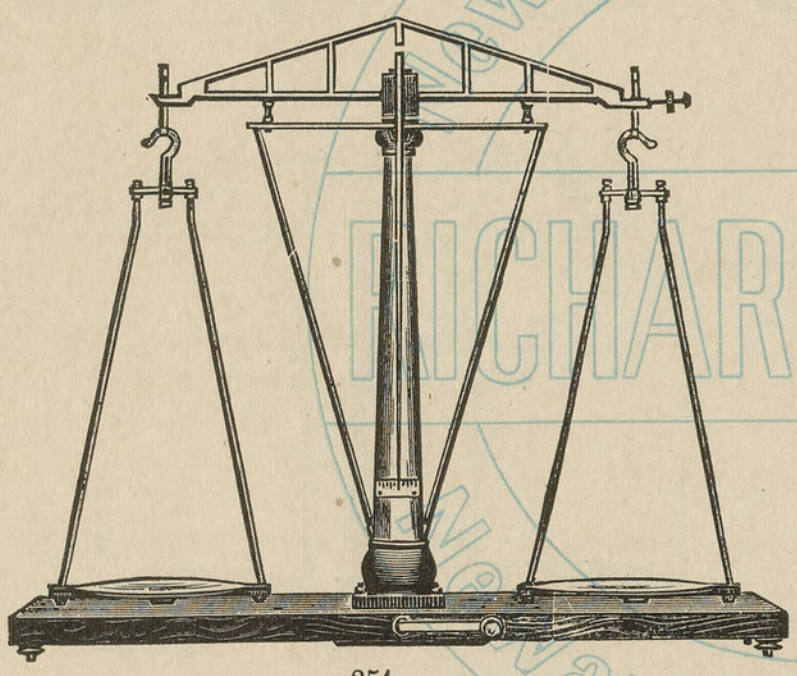

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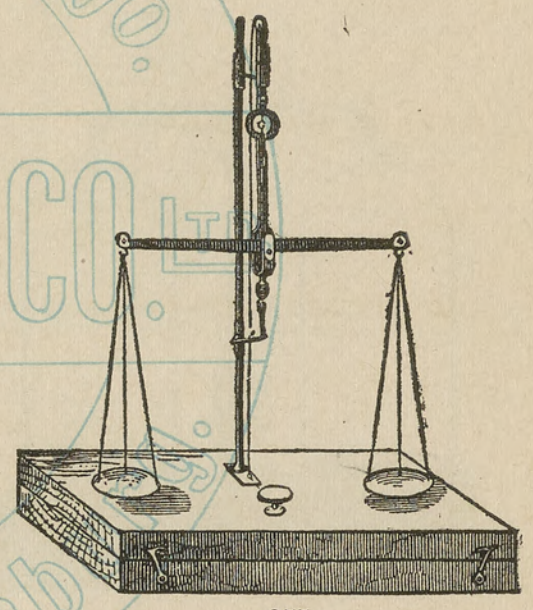

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249. **Balance, Bullion and Specie, Becker's.** Carrying 500 oz. in each pan, sensible to 1 grain; all bearings are agate planes, with steel knife edges; new improved construction for the arrest of the beam and pans; provided with set screw and level..... **$165.00**

250. **Balance, Bullion and Specie, Becker's.** Same as No. 249, but sensible to ½ grain, and in glass case. **250.00**

251. **Balance, Bullion and Specie, Becker's.** Same as No. 249, but for 2000 oz. capacity in each pan; sensible to 2 grains with that charge..... **220.00**

252. **Balance, Bullion and Specie, Becker's.** Same as No. 251, but sensible to 1 grain, in glass case.... **310.00**

253. **Balance, Bullion and Specie, Becker's.** Same as No. 249, but for a charge of 5000 oz. in each pan, sensible to 2 grains with that charge..... **600.00**

254. **Balance, Bullion, "Aurora"**; a strong, well made and sensible balance, to carry 2500 oz. in each pan; with full set of weights..... **200.00**

255. **Balance, Plattner's** for blowpipe analysis, sensible to 1 milligr., nickel plated, with set of weights 1 gramme to 1 milligr., in polished wooden case..... **22.50**

256. —— Same as above, without weights..... **20.00**

Balances, Specific Gravity, See Part II. Specific Gravity.

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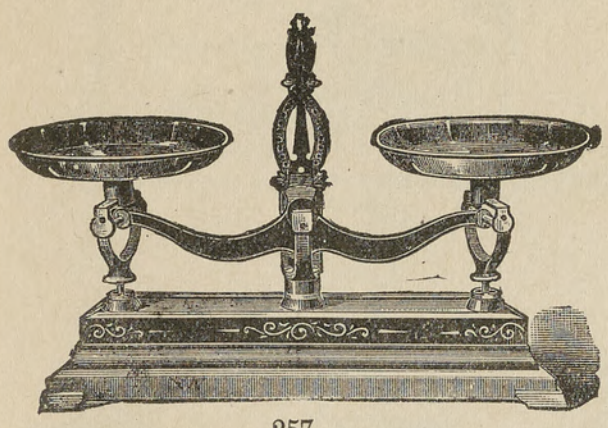

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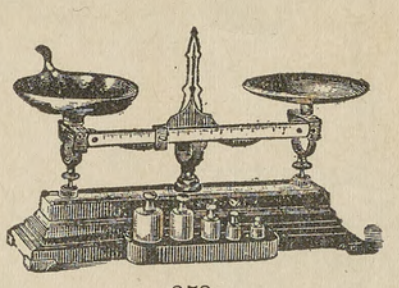

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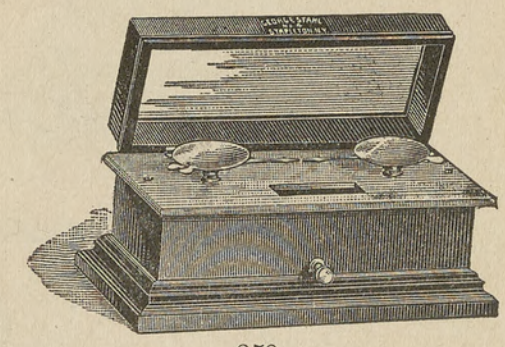

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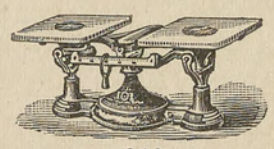

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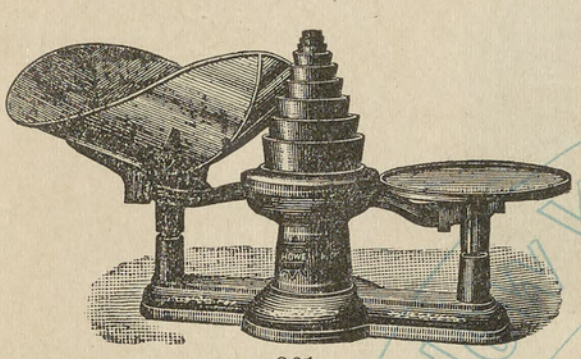

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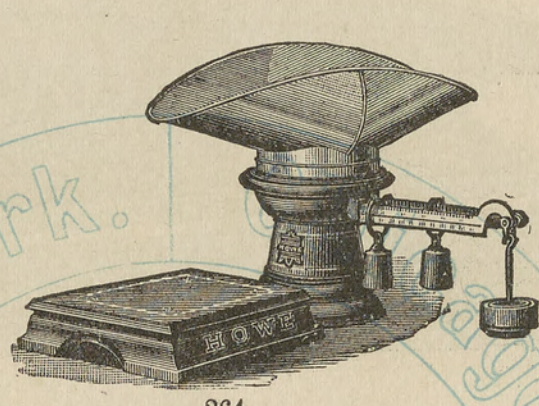

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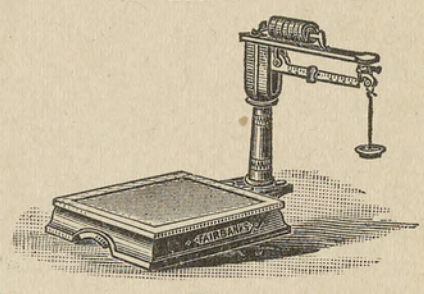

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No.

257t. **Balance, Robervahl Scales,** for coarse weighing

Capacity	1	2	5	10	20	40 lbs.
Dia. of pans	4¾	5	5¾	7¾	8½	10½ in.
Each	$2.75	3.25	4.00	5.00	6.50	10.00

258n. **Balance,** with **side beam** and **sliding weight** to weigh 4 oz. ; has 3¾ in. nickel plated movable pans ; beam is divided into 120 divisions, each division representing 1 grain ; an extra row of metric divisions is placed on bottom edge of beam, each representing 1 decigram ; a set of either gramme or grain weights is fitted into the base ; sensible to ½ grain..... **$8.00**

259. **Balance, Box prescription.** 3 in. nickel plated pans, polished ebony or antique oak box, marble top, hinged cover, reliable and substantial..... **12.00**

260. **Balance, Harvard trip,** with 2 square porcelain plates and side beam for laboratory work ; capacity 1 kilogramme to $\frac{1}{10}$ gramme..... **9.00**

Balance, with 2 iron plates, patent frame and weights combined.

	Capacity	½ oz. to 2 lbs.	½ oz. to 6 lbs.	½ oz. to 10 lbs.	½ oz. to 16 lbs.
261.	without scoop	$5.00	6.00	7.50	9.50
262.	with tin scoop	5.75	7.00	8.50	11.00
263.	with brass scoop	6.50	7.75	9.50	12.00

Balance, with double beam, patent frame

264. with tin scoop, capacity ½ oz. to 240 lbs..... **15.00**

265. with brass scoop, " ½ " 240 " **16.00**

266t. **Balance, with short pillar, sliding poise,** platform 13x19 in., brass weights and counterpoise, capacity 2oz. to 300 lbs..... **19.00**

" ¼ " " 300 " **35.00**

266at. **Balance, Avoirdupoids** weight, marks ¼ oz., otherwise same as No 266..... **50.00**

266bt. **Balance, with tall pillar, sliding poise,** platform 13x19 in.; capacity 2 oz. to 300 lbs..... **21.00**

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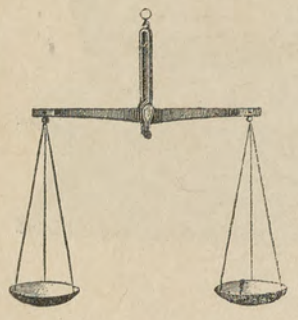

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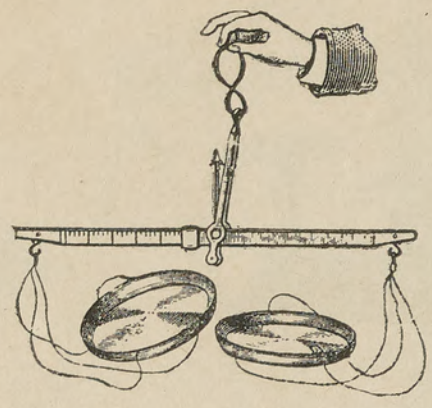

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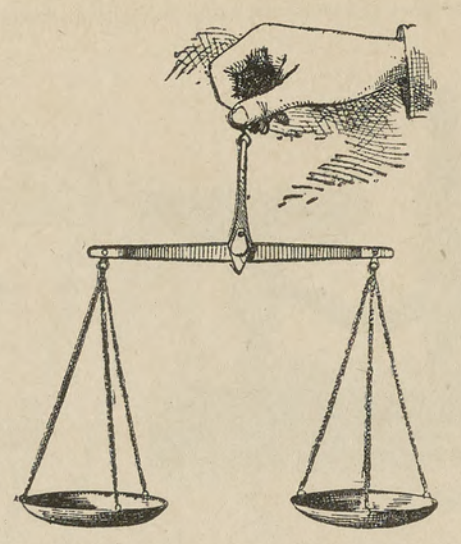

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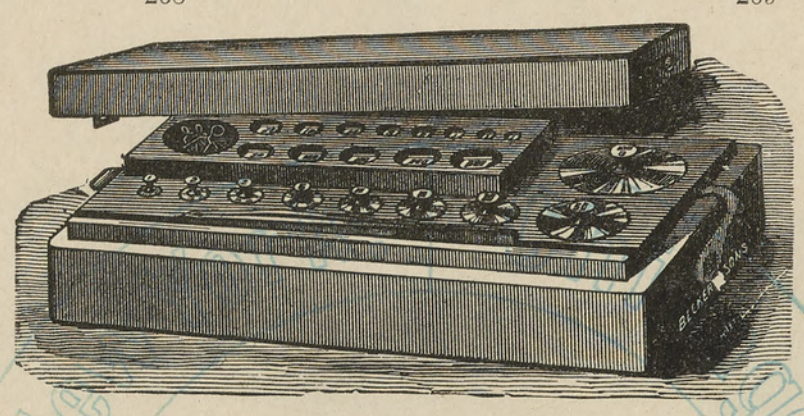


272

No.

267. **Balance, Hand Scale,** with brass beam, horn pans, each scale in box.

Length of beam	4	5	6	6¾	7½ in.
Each	$1.20	1.60	1.75	2.00	2.25

268. — **Hand Scale,** with **sliding weight,** very sensible.

5 grains in $\frac{1}{10}$ grain $3.00

30 " $\frac{1}{2}$ " 3.50

25 centigrammes in $\frac{1}{2}$ centigr 3.00

269. — **Hand Scale,** for weighing larger quantities. All parts nickel plated. Capacity 1 lb. sensible to $\frac{1}{2}$ grain. Beam 9 in. long, pans 4½ in 2.50

270. **Balance** or **Scale strings,** of green silk, ready made, with hook.

Size,	small	medium	large
Per pair	.10	.15	.20

271. **Balance** or **Scale pans,** glass, counterpoised, with handle.

Dia.	2½	3	4 in.
Per pair	.65	.75	$1.00

WEIGHTS, GRAMMES AND GRAINS FOR SCIENTIFIC WORK.

ALL WEIGHTS IN THIS LIST ARE MOST ACCURATELY ADJUSTED ACCORDING TO THE FRENCH STANDARD; ONE OUNCE TROY EQUAL 31,1033 GRAMMES

272. **Analytical Weights, Becker's, No. 1 Quality.** In French polished boxes lined with velvet, each piece fitted separately; Brass weights laquered; the fractions of the gramme are platinum except those below one milligramme which are made of Aluminum.

1 **Platinum Gramme** and down to $\frac{1}{10}$ milligramme $10.00

10 **Grammes** and down to $\frac{1}{10}$ milligramme 12.00

Two 20 — 1 " 3 Riders 14.00

50 — 1 " " 16.00

100 — 1 " " 18.00

200 — 1 " " 24.00

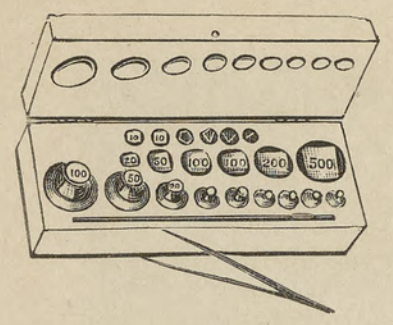
500 — 1 " " 28.00

2 **Kilo** and down to 1 " " 70.00

10 **Grains** and down to $\frac{1}{1000}$ grain 10.00

1000 — $\frac{1}{1000}$ " 3 Riders 18.00

Newark. Hamburg. RICHARDS & CO. LTD.



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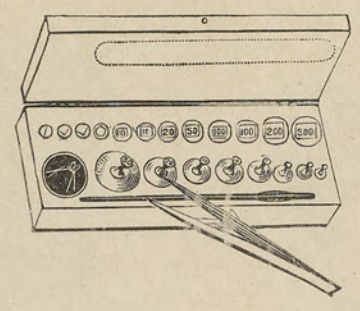

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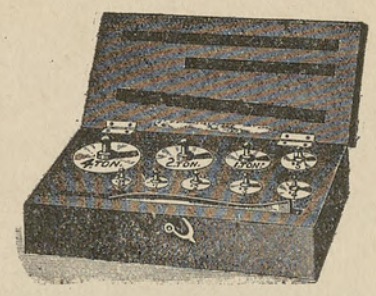

274



277

No.

273. **Analytical Weights, No. 2 Quality.**

20 **Grammes**	and down to	1 milligramme	from 500 down of Aluminum	$ 3.50
100	——	1 "	" 500 " " "	5.50
50	——	1 "	2 Riders from 500 down of Platinum	9.00
100	——	1 "	2 " " 500 " " "	10.00
500	——	1 gramme,	in mahogany block	6.00
500	——	1 milligramme,	in case from 500 down of Aluminum	9.50
1 **Kilo**	and down to	1 gramme,	in mahogany block	8.50
1	——	1 milligramme,	in case, from 500 down of Aluminum	12.00
1000 **Grains**	and down to	$\frac{1}{100}$ grain,	2 Riders	10.00

274. **Assay ton weights,** 4 A. T. to $\frac{1}{20}$ A. T. 6.00

The assay ton weights have been introduced by Dr. C.F. Chandler, of the School of Mines, Columbia College, New York, where they are now in use for convenience in the assay of ores. The weight denominated by Dr. Chandler, "One A. T." equals 29.1666 grammes, and contains consequently as many milligrammes as there are troy ounces in a ton avoirdupois of 2,000 lbs. Therefore, if one A. T. of ore assays 1 milligramme, the ton contains 1 ounce troy.

275. **Riders, single**

Milligrammes	12	10	6	2	$1\frac{2}{10}$	1
Each	.30	.30	.30	.35	.50	.50

276. **Weights, Single of Platinum, Becker's.** No. 1 Quality.

Milligrammes	500	200	100	50	20	10	5	2	1
Each	$1.00	.75	.75	.50	.35	.35	.30	.30	.30

276a. **Set of Milligrammes** $\frac{5}{10}$ to $\frac{1}{10}$ per set 1.00

277. **Weights, single of Platinum, Becker's.** No. 1 Quality.

Grains	10	5	2	1	$\frac{5}{10}$	$\frac{2}{10}$	$\frac{1}{10}$	$\frac{5}{100}$	$\frac{2}{100}$	$\frac{0}{10}$
Each	$1.10	1.00	.75	.75	.50	.35	.35	.35	.35	.30

277a. **Set of** $\frac{5}{1000}$ to $\frac{1}{1000}$ per set 1.00

278. **Weights—single of Aluminum, Becker's.** No. 2 Quality.

Milligrammes 500, 200, 100, 50, 20, 10, 5, 2, 1, per. set 1.50

Grains 10, 5, 2, 1, $\frac{5}{10}$, $\frac{2}{10}$, $\frac{1}{10}$ $\frac{5}{100}$, $\frac{2}{100}$, $\frac{1}{100}$, per set 1.75

279. **Apothecary Weights, Becker's.**

1 Troy oz. down to $\frac{1}{4}$ grain 3.50

1000 **grains** and down to $\frac{1}{10}$ grain 7.75

1 **lb.** and down to $\frac{1}{8}$ oz. avoirdupois; in mahogany block 5.00

2 **lbs.** " " " " " " " " 7.50

280. **Diamond Weights, Becker's.**

100 **carats** and down to $\frac{1}{64}$ carat 8.00

300 " " " " $\frac{1}{64}$ " 10.00

280a. **Weights,** single carats, 2, 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{64}$, each ..... .20

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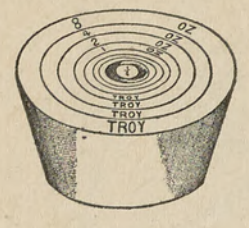

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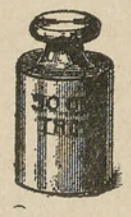

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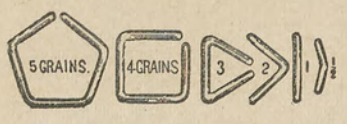

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287a



289

281. **Troy Weights, Brass, Becker's.** In mahogany boxes lined with velvet. All small weights are of aluminum. Fitted separately.

	1 **oz.** and down to ¼ grain	$3.50
two	2 " " " " ¼ "	6.25
	5 " " " " ¼ "	7.75
	10 " " " " ¼ "	10.00
	20 " " " " ¼ "	15.00
	50 " " " " ¼ "	20.00
	100 **oz.** and down to 1 grain	30.00
	200 " " " " 1 "	40.00
two	500 **oz** pieces	45.00

282. **Grain Weights of Aluminum, Becker's.**

12, 6, 3, 2, 1, ½, ¼, per set	.70
10, 5, 3, 2, 1, ½, ¼, per set	.70

283. **Troy Weight. Brass, in block.**

	1 **oz.** and down to ½ grain	1.00
two	2 " " " " ½ "	1.75
	5 " " " " ½ "	2.50
	10 " " " " ½ "	4.00
	20 " " " " ½ "	7.00
	30 " " " " ½ "	9.00
	50 " " " " ½ "	12.50
	100 " " " " ½ "	18.00
	200 " " " " ½ "	27.00
	500 " " " " ½ "	51.00

284. **Troy Cup Weights, Brass.**

4 **oz.** and down to ¼ oz.	1.50
8 " " " " ¼ "	3.00
16 " " " " ¼ "	4.00
32 " " " " ¼ "	5.50
64 " " " " ¼ "	9.00
10 **pennyweights** to ½ grain	.50
½ " " ½ "	.25

285. **Troy Weights, Iron;** separate from full sets.

oz. troy	500	300	200	100
Each	$5.00	3.00	2.00	1.00

286. **Grain Weights,** in mahogany box, with forceps; specially adapted for dispensing purposes.

	300 **grain piece** down to 1/10 grain	1.75
287.	—— **aluminum,** 5 to ½ grain, per set	.25
287a.	—— **aluminum square** 10 to ½ grains, per set	.40
288.	—— **nickel silver** 6 to ½ grain, per set	.10

289. **Drachm Weights, 2 drachms** to ½ grain, per set ..... .25

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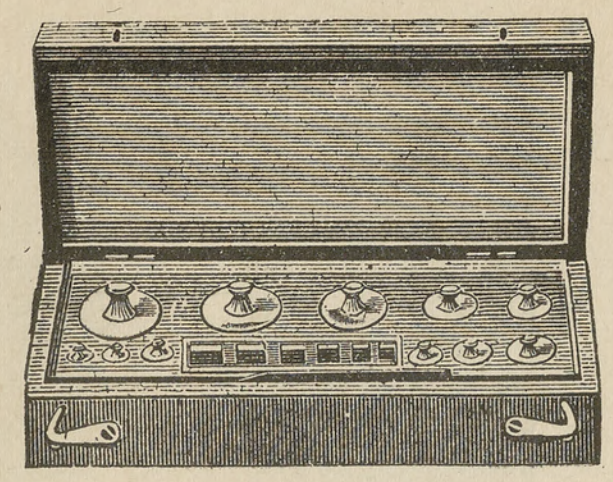

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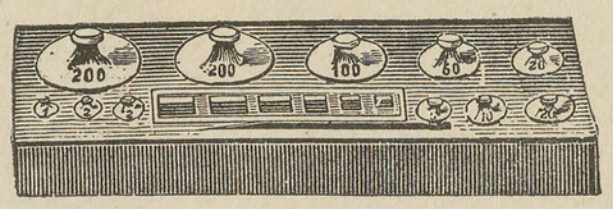

290a

No.

290. **Gramme Weights,** for laboratory and other accurate work not as fine as the analytical weights, but of good quality ; in fine mahogany box ; fractions of gramme ; German silver; under glass cover with forceps

Grammes to 1 milligr.	1000	500	200	100	50	20
Each	**$10.00**	**8.00**	**6.50**	**5.00**	**3.75**	**3.50**

290a. —— as above, but in polished block.

Grammes to 1 milligr.	1000	500	200	100	50	20
Each	**$8.00**	**6.00**	**4.00**	**2.85**	**2.50**	**2.20**

291. **Gramme Weights, Brass,** in polished block, standard quality.

1 kilogramme to 10 grammes	**$5.50**
1 " " 1 "	**6.50**
1 " " 1 centigramme	**7.50**

292. **Gramme Weights, Brass,** in polished block.

20 **grammes** to 1 centigramme	**.65**
50 " " 1 "	**1.10**
100 " " 1 "	**1.60**
500 " " 1 gramme	**2.50**
1000 " " 1 "	**3.50**

293. **Gramme Weights, Iron.**

1 **kilogramme** and down to 10 grammes	**1.25**
2 " " " " 10 "	**2.00**
5 " " " " 10 "	**4.00**

294. **Gramme Weights**—in mahogany box, with forceps; specially adapted for dispensing purposes.

20 grammes and down to 1 centigramme	**.75**

295. **Gramme Weights**—in paper box

1 **gramme** and down to 1 centigramme	**.25**
20 " " " " 1 "	**.50**

296. **Gramme Weights, German Silver.**

500 **milligrammes** and down to 1 milligramme	**.50**

297. **Avoirdupois Weights, Brass ;** standard quality; in oiled walnut block, lined with poplar to prevent shrinkage; weights of the finest finish; burnished.

1 **lb.** and down to $\frac{1}{4}$ oz	**4.00**
2 " " " " $\frac{1}{4}$ "	**5.50**
4 " " " " $\frac{1}{4}$ "	**7.00**

298. **Avoirdupois Weights, Brass;** in walnut block.

1 **lb.** and down to $\frac{1}{8}$ oz	**2.25**
2 " " " " $\frac{1}{8}$ "	**3.50**
4 " " " " $\frac{1}{8}$ "	**5.00**

299. **Avoirdupois Weights, Brass** in case, accurately adjusted and well finished

1 **lb.** and down to $\frac{1}{2}$ oz	**1.00**
2 " " " " $\frac{1}{2}$ "	**1.50**
4 " " " " $\frac{1}{2}$ "	**2.50**

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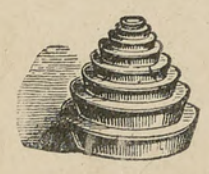

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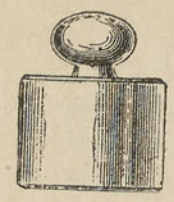

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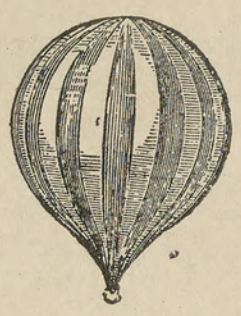

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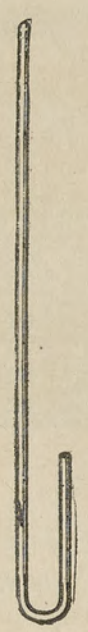

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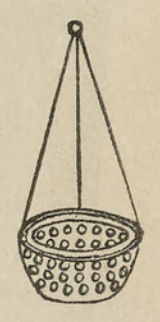

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312

No.

300. **Avoirdupois weights, iron.**

1 **lb.** and down to ½ oz	$ .50
2 " " " " ½ "	.75
4 " " " " ½ "	1.25
7 " " " " ½ " (15 lbs.)	2.00
10 " " " " ½ " (25 lbs.)	3.00

301. **Avoirdupois fractions of ounce, nickel silver.** These weights are the fractions of the avoirdupois ounce.

¼ **oz.** and down to $\frac{1}{128}$ avoirdupois ounce	.75

302. **Decimal grain weights, nickel silver.**

50 **grains** down to 10 grains	.60

303. **Single weights**—Separate from full sets.

Oz.	¼	½	1	2	4	8
Nest, each	.10	.20	.30	.40	.50	.60
Block, "	.15	.25	.35	.50	.60	.70

303a. **Other kinds of weights,** such as **Quartz, Crystalglass, Bergcrystal,** or **goldplated, gilded** and **platinized,** we will be pleased to quote you on application.

304. **Balloons of Collodion film;** for collecting gases.

Capacity	200	800	1500	2500	4000	5000 cc.
Each	.30	.40	.60	$1.00	1.20	1.40

305. —— **of Goldbeater's Skin,** for hydrogen and coal gas.

Diameter	12.	16 in.
Each	$4.00	12.00

—— **of Glass,** for weighing gases, see Part II Apparatus for Vapor Density Determination.

306.	**Barometer,** Bunsen's Syphon, graduated in Millimeters	$10.00
307.	—— Same as No. 402, with support	12.00
308.	**Barometer Tubes,** plain, straight, one end sealed, 35 in. long	.35
309.	—— bent, with bulb, one end sealed	.40
310.	—— graduated for Bunsen's Syphon Barometer	3.00

Other Barometers, see Part II; Meteorological Apparatus and Instruments.

311.	**Baskets of Lead,** for generators, holding pieces of sulphide iron, etc	.50
312.	—— with legs	.75

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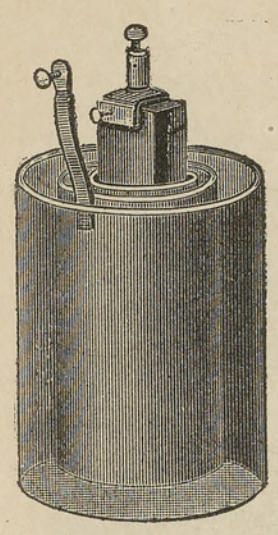

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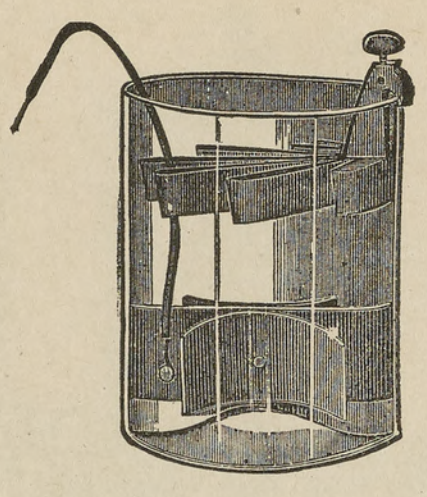

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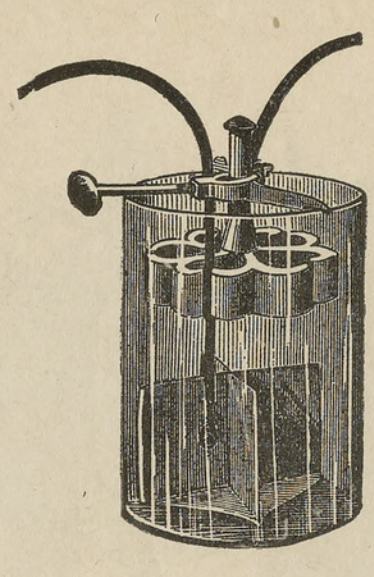

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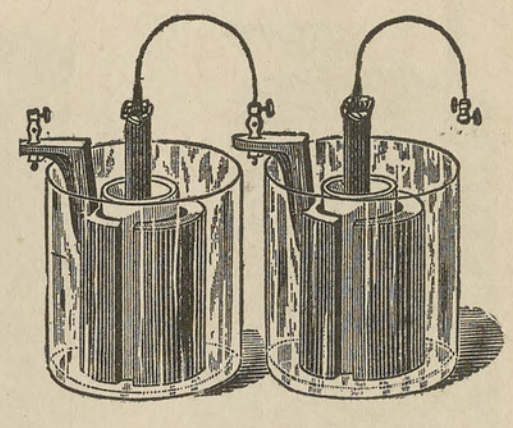


316

GALVANIC BATTERIES.

No.

313t. **Battery, Bunsen** with rolled zincs.

Sizes, Jars,	1 Pt. 4x4 in.	1 Qt. 4½x5 in.	2 Qts. 5x6 in.	1 Gal. 6x8 in.	2 Gal. 8½x12 in.
Cell complete	.90	$1.10	$1.40	$2.50	$4.75
Carbon	.08	.08	.20	.40	1.00
Carbon Connection	.15	.15	.15	.50	1.00
Carbon Clamp	.08	.08	.12	.25	.40
Glass Jar	.16	.24	.26	.36	.88
Porous Cup	.12	.13	.15	.25	.75
Zinc and Connection	.30	.40	.50	.80	1.30

DIRECTIONS.—Amalgamate the zinc with mercury, and place in jar. Place the carbon in porous cup, and fill the porous cup with 40 degree Nitric Acid to within a half inch of the top; then place porous cell immediately within the zinc, and fill the glass jar with water to the same height as the fluid in the porous cell. If greater energy is required add sulphuric acid to the water in the glass jar, but not to a greater extent than one quart acid to twelve parts water. The acid should be added to the water before setting up the battery, and the acid water allowed to cool before using,

314t. **Battery, Crowfoot Gravity.**

	Main. 5x7 in.	Local. 6x8 in.
Cell complete	.70	.85
Jar	.30	.36
Zinc, with Connector	.30	.40
Copper	.14	.15

NOTE:—Directions on Application.

315t. **Battery, Gravity Western Union Standard** with improved adjustable Zinc Hanger and Connection.

	Main. 5x7 in. No. 1.	Local. 6x8 in. No. 2.	Local Ext. heavy. 6x8 in. No. 3.	W. U. Local. 6½x7 in. No. 4.
Cell complete	.85	$1.00	$1.10	$1.30
Copper	.12	.14	.14	.20
Jar	.30	.36	.36	.40
Zinc	.30	.36	.40	.45
Zinc Hanger	.18	.20	.20	.22

DIRECTIONS.—Essentially the same in management as the Crowfoot pattern, except in the hanging of the zinc, which is suspended from the tripod, about 4 inches above the copper. The internal resistance of this battery may be increased by suspending the zinc higher.

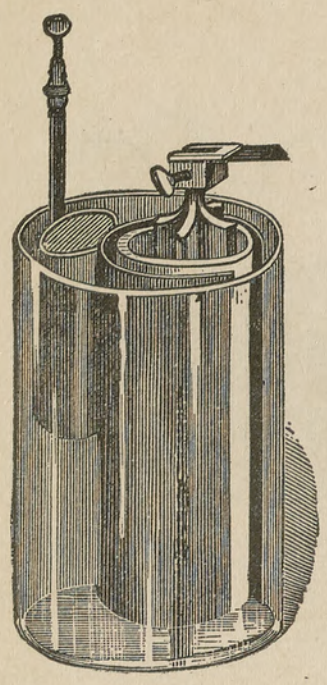
316t. **Battery, Carbon, or, Electropoion.**

	4x4 in. No. 1, (1 pt.)	4½x4½ in. No. 1½, (1 qt.)	6x8 in. No. 2, (1 gal.)
Cell Complete	$1.00	$1.25	$4.00
Carbon	.08	.20	.40
Carbon Connection	.15	.15	.50
Carbon Clamp	.08	.12	.25
Glass Jar	.16	.20	.36
Porous Cup	.10	.10	.25
Zinc	.36	.45	2.00
Zinc Connector	.10	.10	.20

DIRECTIONS—Fill the glass jar with water; the porous cells with electropoion fluid. The height of the liquids in the jar and the porous cells should be about the same. Use the following formula for electropoion fluid;

"Mix one gallon of sulphuric acid and three gallons of water. Then in a separate vessel dissolve 6 lbs. of bichromate of potash in 2 gallons of boiling water, mixing the whole thoroughly together. When cold it is ready for use."

RICHARDS & CO. LTD. New York Chicago Hamburg



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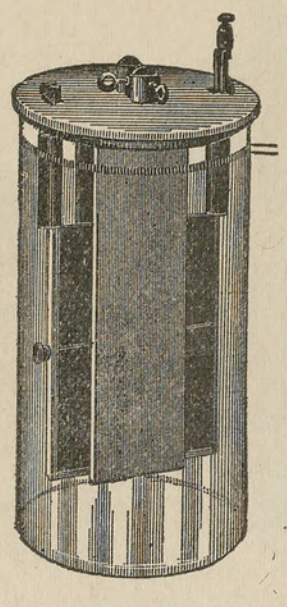

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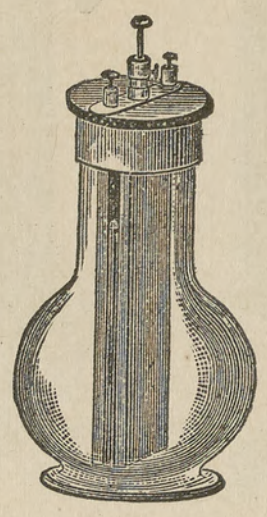

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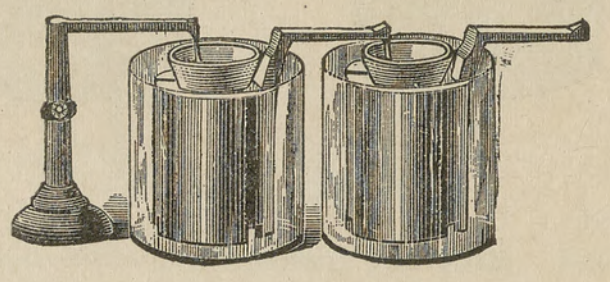

321

No.

317t. **Battery, Daniell, Local.**

Cell complete	$1.70
Copper, with pocker	.60
Porous cup, best quality	.24
Glass Jar, 6 x 8 inches	.36
Zinc	.36
Zinc Clamp	.18
Earthen Jar	.30

DIRECTIONS—Fill the jar and porous cell with water, and the pocket with blue vitriol. Close the circuit for a few hours, or if the battery is required for immediate use add 1 oz. of sulphate of zinc to the water in the porous cell. The direction for Gravity Battery will apply to the maintenance of the Daniell.

Battery, Edison Lalande, Type "K." Phonograph Model, capacity 300 ampere hours.

318t.	Price complete, if furnished in Glass Jar	3.00
319t.	" " " " " Porcelain Jar	3.50

Single parts;

Glass Jar 5 x 11 in	.36
Porcelain Jar 5 x 11 in	1.00
Cover	.36
Zinc Plates, each	.25
Copper oxide Plates, each	.30
1 Can Caustic Potash, in sticks	.35
Bottle heavy Paraffine Oil	.10

320t. **Battery, Grenet.**

Type No.	1	2	3	4	5
Capacity	½ pt.	1 pt.	1qt.	½ gal.	¾ gal.
Cell complete	$1.40	2.40	3.00	4.40	8.80
Glass Jar	.35	.70	.80	1.20	2.00
Carbons, each	.20	.30	.50	.60	1.00
Zinc	.20	.25	.25	.30	.35

TO MAKE SOLUTION—To 3 pints of cold water add 5 fluid oz. of sulphuric acid; when this becomes cold add 6 oz. (or as much as the solution will dissolve) of finely pulverized bichromate of potash. Mix it well.

321t. **Battery, Grove.**

Cell complete	1.25
Platinum	.90
Porous Cup	.17
Jar 4 x 4 in	.16
Zinc	.50
Zinc Connector	.17
Platinum Standard	.55

DIRECTIONS—Amalgamate the zinc with mercury and place in the jar. Place the platinum plate in the porous cell, and fill the cell to the flange with 40° nitric acid. Place the porous cell immediately within the zinc and fill the glass jar with a mixture of 1 pt. sulphuric acid to 12 pts. water. This acid solution should be mixed and allowed to cool before using in the battery.

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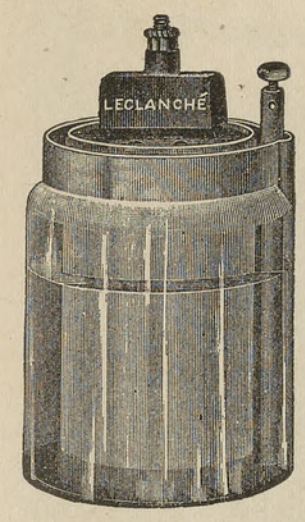

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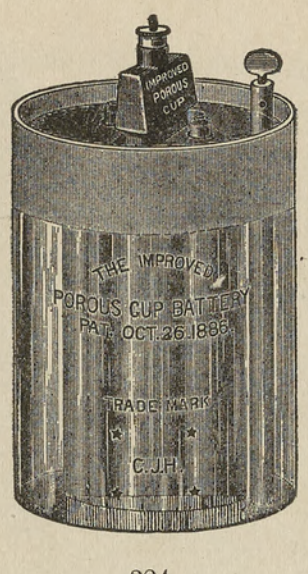

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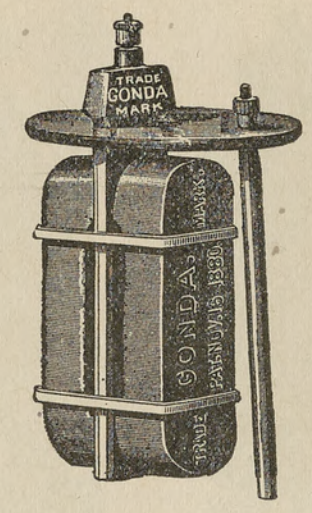

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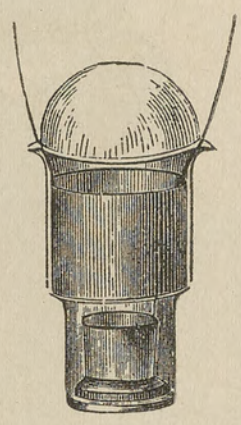

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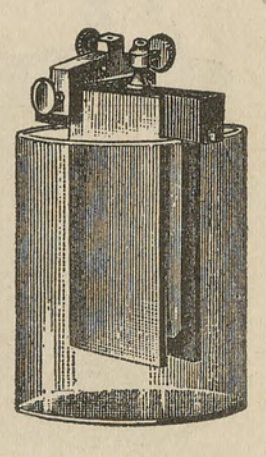

328

No.

322t. **Battery, Leclanche Disque.**

	Cell complete	$ .85
	Porous Cup	.65
	Glass Jar	.20
	Zinc	.10
	Sal Ammoniac	.10
323t.	Cell complete, hermetically sealed	1.25

324t. **Battery, Leclanche Improved;** porous cup; patented. The battery has a glass cover to reduce evaporation and assist sealing.

	Cell complete	1.00
	Porous Cup	.75
	Glass Jar	.15
	" Cover	.15
	Zinc with Connector	.10
	Sal Ammoniac	.10
325t.	Cell complete, hermetically sealed	1.50

DIRECTIONS—Put 6 oz. of sal-ammoniac into the glass jar; fill ⅓ full of water, and stir. Put in porous cell, pouring a little water into the hole in the porous cup. Put in zinc and allow to stand several hours. The inside of the rim of the jar should be greased. Keep the solution at ⅔ the height of the jar, to avoid the running over of salts formed. The battery should be kept in a dry place, and requires very little attention, except to put in water occasionally to supply the loss by evaporation.

After much use, in case of failure to work, the solution should be thrown out and fresh sal-ammoniac and water used. If this does no good, soak out the porous cell in warm water. If it still fails new porous cells must be used.

326t. **Battery, Leclanche Gonda Prism.**

Cell complete	1.00
Gondas per pair with rubber bands	.60
Carbon mounted	.15
Glass Jar	.20
" " Cover	.10
Zinc	.10
Sal Ammoniac	.10
Rubber bands, per pair	.05

327t. **Battery, Meidinger.** For Magnesium Sulphate and Copper Sulphate.

Height	6 in.	9 in.
Each	$1.60	2.00

DIRECTIONS—The larger glass is half filled with solution of 1 pt. magnesium sulphate in 7 pts. water, the balloon with small pieces of copper sulphate and water.

328t. **Battery, Smee.** With Platinized Silver Plates,

	No. 1 3 x 5 in.	No. 2 3½ x 7½ in.	No. 3 4 x 8 in.	No. 4 6 x 10 in.
Cell complete	$2.80	3.10	3.90	5.60
Glass Jar	.35	.35	.40	.85
Zincs, per pair	.55	.70	1.05	1.80
Carbon and Connections	.85	1.00	1.35	1.95
Carbon Connector	.20	.20	.20	.20
Carbon Insulator	.10	.10	.12	.12
Clamp	.70	.70	.70	.70
Wood Support	.10	.10	.12	.12

NOTE—The liquid used to charge this battery is dilute sulphuric acid—about 1 pt. acid to 10 pts. water.

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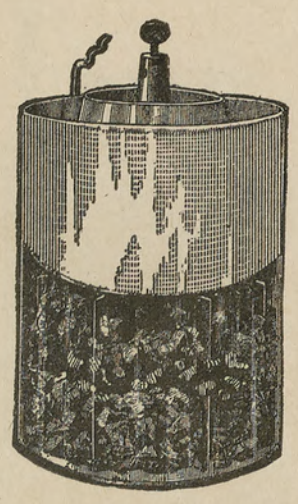

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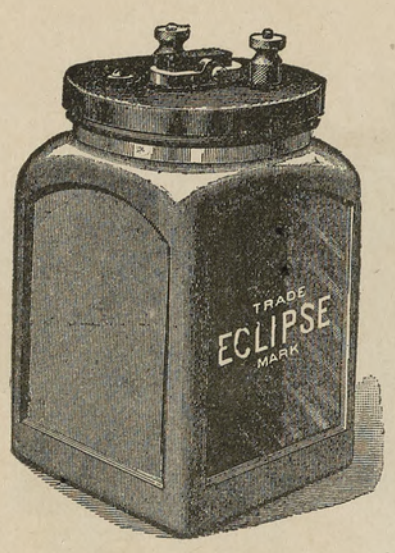

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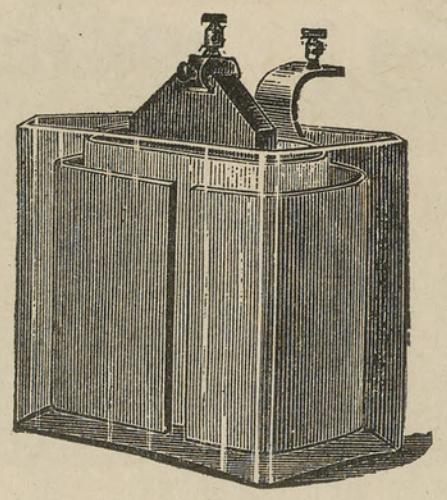

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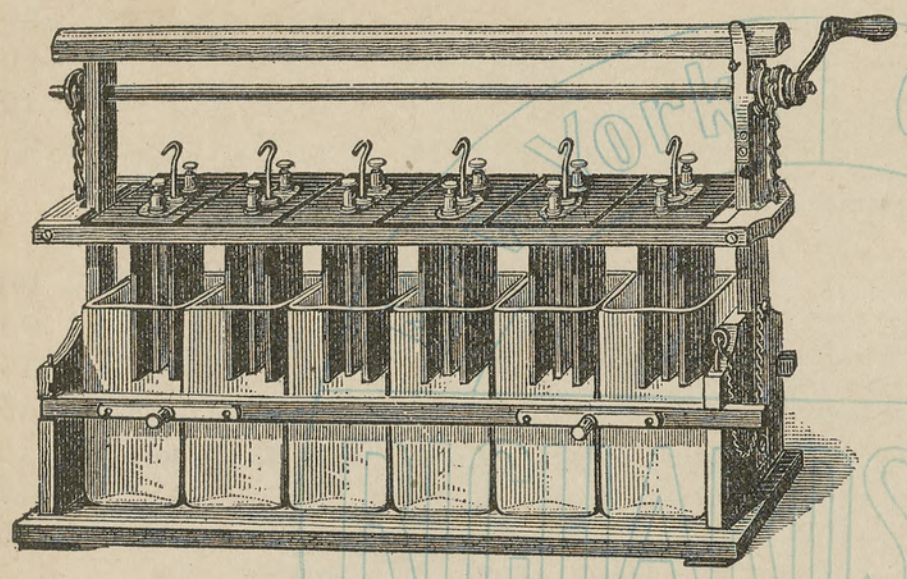

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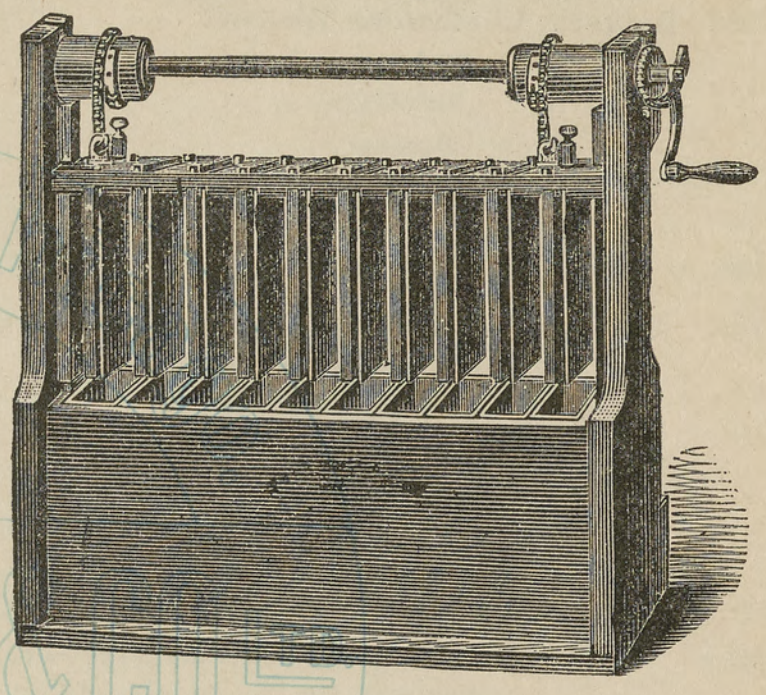


333

No.

329t. **Battery, Hussey, Blue Stone.** Highest American Institute Award in 1890; its distinctive features are greatly increased amperage, cleanliness and convenient handling.

Cell complete (without blue stone)	$1.40
Glass Jar	.36
Porous Cup	.45
Copper	.25
Zinc	.40

NOTE—4 lbs. of blue stone constitute a charge for the battery.

330t. **Battery, Eclipse,** Patented, will not polarize, for intermittent or close circuit work; Electro Motive force $1\frac{1}{2}$ Volt; current 5 Amperes.

Cell Complete	2.00
Glass Jar 6 x 5 in	.26
Cover for Jar	.12
Zinc	.30
Connections	.30
Porous Cup	1.25

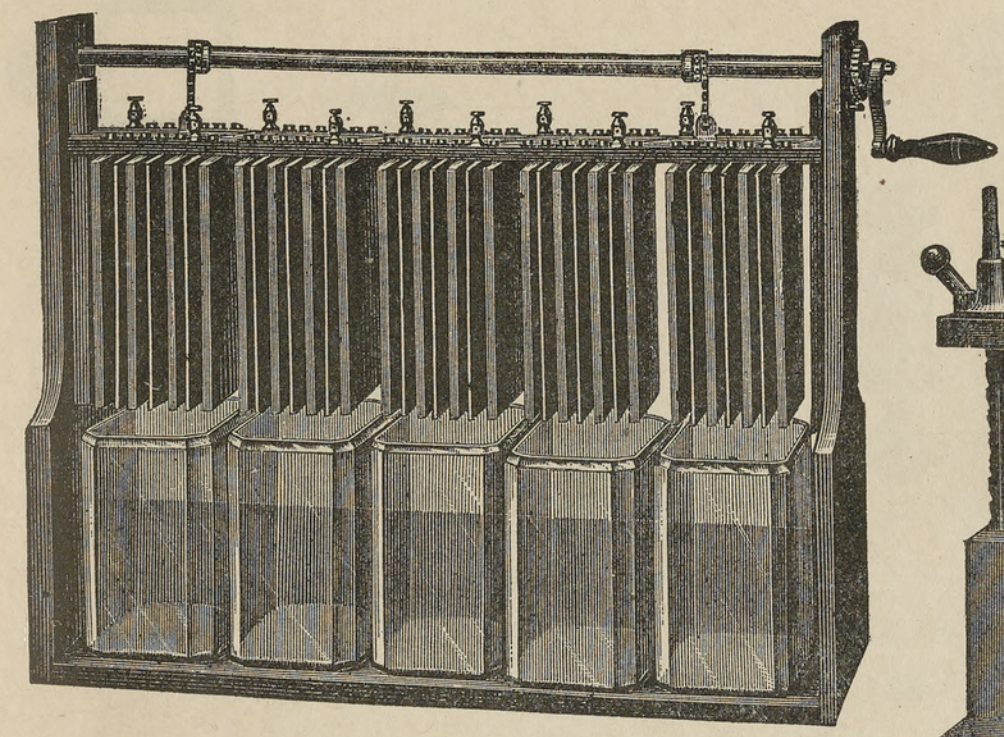
331t. **Battery, Nickel-Plating,** an improved Bunsen Cell of great power, for nickel and electro-plating, striking, electro-motors etc.

Cell Complete	5.50
Carbon $1 \times 4\frac{1}{2} \times 9$ in.	1.75
Carbon Clamp Platinum faced	1.10
Porous Cup $2\frac{1}{8} \times 5\frac{7}{8} \times 7\frac{1}{4}$ in.	.65
Glass Jar $6 \times 8 \times 9\frac{1}{4}$ in.	1.10
Zinc, heavy rolled	1.10
Zinc Connector	.20

N. B. Directions for above battery on application.

332t. **Battery, Hand-Lift Plunge, new pattern,** so arranged that one cell may be lowered at a time, or all in a series, and connections quickly made for intensity or quantity.

6 cells, glass jar, $2\frac{5}{8} \times 2\frac{3}{4} \times 4\frac{3}{4}$. in. Plates 2 x 4 in. Complete	18.00



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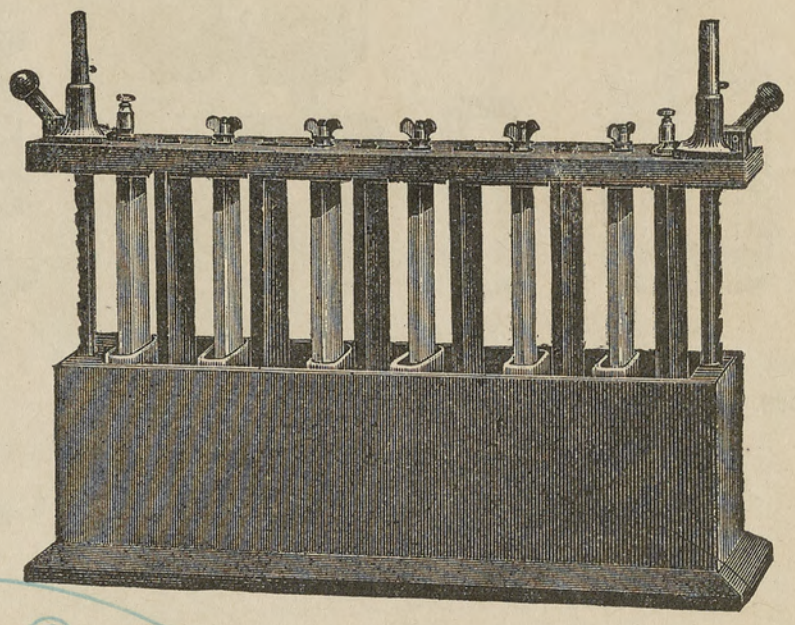

335

No.

333t. **Battery, Windlass Lift Plunge Type "E 4,"** and Carbon and Zinc Elements, for Gold, Silver and Nickel Plating, Electric Light, Laboratory purposes etc. Glass Jars $1\frac{1}{2}$ x $5\frac{5}{8}$ x 6. Plates $4\frac{1}{2}$ x 6 x $\frac{1}{4}$ in

8 Cell Battery, with Windlass, complete **$30.80**

10 " " " " **33.00**

Single Parts.

Carbon ..... **.45**

Glass Jar ..... **.50**

Zinc, without hanger ..... **.40**

Zinc hanger ..... **.17**

Carbon hanger ..... **.17**

334t. **Battery, Windlass Plunge, Type "1 F."** for Gold, Silver and Nickel-Plating, Electric-Light, laboratory purposes, and for operating induction coils of 4 to 10 in. spark. Jars $4\frac{5}{8}$ x $7\frac{3}{4}$ x $8\frac{1}{4}$ in. Plates 6 x 9 x $\frac{1}{4}$ in. 4 Carbons and 3 Zincs to each cell. Each cells has over 400 square in. of carbon surface, giving enormous power.

3 Cell Battery, Complete **38.50**

5 " " **55.00**

Single Parts.

Carbons ..... each **.55**

Carbon hangers ..... " **.35**

Glass Jars ..... " **1.00**

Zincs ..... " **65**

Zinc hangers ..... " **35**

335t. **Battery, Rubber Cell, Bunsen Plunge,** with ratchet lift to graduate immersion of elements. Particularly adapted for the lighting of small Incandescent Lamps and any work within its compass requiring an intense constant current. The Elements and Porous Cups in this adaptation of Bunsen Battery are flat instead of cylindrical, and so mounted as to give great power while occupying but little space. The cells are of hard rubber, $2\frac{3}{4}$ x $3\frac{1}{4}$ x 5 in, inclosed in a suitable wooden tray. Thumb-nut terminals permit any cell or number of cells of the whole series to be put in circuit at pleasure.

3 Cell Battery, complete **10.00**

6 " " " **16.50**

Single Parts.

Carbons ..... each. **.55**

Carbon hanger ..... " **.30**

Zincs ..... " **.55**

Zinc hanger ..... " **.25**

Porous Cups ..... " **.30**

Rubber Cells ..... " **1.10**

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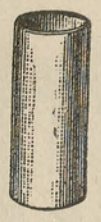

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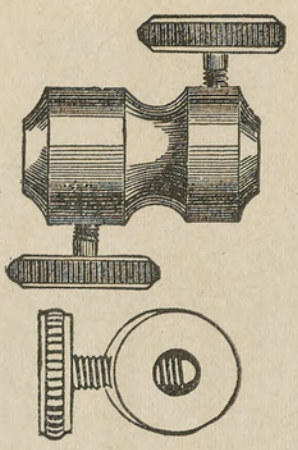

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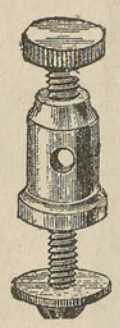

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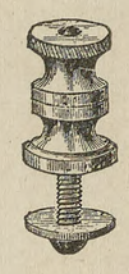

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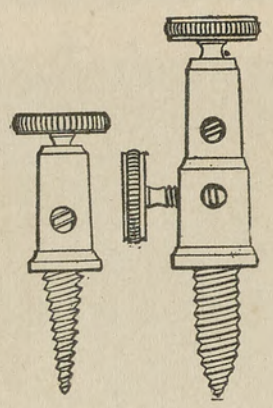

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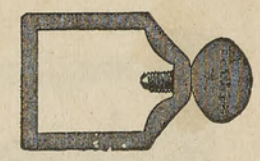

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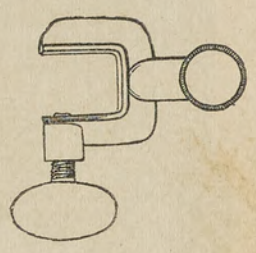

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No.

336. **Battery Jars,** Glass, round.

Width,	4	4½	4½	5	5	5	6	8½	9 in.
Height	4	4½	5	6	7	11	8	12	15 "
Each	.16	.20	.24	.26	.30	.44	.36	.88	$1.24

Battery Jars of Other kinds, see Batteries.

337. **Battery Cells,** Porous, round Cups.

Width	2	2	2	3	3	3 in.
Height	3	4	5	5½	7	8 "
Each	.15	.18	.22	.25	.28	.30

338. **Battery Connections, Binding Screws,** finished.

	Single	Double
Each	.10	.18

339. **Battery Binding Post,** American pattern.

	Sml.	Med.	Lge.
Each	.15	.20	.30

340. — **Binding Post,** English pattern.

	Sml.	Med.	Lge.
Each	.14	.16	.25

341. — **Binding Post,** with wood screw.

	for 1	for 2 wires
Each	.12	.18

342. **Battery Carbon Plates.**

Long	3	3¼	4¼	4¾	5¾	6	6	6	6	7	7	8	8 in.
Wide	2	2½	1⅜	1⅜	1⅞	1⅝	¾	1¾	2⅞	1½	4½	5¾	5¾ "
Thick	¼	¼	¼	¼	¼	5/16	⅝	⅝	½	¼	½	⅛	¼ "
Each	.05	.06	.06	.06	.08	.07	.08	.15	.25	.08	.30	.30	.35

Long	9	9	9	9	9	9	10	10	10	11	11	11 in.
Wide	2	4½	6	6	6	6	6	6	6	6	6	6 "
Thick	⅝	½	⅛	¼	⅜	½	¼	⅜	½	¼	⅜	½ "
Each	.30	.40	.30	.40	.50	.60	.40	.50	.55	.50	.60	.75

Long	11	11	11	12	12	12	12	12	12	12	12	12 in.
Wide	9	9	9	6	6	6	12	12	12	12	12	12 "
Thick	¼	⅜	½	¼	⅜	½	¼	⅜	½	⅝	¾	1 "
Each	.75	.90	$1.10	.50	.70	.80	$1.00	1.15	1.40	1.50	1.65	2.00

x.xx **Battery Clamps,** see under the names of the respective Batteries.

Battery Zincs; Composite Zincs. These Zincs are composed of an alloy of Zinc and Mercury, maintaining a perfect clean and bright surface until entirely consumed. Their use affords an increase of electro-motive force and decrease of internal resistance. For prices, see under the names of the respective batteries.

Battery Solution for Amalgamating Zincs:

Mix 1 lb nitric acid with 2 lbs. hydrochloric acid, and add 8 oz. mercury. When the mercury is dissolved add 3 lbs. more hydrochloric acid. To amalgamate the zinc, immerse it in this solution for a second, then remove it quickly to a dish of clean water, and rub it with a brush or cloth, when it will be found covered with a fine even coat of mercury. This solution can be kept in a covered jar, and used many times. Another method of amalgamating zincs is to clean them by dipping in a solution of dilute sulphuric acid and rubbing on the mercury with a cloth or brush.

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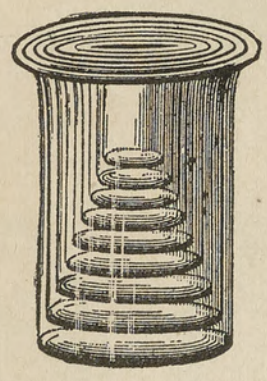

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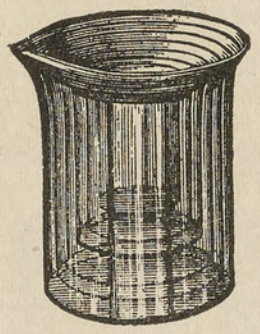

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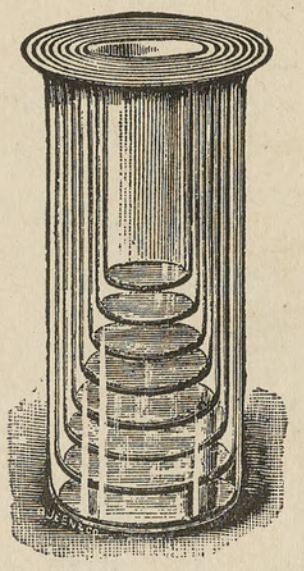

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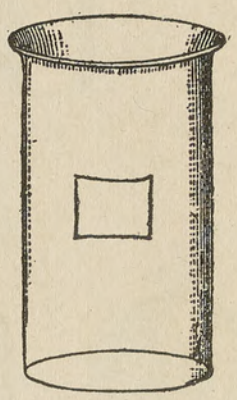

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BEAKERS.

OUR BEAKERS ARE EQUALLY THIN AT BOTTOM AND SIDES, AND THOROUGHLY ANNEALED.

No.

343. **Beakers Bohemian glass,** usual form.

Single.	No.	000	00	0	1	2	3	4	5
	Capacity	½	1	2	3	6	8	14	20 oz.
	Each	.05	.07	.08	.10	.12	.18	.25	.30
	No.	6	7	8	9	10	11	12	
	Capacity	28	38	50	65	80	105	130 oz.	
	Each	.35	.40	.45	.55	.65	.75	.90	

344. **Beakers Bohemian glass,** usual form ; **in nests.**

No. 000	to	0	in nests of	3	capacity	½	to	2 oz	per nest $ .18
00	"	1	"	3	"	1	"	3 "	" " .22
0	"	2	"	3	"	2	"	6 "	" " .30
1	"	3	"	3	"	3	"	8 "	" " .35
2	"	4	"	3	"	6	"	14 "	" " .40
1	"	4	"	4	"	3	"	14 "	" " .55
1	"	5	"	5	"	3	"	20 "	" " .70
1	"	6	"	6	"	3	"	28 "	" " 1.00
1	"	8	"	8	"	3	"	50 "	" " 1.60
1	"	12	"	12	"	3	"	130 "	" " 3.50

345. **Beakers Bohemian glass, Griffin's** form with lip, extra wide.

Single.	No.	00	0	1	2	3	4	5
	Capacity	1½	3	5	8	12	28	24 oz.
	Each	.09	.10	.12	.18	.25	.30	.40
	No.	6	7	8	9	10	11	12
	Capacity	36	50	64	80	96	112	144 oz.
	Each	.50	.60	.70	.80	.90	$1.00	1.20

346. **Beakers Bohemian glass,** Griffin's ; **in nests.**

No. 00	to	1	in nests of	3	capacity	1½	to	5 ozs	per nest .25
0	"	2	"	3	"	3	"	8 "	" " .35
1	"	3	"	4	"	5	"	12 "	" " .50
1	"	4	"	4	"	5	"	20 "	" " .80
1	"	5	"	5	"	5	"	25 "	" " 1.10
1	"	6	"	6	"	5	"	36 "	" " 1.60
1	"	8	"	8	"	5	"	64 "	" " 2.50
1	"	10	"	10	"	5	"	96 "	" " 3.50
1	"	12	"	12	"	5	"	144 "	" " 5.00

347. **Beakers Bohemian glass,** extra tall.

No. 1	to	6	in nests of	6	capacity	6	to	2 oz	per nest 1.50
1	"	8	"	8	"	6	"	80 "	" " 2.40
7	"	8	"	2	"	60	"	80 "	" " .90

348. **Beakers Bohemian glass,** if provided with ground labels for writing on same with a pencil, each additional..... .10

RICHARDS & CO. LTD. New York. Chicago. Warehouse Hamburg.



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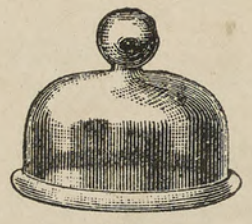

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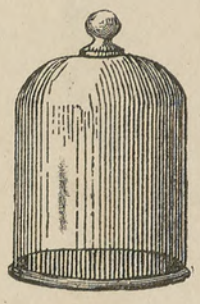

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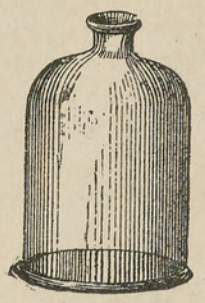

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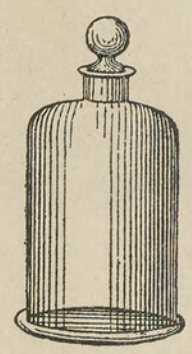

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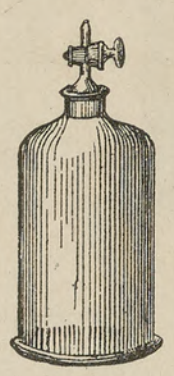
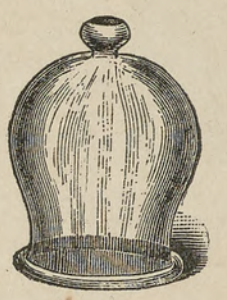


357a



357b



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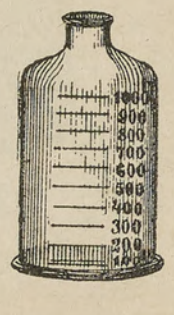


359

No.

349. **Beakers Royal Berlin porcelain,** glazed.

No.	1	2	3	4
Capacity	6	12	22	34 oz.
Each	.45	.60	.90	$1.50

350. **Beakers thin copper,** tin lined.

Capacity	8	16	32 oz.
Each	.75	$1.00	1.25

351. **Beakers, copper, nickel-plated.**

Capacity	8	16	32 oz.
Each	.90	$1.25	1.50

Beaker cover glasses, see Watch Glasses.

BELL GLASSES.

All with large rim, ground airtight to fit glass plates.

352. **Bell glasses, of light glass,** lampwork, made to order.

353. —— **low form,** with knob.

Height	1½	2¼	3½	4	5	5 in.
Dia.	3	4	5	6	7	8 in.
Each	.45	.60	.75	.85	$1.00	1.25

354. —— **tall form.** With knob.

Height	6	8	10	12	14	15	18½	21 in.
Dia.	3	4	5	6	6½	7½	8½	9 in.
Capacity	pt.	qt.	½	1	1½	2	3	5 gal.
Each	.30	.40	.60	.85	$1.10	1.50	3.75	5.00

355. —— **With open top.**

Height	6	8	10	12	14	15	18½	21 in.
Dia.	3	4	5	6	6½	7½	8½	9 in.
Capacity	pt.	qt.	½	1	1½	2	3	5 gal.
Each	.30	.40	.60	.85	$1.10	1.50	3.75	5.00

356. —— With ground in **glass stopper.**

Height	8	10	12	14	15 in.
Dia.	4	5	6	6½	7½ in.
Capacity	qt.	½	1	1½	2 gal.
Each	.75	$1.00	1.40	2.00	2.50

357. —— Fitted with **ground in stopcock.** Form a and b; from **$1.00** to **2.50** extra.

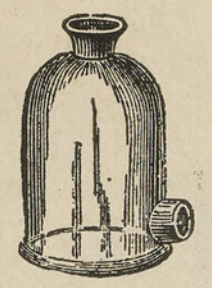
358. —— **Swelled form.** With knob.

Capacity	pt.	qt.	½	1	1½	2	3	5 gal.
Base dia.	3¾	4½	6	7¾	8½	9	10½	11½ in.
Each	.45	.55	.85	$1.15	1.50	2.25	3.25	5.50

359. —— **Open top; graduated.**

Capacity	1000	2000	3000	5000 cc.
Each	$3.20	4.00	5.00	6.50

RICHARDS & CO. LTD. Newark. New York. Chicago. Hamburg.



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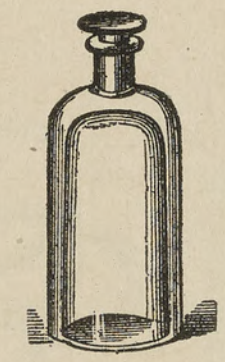

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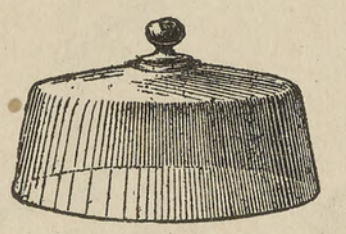

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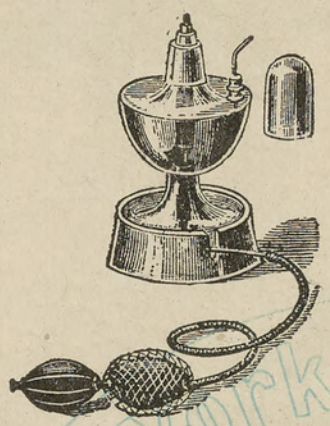

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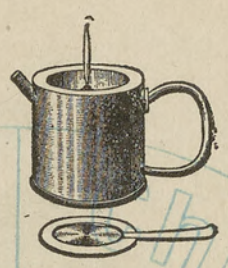

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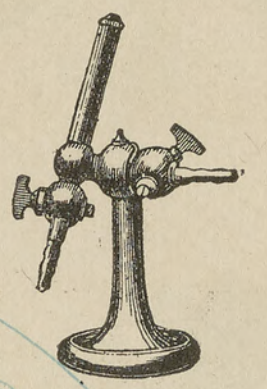

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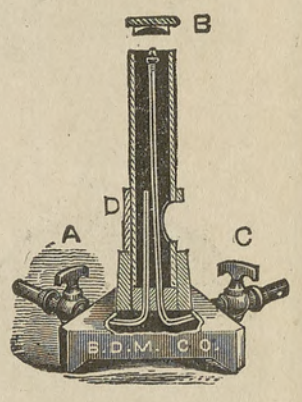

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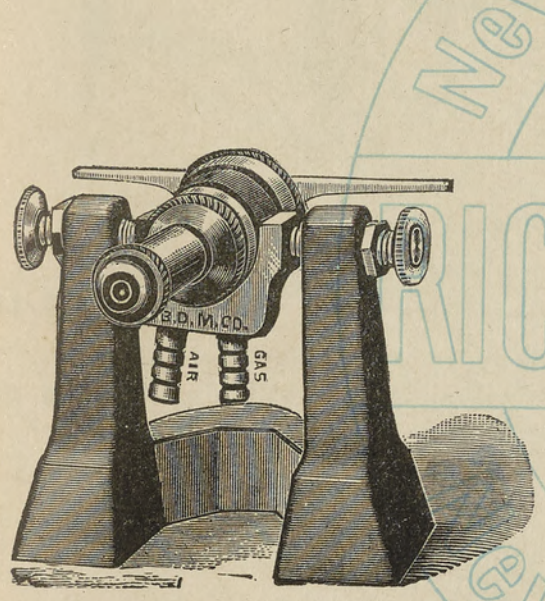

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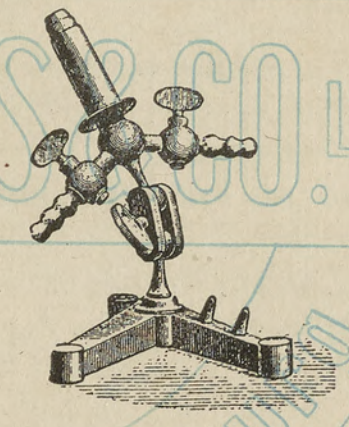

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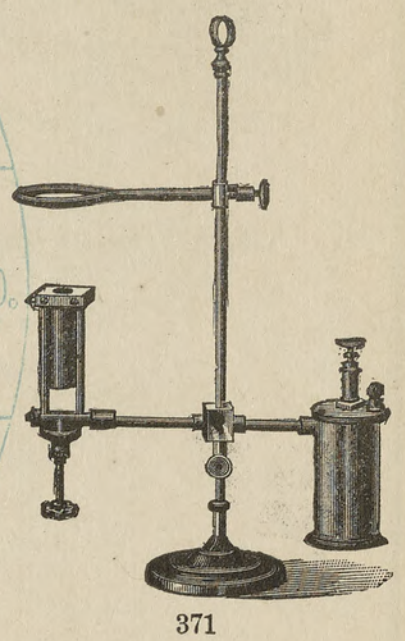


371

No.

360. **Bell glasses,** Open top, **with tubulature** on side, ½ gallon capacity **$2.40**

361. —— after **Prof. Sachs** with double walls and ground in stopper.

Height	12	16 in.
Dia.	5	6 in.
Each	**$5.25**	**6.50**

362. —— To **protect plants,** with knob.

Dia.	9½	10½	12½	13½ in.
Each	**$1.00**	**1.50**	**1.75**	**2.00**

363. **Blast Lamp, Aeolipile.** For alcohol, with horizontal flame **3.00**

364. —— **of Glass.** For alcohol with bellows **3.00**

365. —— **Russian.** For alcohol of copper **1.50**

366. —— **Bunsen's.** For gas **3.60**

367n. —— **Fletcher's.** For gas; upright **4.20**

(Can also be used as Bunsen's burner).

368n. —— **Fletcher's** Compound; for glass workers and experimental laboratories **10.00**

369. —— **Waller's** **4.00**

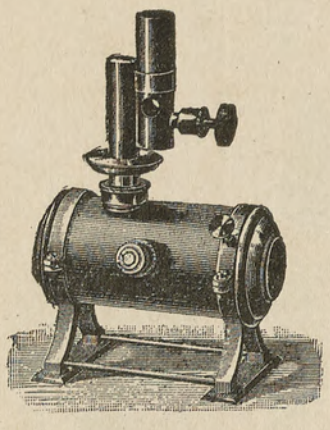
370. —— **Wiesnegg's.** French form; mounted on ball joint **4.50**

371n. —— **Hoskin's.** For gasoline; serving for all purposes in the laboratory where Bunsen Burners, Alcohol Lamps or Blasts may be used, such as Fusions in Platinum Crucibles, Ignitions, Evaporations, Glass Working, etc. **15.00**

RICHARDS & CO. LTD. New York. Chicago. Newark. Hamburg.



373



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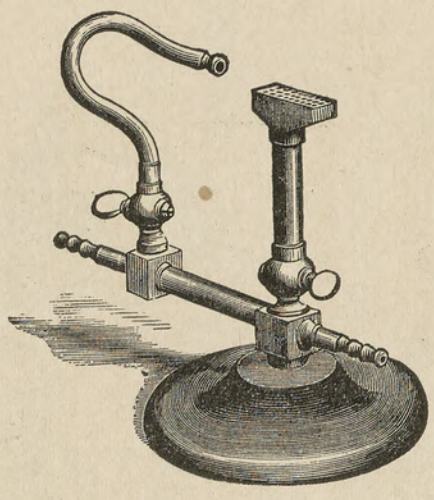

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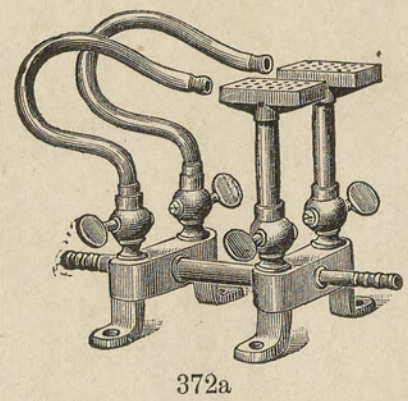

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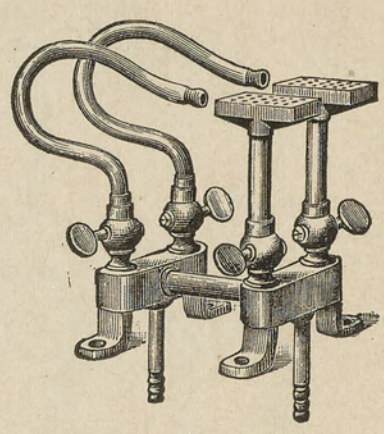

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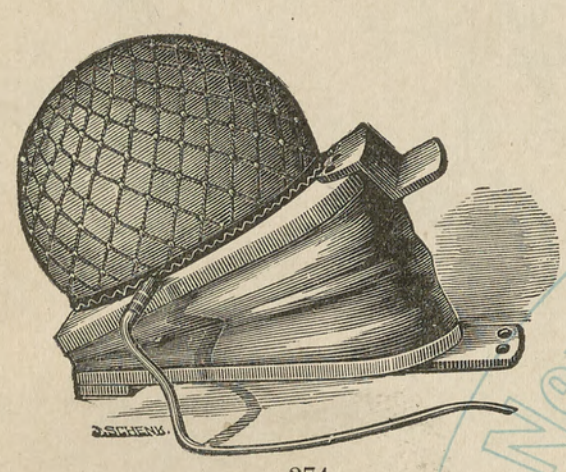

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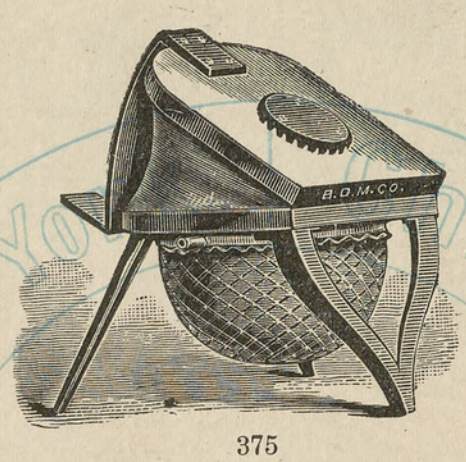

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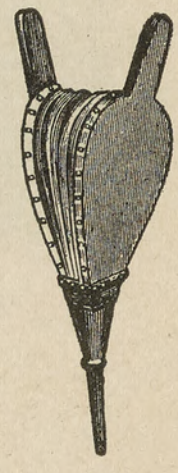
378



380

No.

371a. **Blast Lamp, Barthel's, for use with alcohol;** works automatically. Copper wire of ¼ in. fuses in the flame to a bead, thick glass tubes, combustion tubes, the decomposition of $CaCo_3$ into CaO, the fusing of Silicates with Na_2Co_3 or $BaCO_3$ etc is done in the shortest possible time..... ..... **$6.50**

371b. —— **Barthel's, for use with benzine;** giving the same satisfaction as above lamp, and even still greater effect..... ..... **8.00**

372n. —— **Glass Blower's.** On round base.

NOTE: We furnish them also on legs, to be screwed on the table as No. 372a or so that the gas supply tubes can pass through the table as No. 372b, at the same prices,

	Single light	Double light	Triple light
Per set of two	**$4.50**	**7.00**	**9.50**

373n. —— **Tips for Glass Blower's Burners**..... **.35**

374n. **Blowers, Fletcher's Foot Bellows,** portable and powerful, giving a continuous blast of air.

No.	9, small	9A, med.	9B, large
Dia.	7¼	9	11 in.
Each	**$4.00**	**5.00**	**7.00**

375n. —— **Foot Bellows, mounted** on legs.

No.	10, small	10A, med.	10B, large
Dia.	7¼	9	11 in.
Each	**$5.00**	**6.00**	**8.00**

376n. —— **Extra Rubber Disk** for Nos. 9 or 10 ..... each **.50**

" " " " " 9A or 10A ..... " **.75**

" " " " " 9B or 10B ..... " **1.00**

377n. —— **Extra Nets** for above ..... **.35**

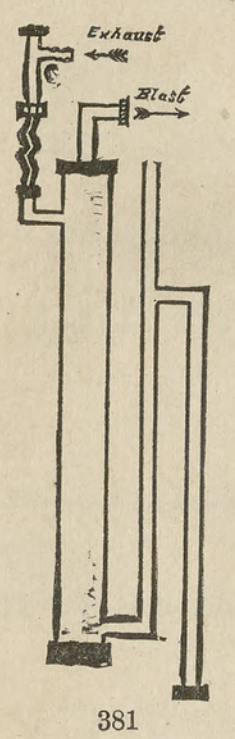
378n. —— **Hand Bellows** of rubber, double bulb, for use with blowpipes, etc., giving continuous blast of air..... **1.50**

379n. —— **Fletcher's Hand Blower and Chemical Blow Pipe.** complete in case..... **4.00**

380n. —— **French Parlor Bellows.**

Size	5½	6½	7½ in.
Each	.50	.60	.75

New York Chicago Newark Hamburg BRUCKHARDT & CO. LTD.



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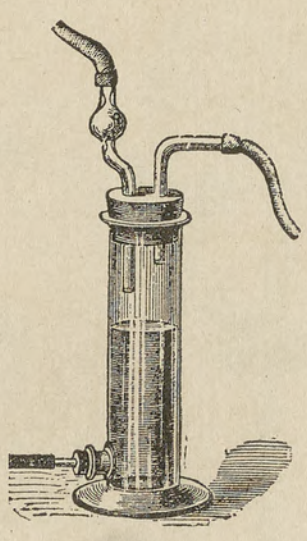

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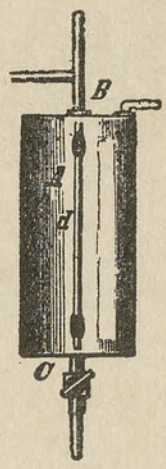

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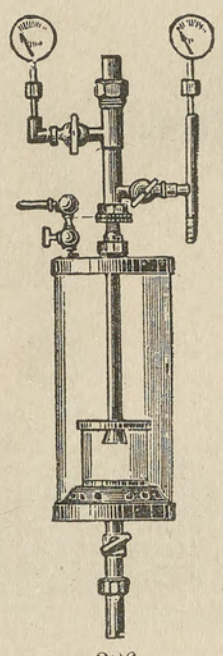

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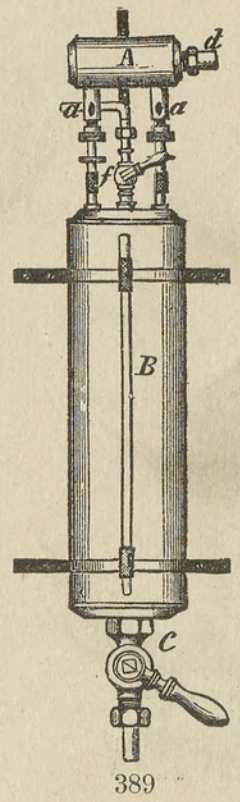

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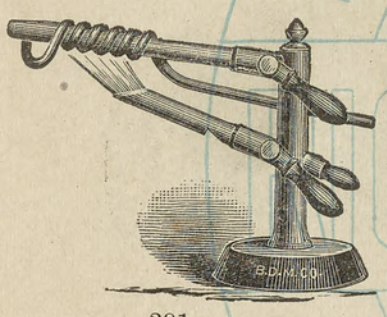

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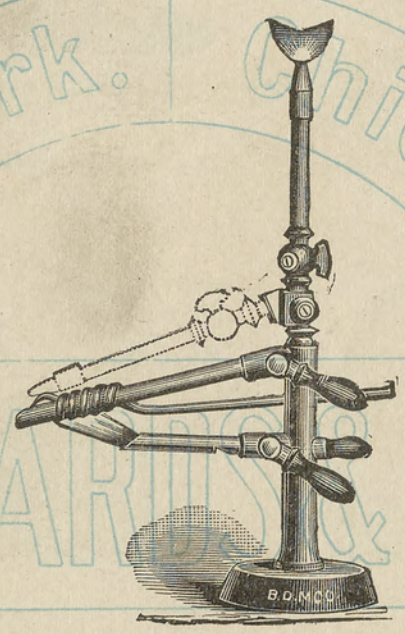

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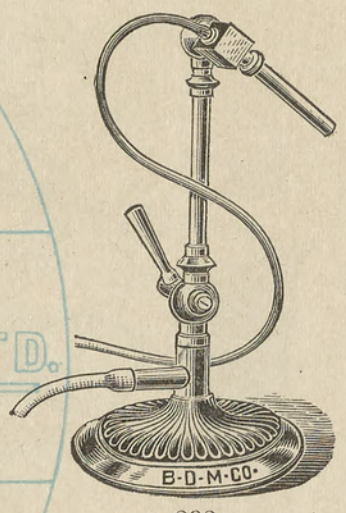


393

No.

381. **Blowers, Prof. Richard's Water Blast.** Water and air enter the apparatus through a jet filter pump the air becoming separated, is forced out with sufficient pressure for a blast lamp. Without the filter pump $6.50

382. —— **Prof. Richard's.** Complete with the filter pump 8.00

383. —— **Beutell's.** Produces by water pressure a very powerful and constant blast; for glass-blower lamps, etc. (See Chem. Zeitg. 1887, p. 1381) 8.00

384. —— **Muencke's Water Blast and Exhauster,** of brass, with air outlet and water regulating stopcock 10.50

385. —— Same as above ; of brass, with 3 way movable stopcock at air outlet and water regulating stopcock 14.00

386. —— Same as above; with vacuumeter 28.00

387. —— Same as above; with vacuumeter and manometer 45.00

388. —— Same as above ; with glass cylinder instead of brass, so that the construction and operation can be observed 49.00

389. —— Same as above ; of copper. For chemical and physiological laboratories.

With	1	2	3	3 injectors
Dia. of connecting tube	13	19	19	26 millim.
Each	$40.00	50.00	63.00	77.00

390n. —— **Roots.** Improved; giving constant blast under pressure; for smelting and glass-blowing.

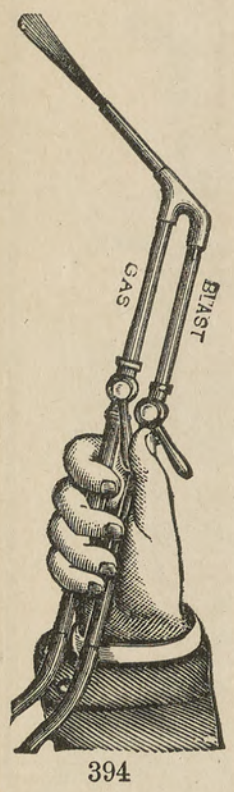
Small	large
$35.00	80.00

391n. **Blowpipe, Hot Blast.** With down jet $5.00 ....with upright jet 6.00

392n. —— Same as above; but with bench light arrangement on swivel, so as to carry a light to the blow-pipe jet 7.00

393n. —— **Fletcher's** improved **Herapath** 3.75

New York. Chicago. RICHARDS & CO. LTD. London. Hamburg.



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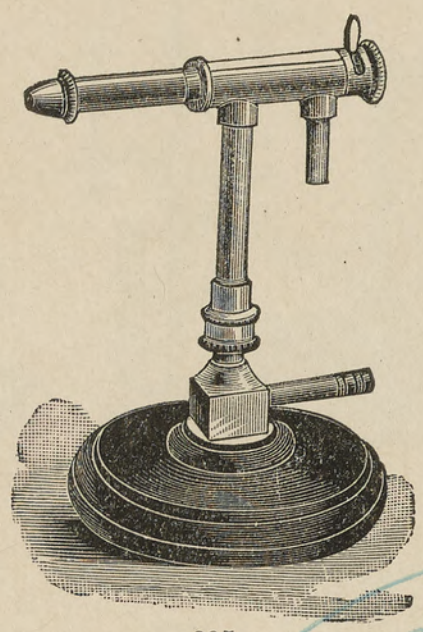
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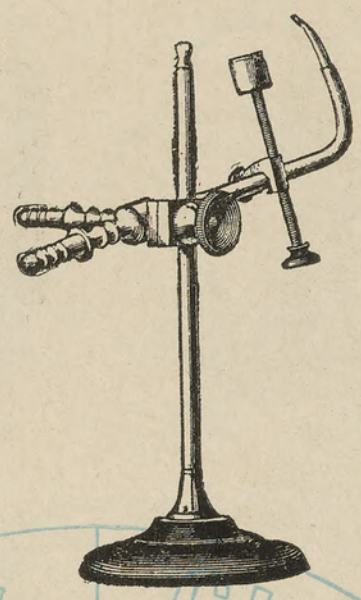
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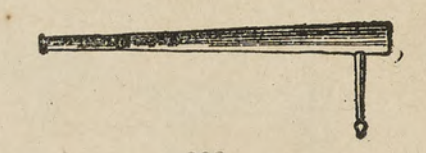
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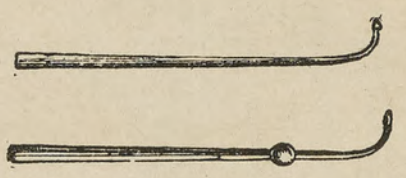
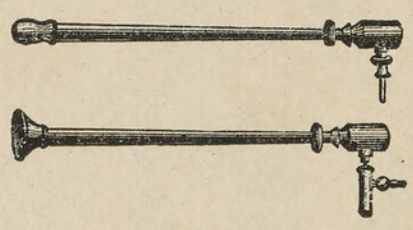
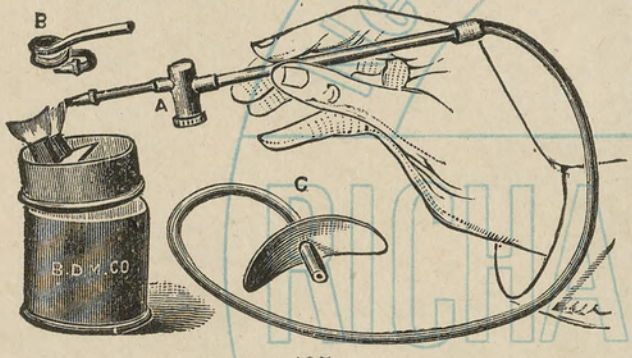

399 and 400


402 and 403



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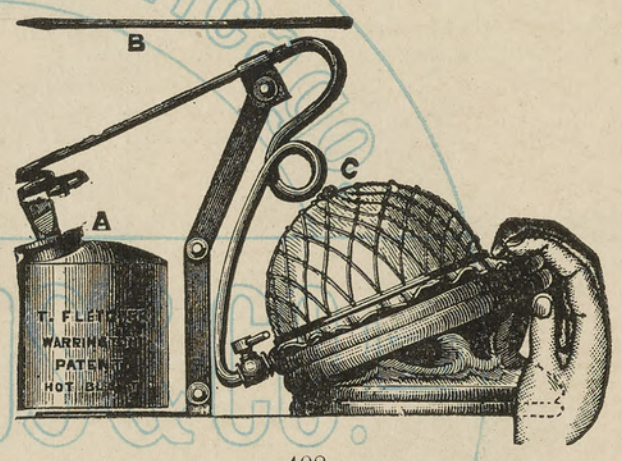

408

No.

394n. **Blowpipe, Fletcher's,** for brazing work, requiring great heating power; with 2 lever stopcocks $3.00

395n. —— **Fletcher's Automaton Hand.** On stand 4.00
(The blowpipe can be detached and used in the hand)

396. —— **Oxyhydrogen.** On stand; with universal movement and movable lime holder 5.50

397. —— Same as No. 396, but with 2 stopcocks 7.50

398. —— **Black's.** japanned tin with tip ..... .30

399. —— **Jeweller's** form, brass, plain

Length	8	10	12 in.
Doz.	$1.40	1.75	2.50
Each	.15	.20	.25

400. —— Same as above brass, with bulb.

Length	8	10	12 in.
Each	.25	.30	.35

401. —— Same as above, nickel-plated, with bulb.

Length	8	10	12 in.
Each	.35	.40	.45

402. —— **Plattner's,** nickel-plated, with movable platinum tip, hard rubber mouth-piece 2.25

403. —— Same arranged for gas, with stopcock and Platinum tip 3.25

404n. —— **Fletcher's,** with hot blast jet and hard rubber mouth piece 1.25

405n. —— **Fletcher's** patent folding in case with both hot and cold blast jets 1.50

406n. —— **Fletcher's** special chemical with hand blower, complete 4.75

407. **Blowpipe mouth pieces,** of wood ..... .10

408. —— **mouth pieces,** hard rubber, trumpet-shaped ..... .30

409. **Blowpipe Tips,** brass ..... .10

New York. Chicago. Newark. Hamburg. RICHARDS & CO.



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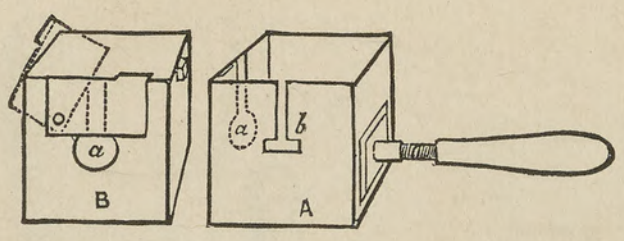

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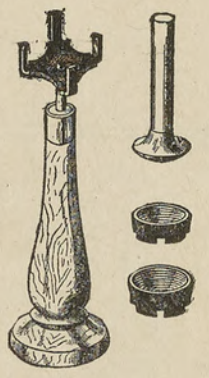

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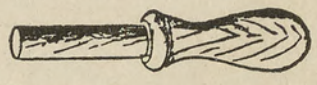

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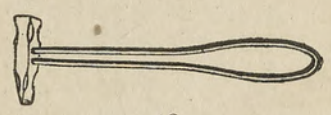

48

BLOWPIPE GOODS.

No.

410. **Blowpipe Goods** according to Prof. Plattner for qualitative and quantitative blowpipe analysis.

1	Anvil of best polished steel	$ .50
2	Balance Plattner's, in polished case, with weights	23.00
3	Beakers, lipped, 000 to 0	.30
4	Blowpipe, Black's conical, with brass tip	.30
5	Blowpipe, brass, jeweler's form, plain	.20
6	Blowpipe, brass jeweler's form, with bulb	.25
7	Blowpipe Plattner's brass, with platinum plate	1.40
8	Blowpipe, Plattner's, brass, with movable platinum tip and hard rubber mouth piece	2.25
9	Blowpipe, Plattner's, brass, nickel-plated, otherwise same as above	2.50
10	Blowpipe, Plattner's, German Silver, otherwise same as above	5.50
11	Burner, Bunsen's with tip and tube for blowpiping	.85
12	Button Brush	.50
13	Capsules, of porcelain	.20
14	Carbon Blocks, moulded	.30
14a	Carbon Blockholder	.35
15	Carbon Cylinders, moulded, 3x1⅛ in	.25
16	Charcoal Borer, club shape, large	.75
17	Charcoal Borer, four-cornered, small	.45
18	Charcoal Borer, with spatula	.50
19	Charcoal Capsules	per doz .20
20	Charcoal Crucibles,	" " .20
21	Charcoal Holder, with platinum wire and shield	2.25
22	Charcoal Saw	.30
23	Charcoal Squares,	per doz .75
24	Charcoal Square Covers,	" " .60
25	Charcoals, natural,	" " .50
26	Charcoals, artificial,	" " .60
27	Clay Capsules,	" " .20
28	Clay Crucibles,	" " .20
29	Clay Cylinder	.25
30	Crucibles, of porcelain, Plattner's	.25
31	Cupel Holder, with two moulds and one stamp	1.50
32	Dishes, of porcelain, three in set,	per set .25
33	Dropping Bottle	.30
34	Dropping Tube	.10
35	Files, round and triangular, with handles	.30
36	Forceps, brass, straight	.25
37	Forceps, brass, bent	.25
38	Forceps, brass, bent, with ivory tips	.60
39	Forceps, brass, Plattner's form, with ivory tips	1.40
40	Forceps, German Silver, Plattner's with platinum points	2.00
41	Forceps, brass, nickel-plated, French form, with platinum points	2.25
42	Forceps, steel, for blow-pipe lamp	.20
43	Forms, of boxwood, for paper cylinders	.15
44	Funnel, of glass	.15
45	Funnel, of tin	.15
46	Funnel, of tin, japanned	.25
47	Hammers, Plattner's, wooden handle	.60
48	Hammers, Plattner's, polished wire handle	.75
49	Hardness Scale	2.25
50	Holder, for chimney and funnel	1.50
51	Holder, for evaporating dish with triangle	2.00
52	Holder, for platinum wire	.80
53	Holder, as above, with six wires	1.00

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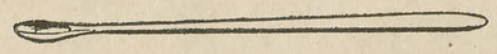

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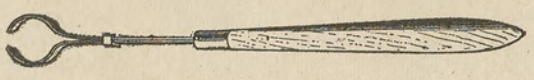

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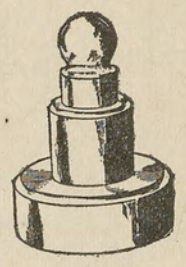

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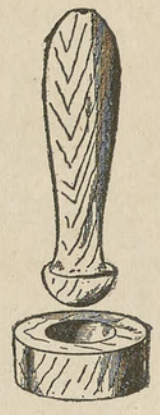

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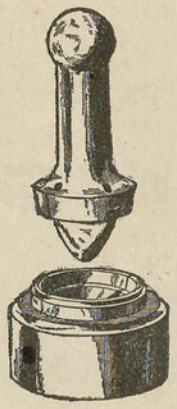

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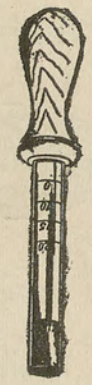

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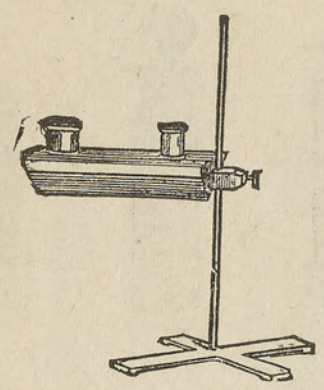
54	Ivory Spoon	$ .25
55	Knife	.25
56	Lamp, for alcohol,glass	.75
57	Lamp, for alcohol, brass	.40
58	Lamp, Plattner's, plain, brass	3.50
59	Lamp, Plattner's, brass, nickel-plated, with patent swivel	4.25
60	Lamp, polished brass	.75
61	Lamp, brass, nickel-plated	1.05
62	Lamp, tin, for tallow	.30
63	Magnet, horseshoe	.25
64	Magnet, straight with chisel edge	.35
65	Magnifier, with one lense	.40
66	Magnifier with two lenses	.60
67	Magnifier, with three lenses	.80
68	Magnifier, on three legs	1.00
69	Magnifier, with handle, brass casing	1.50
70	Mattrasses of Bohemian glass, with bulb,	per doz .75
71	Mattrasses of German glass, flask shape,	" " .30
72	Mattrass Holder	.30
73	Mixing Capsule, brass	.15
74	Mixing Capsule, brass, nickel-plated	.20
75	Mixing Capsule, German silver	.35
76	Mixing Capsule, horn	.15
77	Mixing Spatula, steel	.25
78	Mortar, agate, with pestle	1.75
79	Mortar, steel, Plattner's diamond, small	4.00
80	Mortar, steel, Plattner's diamond, large	6.00
81	Motar, steel, Leed's form	2.00
82	Moulds, for charcoal squares and covers	4.50
83	Moulds, for charcoal capsules	.50
84	Moulds, for charcoal crucibles	.50
85	Moulds of brass, for clay crucibles	4.00
86	Moulds of boxwood, for clay crucibles	1.25
87	Moulds of boxwood, for clay capsules	.75
88	Nippers, flat nose	.50
89	Platinum Foil	.50
90	Platinum Wire	.50
91	Platinum Crucible	4.50
92	Platinum Spoon	2.50
93	Platinum Tips	1.00
94	Pliers, for assay buttons	1.00
95	Scale, Plattner's, of ivory, for silver beads	3.00
96	Scale, Goldschmidt's, for testing ore	7.50
97	Scissors, for lamp	.50
98	Shears, for cutting metal	1.00
99	Silver Foil, per oz	2.00
100	Soda Papers, per box	.20
101	Stirrers, of glass	.25
102	Streak Plate	.25
103	Test Lead Measure	.50
104	Test Lead Sieve	1.00
105	Test Tubes	.25
106	Test Tube Holder	.15
107	Test Tube Support	.35
108	Tin box, japanned, for charcoal squares	.75
109	Tin box, japanned, for capsules and crucibles	.75
110	Tin Flask, japanned, for alcohol	2.00
111	Tin Trays, japanned, for charcoal	.45
112	Tin Trays, japanned, for dirt	.35
113	Tubes, open at both ends, hard glass, per doz	.50
114	Tubes, for arsenic reduction	.10
115	Washbottle	.75
116	Watch Glasses, 2 in., per doz	.50
117	Watch Glass Clip	.20
118	Wicks, for lamps, per bundle	.10
119	Frame, for 18 reagents	.60
120	Frame, with 18 cork-stoppered bottles, labeled	1.50
121	Frame, with 18 glass-stoppered bottles, labeled	2.00
122	Filling, 18 bottles with reagents	2.00



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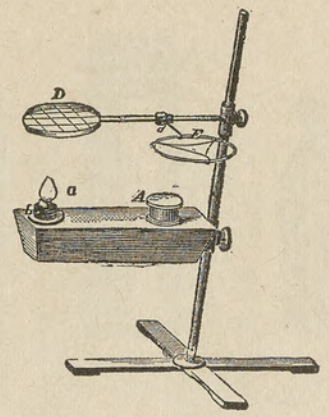

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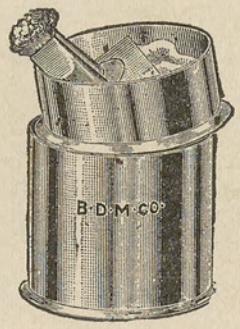

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414

No.

411. **Blow-pipe Cabinet.** According to Professor Plattner, complete, original Freiberg make, imported to order. The apparatus are fitted in trays, which are contained in polished mahogany cases and the whole put into a substantial leather case with handles, which measures 12x12x13 in. The collection embraces everything necessary for qualitative or quantitative analysis in the dry or wet way, complete **$175.00**

412. **Set of blow-pipe, goods and chemicals.** As described in "Brown's Manual of Assaying.

1 set (3) Porcelain Dishes.
1 Diamond Steel Mortar.
1 pair Platinum Pointed forceps.
1 pr. heavy Tip Steel Forceps.
1 pair Steel Forceps.
1 Steel Chisel.
1 Charcoal Borer, club shape.
1 Charcoal Borer, with spatula.
1 pair Scissors.
1 Platinum Holder, 6 wires.
1 Plattner's Blow-pipe Lamp, with swivel.
1 Charcoal Saw.
1 Mattrass Holder.
1 Plattner's Blow-pipe, nickel plated.
1 Platinum Tip for same.
1 Steel Hammer, with wire handle.
1 set Moulds and Stamps.
1 pair Nippers.
1 Double Lens.
1 Knife.
1 Dropping Pipette.
1 Camel Hair Brush.
6 Mattrasses.
1 Glass Alcohol Lamp.
1 Chamois Skin.
6 Glass Tubes.
½ dozen Charcoals.
Coal Tray.
Ash Tray.
Frame, with 18 stoppered and Labeled Reagent bottles, containing the following reagents:
Test Lead.
Tin.
Phosphorous Salt.
Borax Powder.
Borax Glass.
Boracic Acid, fused.
Boracic Acid, cryst.
Plattner's Flux.
Bismuth Flux.
Carbonate Soda.
Potash Oxalate.
Salt.
Soda Nitrate.
Charcoal.
Boneash, sieved.
Boneash, washed.
Copper Oxide.
Bisulphate Potash.
Test Papers.

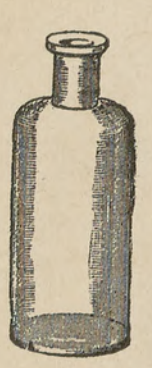
The above in elegant velvet lined, polished mahogany case, with handle and lock, for traveling, complete, with case **38.00**

413. **Blow-Pipe Reagents.**

Carbonate of Soda, pure, dry.
Neutral Oxalate of Potash or Ammonia, crystals.
Cyanide of Potassium, pulverized.
Iodide of Potassium, crystals.
Borax, pulverized.
Borax glass, pulverized,
Phosphorus Salt.
Bismuth Flux.
Nitre, Crystals.
Bisulphate of Potassium, pulverized.
Vitrified Boracic Acid.
Nitrate of Cobalt, solution.
Test Lead, finely granulated.
Tin Foil.
Iron Wire.
Gold, pure and in foil.
Arsenic Metallic Powder.
Blue Litmuspaper.
Red Litmuspaper.
Salt, pulverized and dry.
Sulphur Flowers.
Fluorspar, fine and dry.
Silica, ground and ignited.
Oxide of Copper, pure and fine.
Chloride of Silver, in paste
Nitrate of Silver.
Starch Meal.
Grapite, fine and pure.
Concentrated Sulphuric Acid.
Concentrated Nitric Acid.
Concentrated Muriatic Acid.
Acetic Acid.
Ammonia.
Carbonate Ammonia Powder.
Sifted Boneash.
Washed Boneash.
Starch Paper.
Citric Acid.
Tartaric Acid.
Iodine.

Prices of above on application.

414. **Bologna Flasks.** Showing the brittleness of glass ..... Each, **10c.** Doz. **$1.00**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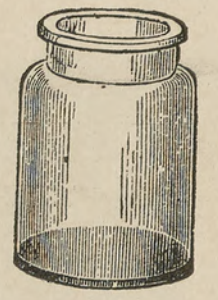
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423


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425


426

BOTTLES.

a, for general use ; b, for specific use ; c, for reagents.

415. **Bottles, round,** flint glass, **narrow mouth.**

Capacity	½	1	2	3	4	6	8	12	16	32 oz.
Doz.	.20	.25	.30	.35	.40	.50	.55	.75	.90	$1.50

416. —— green glass, **narrow mouth.**

Capacity	½	1	2	5 gal.
Each	.20	.25	.75	$1.50

417. —— **Round,** flint glass, **wide mouth,**

Capacity	½	1	2	3	4	6	8	12	16	32 oz.
Doz.	.25	.28	.30	.35	.40	.50	.70	.90	$1.20	1.80

418. —— green glass, **wide mouth.**

Capacity	½	1	2 gal.
Each	.30	.40	$1.00

419. —— flint glass, **extra wide mouth** for corks.

Capacity	½	1	2	4 oz.
Doz.	.30	.35	.40	.60

420. —— flint glass, extra wide mouth, "Quinine:"

Capacity	3	5 oz.
Doz.	.55	.80

421. —— **Bohemian glass, extra wide mouth,** for corks; an elegant and well finished bottle suitable for samples, specimens, etc.

Capacity	½	1	2	3	4	6	8	16	32 oz.
Doz.	.50	.55	.65	.75	.85	$1.05	1.25	1.65	2.50

422. —— **Homeopathic vials.**

Capacity	⅛	¼	½	1	2	3	4	6	8 drachms
Gross	$1.15	1.15	1.15	1.25	1.50	2.00	3.00	4.00	5.00

423. —— **Round,** with nickel plated **screw-caps,** cork-lined.

Size	⅞ x 2	⅞ x 3½	⅞ x 5½	⅞ x 6½ in.
Doz.	.60	.70	.85	$1.00

424. —— **Square,** with nickel plated **screw-caps,** cork-lined.

Capacity	1	2	4 oz.
Doz.	$1.00	1.25	1.50

425. —— **Glass-stoppered, "Specimen Bottles."**

Capacity	1	2	5	10 grammes
Doz.	.70	.80	$1.00	1.30

426t. —— **High glass stopper,** narrow mouth, **"German Tincture."**

Capacity	½	1	2	4	8	16 oz.	qt.	½	¾	1 gal.
Doz.	.70	.80	$1.00	1.25	1.60	2.50	Each .32	.50	.70	.90

427n. —— **High glass stopper,** of green glass, **"Acid Bottles."**

Capacity	½	1 pt.	1 qt.	½	1 gal.
Each	$1.25	1.50	2.00	3.00	4.00

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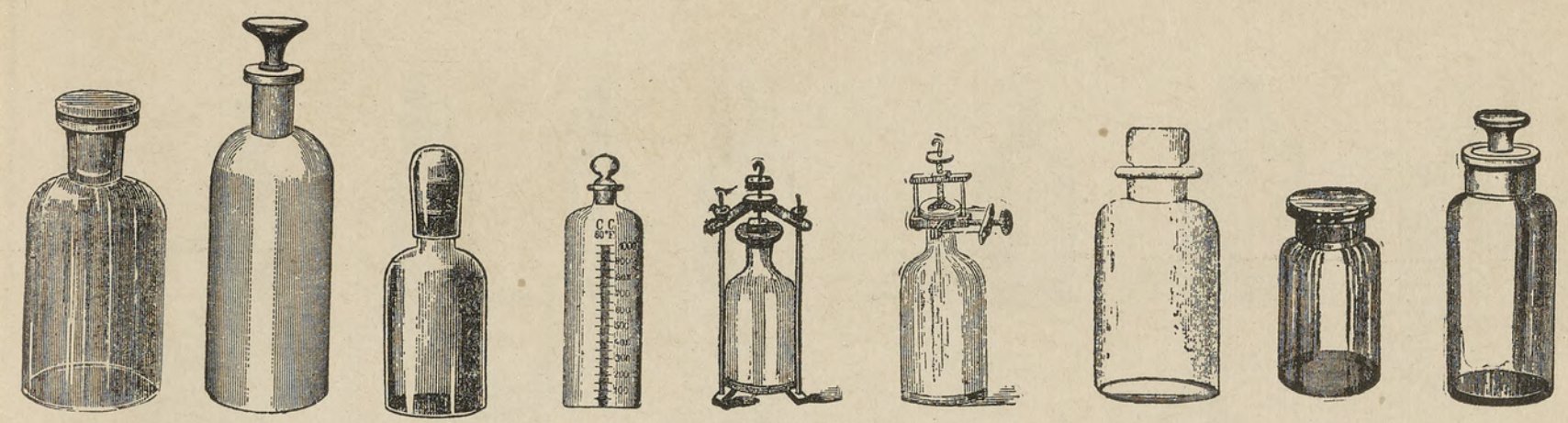

428 430 432 433 434 435 438 439 441

No.

428t. **Bottles, Flat-glass stopper,** narrow mouth; a handsome, solid bottle.

Capacity	½	1	2	4	8	16 oz.	1 qt.	½ gal.
Doz.	.70	.80	$1.00	1.25	1.60	2.50	each .32	.50

429t. —— **Flat glass stopper,** "Chemical Tinctures," heavy, and finely finished.

Capacity	1	2	4	8	16 oz.
Doz.	$1.40	1.60	1.90	2.60	3.10

430. —— Flint glass, narrow mouth, "Tinctures," **Mushroom Stopper;** nicely finished, without mould seam.

Capacity	1	2	4	8	16 oz.	1qt.	½	1	2	3 gal.
Doz.	$1.00	1.25	1.50	1.75	2.00	2.25	4.00	6.00	13.00	24.00

431t. —— Narrow mouth, **glass stopper, blue glass.**

Capacity	1	2	4	8	16 oz.	1 qt.	½	1 gal.
Doz.	.95	$1.20	1.50	2.00	3.00	each .40	.60	$1.10

432. —— With **glass stopper** and **cap for volatile liquids.**

Capacity	4	8	16	32 oz.
Each	.35	.55	.65	.75

433. —— Glass stoppered, **for mixing.**

Capacity	250	500	1000 cc.
Each	$1.25	2.00	3.00

434. —— **Compressing** after **Lintner,** for conversions and digestions; **with metal frame.**
Capacity 125 cc. (4 oz.) **$2.75**

435. —— **Compressing** after **Salomon.** Capacity 125 cc **2.75**

436n. —— **Gutta percha,** for hydrofluoric acid.

Capacity	1	2	4	8	16 oz.
Doz.	.40	.55	.65	.85	$1.10

437n. —— **Gutta percha,** with handle.

Capacity	2	4	8 pts.
Each	$2.75	3.25	6.75

438t. —— **German Salt mouth, high** stopper; a handsome, solid bottle.

Capacity	½	1	2	4	8	16	32 oz.
Doz.	$1.10	1.20	1.40	1.75	2.25	3.25	4.50

439t. —— **German Salt mouth, Flat** stopper; a handsome solid bottle.

Capacity	½	1	2	4	8	16	32 oz.
Each	$1.10	1.20	1.40	1.75	2.25	3.25	4.50

440t. —— **Chemical Salt mouth,** with flat stopper; heavy and finely finished.

Capacity	1	2	4	8	16 oz.
Doz.	$1.60	1.80	2.20	3.00	3.60

441. —— Wide mouth, glass stoppered; "**Mushroom Stopper;**" finely finished, without seam.

Capacity	1	2	4	8	16	32 oz.	½	1	2 gal.
Doz.	$1.25	1.50	1.75	2.25	2.50	3.25	5.00	8.00	18.00

442. —— Wide mouth, of **blue Glass; "Salt mouth."**

Capacity	1	2	4	8	16	32 oz.	½	1 gal.
Doz.	$2.25	2.50	3.00	3.75	4.50	6.00	9.50	15.00

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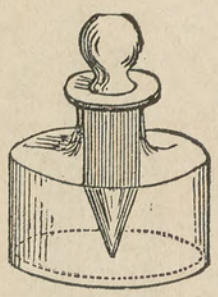
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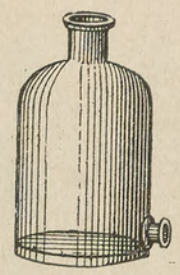
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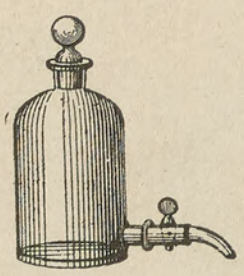
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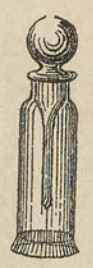
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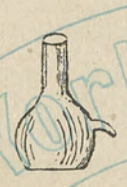
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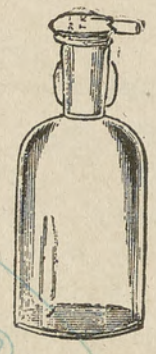
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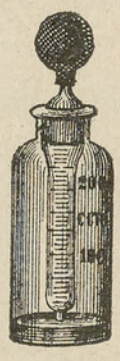
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No.

443. **Bottles, Acid or Coin Test Bottle.**

Capacity	1	2 oz.
Each	.40	.45

444. — **Aspirator Bottle,** with **outlet** near bottom.

Capacity	¼	½	1	2 pts.	½	1	2	3 gal.
Each	.35	.40	.45	.60	.80	$1.20	2.20	3.50

445t. — **Aspirator Bottle,** with glass stopper and glass stopcock ground into tubulature.

Capacity	½	1	2 pts.	½	¾	1	1½	2 gal.
Each	$1.60	1.80	2.00	2.25	3.00	4.00	4.75	5.75

Aspirator Bottles, with 2 or 3 necks. See Woulff Bottles.

446. — **Balsam Bottles,** with rod, and ground **glass cap** ..... $ .25

447. — **Cobalt Bottle,** with **ground in Rod Stopper,** Capacity 1 oz. ..... .25

448. — **Cobalt Bottle,** with ground on **glass cap,** and **long stopper.**

Capacity	1	2 oz.
Each	.35	.40

449. — **Dropping Bottle,** with ground in **stopper,** capacity 1 oz. ..... .25

450. — **Dropping Bottle,** with **ground in pipette,** hole in ball stopper.

Capacity	1	2 oz.
Each	.35	.40

451. — **Dropping Bottles,** with **pipette stopper,** top covered with thin sheet rubber ..... .25

452. — **Dropping Bottles,** with **pipette stopper,** and **rubber bulb.** Capacity 1 oz ..... .20

453. — **Dropping Bottles,** after **Schuster** ..... .20

454. — " " " " **with stopper** ..... .25

455. — **Dropping Bottles,** " **Salleron** ..... .25

456. — " " " " **with stopper** ..... .35

457. — **Dropping Bottles, Patent dropper.**

Capacity	½	1	2 oz.
Each	.20	.20	.20

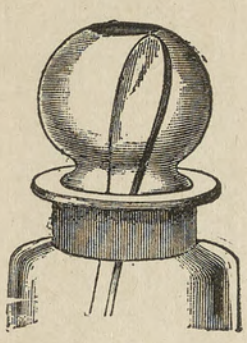
458. — **Dropping Bottles, Traube-Kattentidt.** Capacity 1 oz. ..... .30

459. — **Dropping Bottles,** after **Wollny for Normal Solution,** with graduated Pipette and Rubber Bulb $1.75

460. — **Oil Sample Bottles,** long form.

Capacity	1	2	4	8 oz.
Doz.	.70	.85	$1.00	1.35

New York. Chicago. Newark. Hamburg. RICHARDS & CO. LTD.



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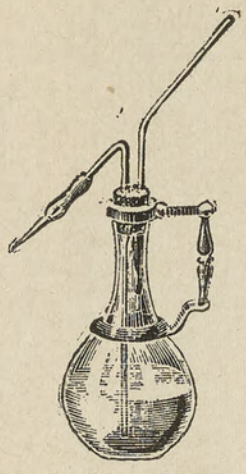

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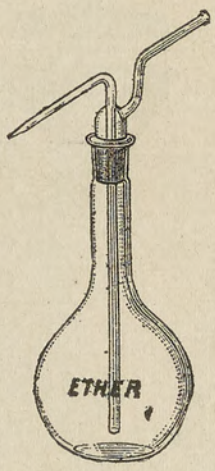

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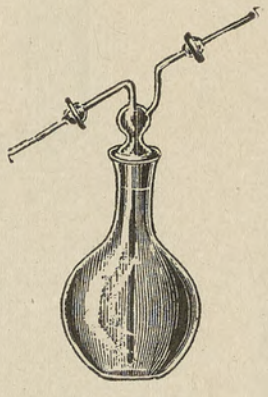

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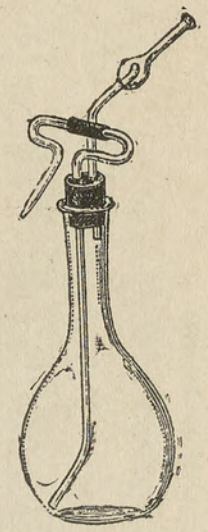

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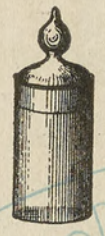

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470



471

No.

461. **Bottles. Powder Bottles,** with **hollow glass stopper** for **horn spoons.** Capacity 4 oz..... $ .50

Reagent Bottles, see after Woulff Bottles.

Specific Gravity Bottles, see Part II. Apparatus for Specific Gravity.

462. — **Wash Bottles, Fresenius,** complete with **rubber stopper,** and **movable exit tube.**

Capacity	4	8	12	16	24	32 oz.
Each	.35	.40	.45	.50	.60	.75

463. — **Wash Bottles, fitted** as above; each additional..... .40

464. — **Wash Bottles, Drechsel's;** all glass.

Capacity	4	8	16	32 oz.
Each	.75	$1.00	1.25	1.50

465. — **Same,** with **name etched in,** each extra..... .50

466. — **Wash Bottles,** after Langbein **with 2 glass stopcocks,** for Ether, Bromine, $C.S_2$, etc

Capacity	4	8	16	32 oz.
Each	$2.25	2.50	2.75	3.00

467. — **Wash Bottles,** with **movable exit tube** and mouth tube so constructed **to prevent saliva entering.**

Capacity	8	16	32 oz.
Each	$1.10	1.40	1.70

468. — **Weighing Bottles** for **Water** and **Wine Analysis.**

Capacity	50	100	150 cc.
Each	.50	.75	$1.00

469. — **Weighing Bottles for filters,** extra wide mouth and ground stopper.

Height	50	50	50	60 millim.
Dia.	25	30	40	50 millim.
Each	.30	.35	.40	.50

470. — **Weighing Bottles,** with **ground stopper,** with flat bottom.

Height	50	65	75	100 millim.
Dia.	10	12	15	20 millim.
Each	.25	.30	.35	.40

471. — **Weighing Bottles,** both **ends** with ground **caps.**

Length	80	100	120	150 millim.
Dia.	15	18	20	25 millim.
Each	.40	.45	.50	.60

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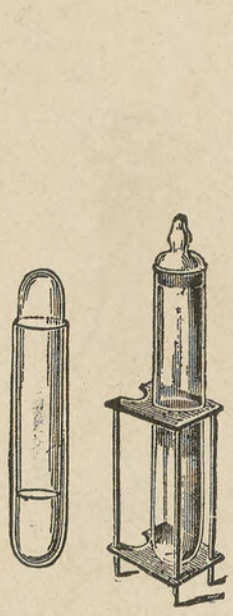

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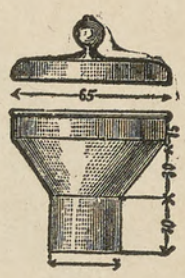

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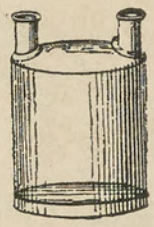

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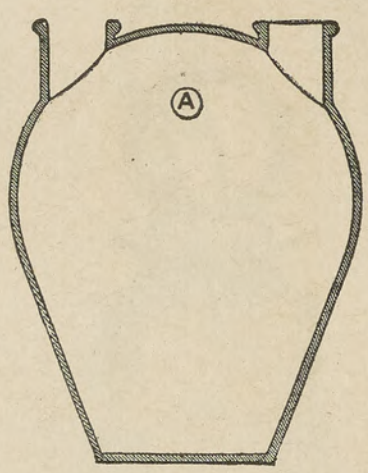

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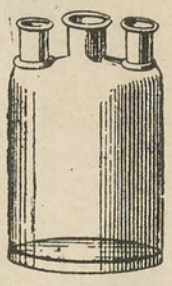

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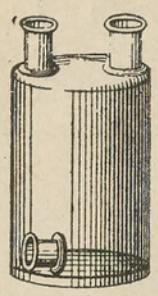

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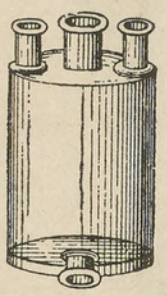

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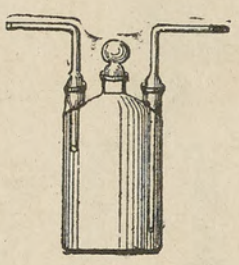

482

No.

472. **Bottles. weighing bottles, two tubes,** one fitting into the other.

Length	70	75	80 millim.
Dia.	15	20	25 millim.
Each	.20	.25	.30

473. — **Support of brass, for bottles,** to be used upright or horizontal $1.50

474. — **Weighing Bottles, conical,** with glass stopper.

Capacity	1	2	4 oz.
Each	.30	.35	.40

475. — **Weighing and Drying Bottles,** after **Reinhardt,** for filters, 65 millim. dia. on top... 1.50
(See Fres. Zeits 1890, P. 167.)

476. — **Woulff Bottles,** of **light blown glass,** with two necks.

Capacity	1	2	4 oz.
Each	.25	.30	.40

477. — **Woulff Bottles,** of **light blown glass,** with 3 necks.

Capacity	1	2	4 oz.
Each	.30	.35	.45

478. — **Woulff Bottles,** with **2 necks.**

Capacity	¼	½	1 pt.	1 qt.	½	1	2 gal.
Each	.40	.45	.50	.85	$1.25	2.25	4.50

479. — **Woulff Bottles,** with **3 necks.**

Capacity	¼	½	1 pt.	1 qt.	½	1 gal.	2 gal.
Each	.45	.50	.55	.95	$1.40	2.50	5.00

480. — **Woulff Bottles,** with **2 necks** and **tubulature** near bottom.

Capacity	1 pt.	1qt.	½	1 gal.
Each	$1.00	1.25	1.75	2.25

481. — **Woulff Bottles,** with **3 necks,** and **tubulature** near bottom.

Capacity	1 pt.	1 qt.	½	1 gal.
Each	$1.10	1.40	2.00	2.50

482. — **Woulff Bottles,** with **2 ground tubes** into neck and **glass stopper.**

Capacity	¼	½	1 pt.	1 qt.
Each	$1.00	1.25	1.60	2.00

Woulff Bottles, with Mercury seal, see Part II. Gas Washing bottles.

483. — **Woulff Bottles,** of **stone ware.**

Capacity 10 to 100 gal.....Per gal. .40

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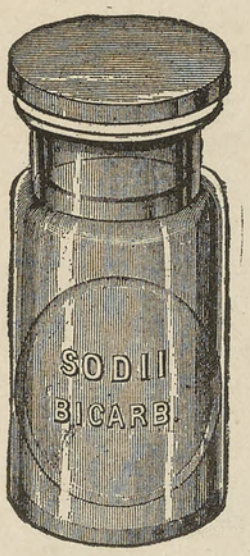

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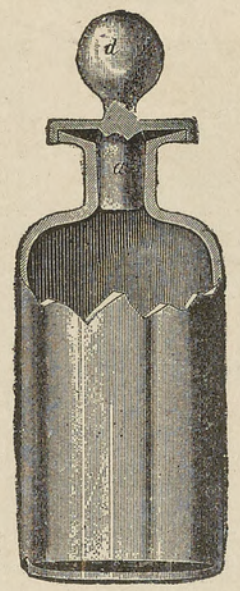


494



495a



495a

Reagent Bottles, with ground glass labels.

N.B. These bottles have the chemical names and equivalents in raised letters ground on the surface. They are made from glass containing no lead, zinc or other metallic flux. Please order by numbers.

No.

484n. **Reagent Bottles.** Capacity 4 oz.=125 cc. Height 5½ in. ..... Per. doz. **$1.75**

1. H_2S ..... Hydric Sulphide. (Amber).
2. HCl ..... Hydric Chloride.
3. $HC_2H_3O_2$ ..... Hydric Acetate.
4. H_2SO_4 ..... Hydric Sulphate.
5. HNO_3 ..... Hydric Nitrate.
6. K_4FeCy_6 ..... Potassic Ferrocyanide.
7. KCyS ..... Potassic Sulphocyanide.
8. K_2CO_3 ..... Potassic Carbonate.
9. K_2SO_4 ..... Potassic Sulphate.
10. KI ..... Potassic Iodide.
11. K_3FeCy_6 ..... Potassic Ferricyanide.
12. KHO ..... Potassic Hydrate.
13. $K_2Cr_2O_7$ ..... Potassic Acid Chromate.
14. Na_2HPO_4 ..... Di Sodic Hydric Phosphate.
15. NH_4HO ..... Ammonic Hydrate.
16. $(NH_4)_2S$ ..... Ammonic Sulphide. (Amber).
17. NH_4Cl ..... Ammonic Chloride.
18. $(NH_4)_2CO_3$ ..... Ammonic Carbonate.
19. $(NH_4)_2C_2O_4$ ..... Ammonic Oxalate.
20. $BaCl_2$ ..... Baric Chloride.
21. $CaCl_2$ ..... Calcic Chloride.
22. $CaSO_4$ ..... Calcic Sulphate.
23. CaH_2O_2 ..... Calcic Hydrate.
24. $MgSO_4$ ..... Magnesic Sulphate.
25. $HgCl_2$ ..... Mercuric Chloride.
26. $AgNO_3$ ..... Argentic Nitrate. (Amber).
27. $PbO_2(C_2H_3O)_2$ ..... Plumbic Acetate. (Amber).
28. $FeSO_4$ ..... Ferrous Sulphate.
29. Fe_2Cl_6 ..... Ferric Chloride.
30. C_2H_6O ..... Alcohol.
31. NH_4CyS ..... Ammonic Sulphocyanide.
32. $Ba(HO)_2$ ..... Baric Hydrate.
33. $BaCO_3$ ..... Baric Carbonate.
34. NH_4CNS ..... Ammonic Sulphocyanate.
35. $C_4H_{10}O$ ..... Ether.
36. $CuSO_4$ ..... Cupric Sulphate.
37. $PtCl_4$ ..... Platinic Chloride.
38. 39, 40. Blank.

485n. 1 set of above 40 bottles, No. 1 to 40 ..... per set. **6.00**

486n. 1 set of above 40 bottles, filled with chemically pure reagents, accdg to Fresenius; bottles included ..... per set. **12.50**

487n. **Reagent Bottles;** same style as No. 484 ..... Per Doz. **1.75**

41. $HC_2H_3O_2$ ..... Symbols only.
42. NH_4Cl ..... " "
43. $(NH_4)_2CO_3$ ..... " "
44. $(NH_4)_2C_2O_4$ ..... " "
45. $(NH_4)_2S$ ..... " "
46. Na_2HPO_4 ..... " "
47. $BaCl_2$ ..... " "
48. $Ba(NO_3)_2$ ..... " "
49. $CaSO_4$ ..... " "
50. $MgSO_4$ ..... " "
51. Fe_2Cl_6 ..... " "
52. K_4FeCy_6 ..... " "
53. K_3FeCyc ..... " "
54. $K_2Cr_2O_7$ ..... " "
55. $PbO_2(C_2H_3O)_2$ ..... " "
56. No Symbols ..... Uranic Acetate.
57. $Hg(NO_3)_2$ ..... Mercuric Nitrate.
58. No Symbols ..... Fehling's Solution.
59. Na_2CO_3 ..... Sodic Carbonate.
60. $NaC_2H_3O_2$ ..... Sodic Acetate.
61. NaOH ..... Sodic Hydrate.
62. No Symbols ..... Baryta Mixture.
63. HNO_2 ..... Acid Nitrous.
64. H_3PO_4 ..... Symbols only.
65. Na_2HPO_4 ..... Sodic Phosphate.
66. $C_2H_4O_2$ ..... Acetic Acid.
67. HNO_3 ..... Nitric Acid.
68. Fe_2Cl_6 ..... Ferric Chloride.
69. H_2SO_4 ..... Sulphuric Acid.
70. Na_2SO_4 ..... Sodic Sulphate.
71. $(NH_4)_4(CO_3)_3H_2$ ..... Ammonic Carbonate.
72. HCl ..... Hydrochloric Acid.
73. $K_4Fe_2Cy_6$ ..... Postasic Ferrocyanide
75. NaHO ..... Sodic Hydrate.
76. I ..... Iodine.
77. NH_3 ..... Ammonia.
78. $Pb_2C_2H_3O_2 2PbO$ ..... Basic Plumbic Acetate
79. No Symbols ..... Millon's Reagent.
80. $C_2H_2O_4$ ..... Hydric Oxalate.
81. $SnCl_2$ ..... Stannous Chloride.
82. No symbols ..... Ammonic Molybdate.
83. CS_2 ..... Carbon Di Sulphide.
84. $(C_2H_5)_2O$ ..... Ether.
85. $NaHSO_3$ ..... Sodic Hydric Sulphite.
86. $Hg_2(NO_3)_2$ ..... Mercurous Nitrate.
87. No symbols ..... Indigo Solution.
88. No Symbols ..... Nessler's Solution.
89. $Sr(NO_3)_2$ ..... Strontic Nitrate.
90. No Symbols ..... Magnesia Mixture.
91. H_2SO_4 ..... Acid Sulphuric Conc.
92. $HC_2H_3O_2$ ..... Acid Acetic.
93. $C_2H_2O_4$ ..... Acid Oxalic.
94. $C_6H_3O(NO_2)_3$ ..... Acid Picric.
95. NaClO ..... Sodic Hypochlorite.
96. K_2CrO_4 ..... Neutral Potassic Chromate.
97. NH_4HS ..... Ammonic Sulphydrate.
98. $NaHC_4H_4O_6H_2O$ ..... Sodic Bitartrate.
99. $Na_2S_2O_35H_2O$ ..... Sodic Hyposulphite.
100. Iodide Mercury and Potash.
401. $Ba(NO_3)_2$ ..... Baric Nitrate.
402. $K_2Mn_2O_8$ ..... Potassic Permanganate.
403. $(NH_4)_2HPO_4$ ..... Ammonic Phosphate.
404. Ag_2SO_4 ..... Argentic Sulphate.
405. KCl ..... Potassic Chloride.

EDWARDS & CO. LTD. Newark. London.

488n. **Reagent Bottles.** Capacity 8 oz.=250 cc. Height 6½ in. ..... Per doz. **$2.25**

101. H_2SO_4 ..... Sulphuric Acid (Concent).
102. $H_2SO_4 \cdot Aq$ ..... Sulphuric Acid (Dilute).
103. $HNO_3 \cdot Aq$ ..... Nitric Acid(Concent).
104. $HNO_3 \cdot Aq$ ..... Nitric Acid (Dilute).
105. $HCl \cdot Aq$ ..... Hydrochloric Acid (Concent).
106. $HCl \cdot Aq$ ..... Hydrochloric Acid (Dilute).
107. H_2S ..... Hydric Sulphide.
108. H_4NHO ..... Ammonic Hydrate.
109. $H_4NCl \cdot Aq$ ..... Ammonic Chloride.
110. $(H_4N)_2CO_3 \cdot Aq$ ..... Ammonic Carbonate.
111. $NaOH \cdot Aq$ ..... Sodic Hydrate.
112. Na_2CO_3 ..... Sodic Carbonate.
113. $H_4NSH \cdot Aq$ ..... Ammonic Sulphydrate.
114. $BaCl_2 \cdot Aq$ ..... Baric Chloride.
115. $CaCl_2 \cdot Aq$ ..... Calcic Chloride.
116. 117, 118. Blank.
119. H_2SO_4 ..... Hydric Sulphate.
120. HCl ..... Hydric Chloride.
121. HNO_3 ..... Hydric Nitrate.
122. $(NH_4)_2S$ ..... Ammonic Sulphide (Amber).
123. $BaCO_3$ ..... Baric Carbonate.
124. $BaOH_2O$ ..... Baric Hydrate.
125. $C_3H_8O_3$ ..... Glycerin.
126. C_2H_6O ..... Alcohol.
127. $C_2H_4O_2$ ..... Hydric Acetate.
128. K_4FeCy_6 ..... Potassic Ferrocyanide.
129. Na_2HPO_4 ..... Sodic Phosphate.
130. $(NH_4)_2C_2O_4$ ..... Ammonic Oxalate.
131. $HC_2H_3O_2$ ..... Acetic Acid.
132. $C_4H_{10}O$ ..... Ether.
133. Conc. H_2SO_4 ..... Symbols only.
134. Conc. HNO_3 ..... " "
135. Conc. HCl ..... " "
136. Dil. H_2SO_4 ..... " "
137. Dil. HNO_3 ..... " "
138. Dil. HCl ..... " "
139. NH_4HO ..... " "
140. $NaHO$ ..... " "
141. Na_2CO_3 ..... " "
142. K_3FeCy_6 ..... Potassic Ferricyanide.
143. KI ..... Potassic Iodide.
144. $K_2Cr_2O_7$ ..... Potassic Acid Chromate.
145. $AgNO_3$ ..... Argentic Nitrate (Amber).
146. Fe_2Cl_6 ..... Ferric Chloride.
147. H_2SO_4 ..... Acid Sulphuric (Dilute).
148. HCl ..... Acid Hydrochloric.
149. HNO_3 ..... Acid Nitric.
150. KHO ..... Potassic Hydrate.

489n. **Reagent Bottles.** Capacity 1 pint = 500 cc. Height 7¾ in. ..... Per doz. **$3.50**

201. $H_2SO_4 \cdot Aq$ ..... Sulphuric Acid (Dilute).
202. $HNO_3 \cdot Aq$ ..... Nitric Acid (Dilute).
203. $HCl \cdot Aq$ ..... Hydrochloric Acid (Dilut
204. H_4NHO ..... Ammonic Hydrate.
205. $H_4NCl \cdot Aq$ ..... Ammonic Chloride.
206. $(H_4N)_2CO_3 \cdot Aq$ ..... Ammonic Carbonate.
207. No Symbols ..... Dil. Nitro-Hydr. Acid.
208. No Symbols ..... Liquor Potassæ.
209. No Symbols ..... Tinct. Ferri Perchlor.
210. H_2S ..... Hydric Sulphide.
211. 212. Blank.
213. $H_3PO_4 \cdot Aq$ ..... Phosphoric Acid (Dilute).
214. $(NH_4)_2S$ ..... Ammonic Sulphide.
215. $H_2SO_4 \cdot Aq$ ..... Sulphuric Acid.
216. $HNO_3 \cdot Aq$ ..... Nitric Acid.
217. $HCl \cdot Aq$ ..... Hydrochloric Acid.
251. $KOH \cdot Aq$.
252. $H_2SO_4 \cdot Aq$. Dil.
253. $HCl \cdot Aq$. Dil.
254. $HNO_3 \cdot Aq$. Dil.
255. $(NH_4)OH \cdot Aq$.
256. $(NH_4)_2CO_3 \cdot Aq$.
257. $(NH_4)Cl \cdot Aq$.
258. $(NH_4)SH \cdot Aq$.
259. $BaCl_2 \cdot Aq$.
260. $CaCl_2 \cdot Aq$.
261. H_2SO_4.
262. $HCl \cdot Aq$. Conc.
263. $HNO_3 \cdot Aq$. Conc.
264. $PbO_2(C_2H_3O)_2 \cdot Aq$.
265. $CaSO_4 \cdot Aq$.
266. $H(C_2H_3O_2) \cdot Aq$.
267. $HNa_2PO_4 \cdot Aq$.
268. $AgNO_3 \cdot Aq$.
269. $(NH_4)_2C_2O_4$ ..... Ammonic Oxalate.
270. $BaCO_3$ ..... Baric Carbonate.
271. Na_2CO_3 ..... Sodic Carbonate.
272. $NaOH$ ..... Sodic Hydrate.

490n. **Reagent Bottles.** Capacity "Quarts" = 1000 cc. Height 9¾ in. ..... Per doz. **4.00**

1. H_2SO_4 ..... Sulphuric Acid (Concent).
2. $H_2SO_4 \cdot Aq$ ..... Sulphuric Acid (Dilute).
3. $HNO_3 \cdot Aq$ ..... Nitric Acid (Concent).
4. $HNO_3 \cdot Aq$ ..... Nitric Acid (Dilute).
5. $HCl \cdot Aq$ ..... Hydrochloric Acid (Concent).
6. $ACl \cdot Aq$ ..... Hydrochloric Acid (Dilute)
7. No Symbols ..... Nitro Hydr. Acid (Dilute).
8. H_4NHO ..... Ammonic Hydrate (Concent
9. $H_4NHO \cdot Aq$ ..... Ammonic Hydrate (Dilute).
10. C_2H_6O ..... Alcohol.

491n. **Reagent Bottles.** Capacity 1 oz. Height 3⅜ in. ..... Per doz. **1.25**

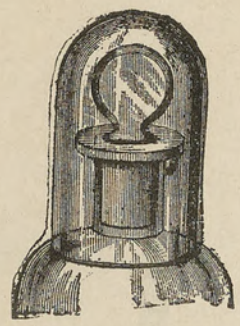
325. $AgNO_3$ ..... Symbols Only.
326. $Co(NO_3)_2$ ..... " "
327. $PtCl_4$ ..... " "
328. $HgCl_2$ ..... " "
329. No Symbols ..... Glycerin.
330. Albumen.
331. Ammonio-Nitrate Silver.
332. Ammonio-Sulphate Copper.
333. Gelatin.
334. $C_{14}H_{10}O_9$ ..... Acid Tannic.
335. $H_2C_4H_4O_6$ ..... Acid Tartarie.
336. $AuCl_3$ ..... Aurum Chloride.
337. K_3FeCy_6 ..... Potassic Ferricyanide.
338. $FeSO_4$ ..... Ferrous Sulphate.
339. Indigo Solution.
340. $PtCl_4$ ..... Platinic Chloride.

492n. **Saltmouth Reagents.** Capacity 1 oz. Height 3⅛ in., symbols only ..... Per doz. **1.35**

350. Na_2CO_3.
351. $Na_2B_4O_7$.
352. $H_2C_4H_4O_6$.
353. $NaC_2H_3O_2$.
354. KNO_3.
355. FeS.
356. KNO_2.
357. $K_2OSb_2O_5$.
358. KCN.
359. $Ba(HO)_2$.
360. $CaFl_2$.
361. $Na(NH_4)HPO_4$.
362. MnO_2.

493n. **Saltmouth Reagent.** Capacity 4 oz. Height 4⅝ in. ..... Per doz. **2.00**

301. Na_2CO_3.
302. KNO_3.
303. KCN.
304. $Na_2B_4O_7$
305. $FeSO_4$. Ferrous Sulphate.
306. $Na(NH_4)HPO_4 \cdot 4H_2O$.
307. Blank.
308. $NaNO_3$
309. Na_2CO_3. Sodic Carbonate.
310. $Na_2B_4O_7 \cdot 10H_2O$. Borax.
311. $Na(NH_4)HPO_4 \cdot 4H_2O$. Phosphorous Salt.
312. Test Paper.
314. KCy. Potassic Cyanide.



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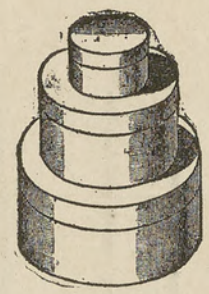

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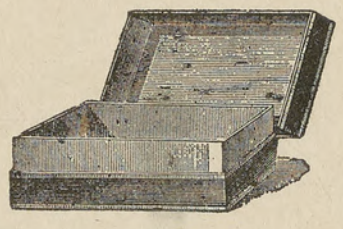

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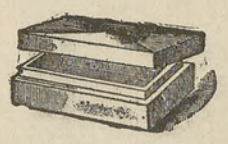

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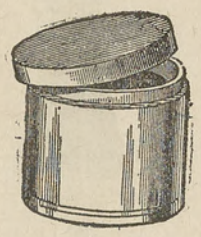

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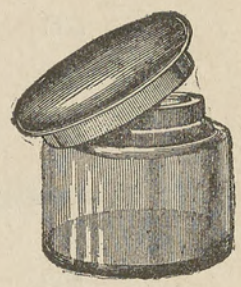

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No.

494n. **Bottles, Reagent Jewett's Patent.** The great utility of this improvement in reagent bottles will at once be recognized. To keep the contents pure, the mouth and lip are completely protected from accumulations of dust by a hood and its pendant flange, made in one piece with the stopper. It is a simple and effective apparatus, and needs but a trial to ensure it a permanent place in every laboratory. (See Cut, page 47.)

Capacity	4	8	16 oz.
Doz.	$3.40	4.50	5.00

495. **Bottles, Reagent Bottles,** glass stoppered, **with indestructible vitrified labels;** the most perfect Reagent Bottles made. **Imported to order only.**

Sizes	2	4	6	8	12	16	32 oz.

The following styles of labels and stoppers can be furnished:
Black letters, on white background.
Transparent letters, on white background.
White letters, on black background.
Flat stoppers.
High, round stoppers.
High, square cut and polished stoppers.
Lettering on Label only.
Lettering and Symbol on Label.
Lettering and Symbol on Label, and Symbol on stopper.

496n. **Bottle Caps,** to protect the stoppers, and mouth of bottles from dust.

Size	1½x2¼	2¼x3⅛	2⅜x4¼	2⅝x3½ in.
Doz.	$1.00	2.50	3.25	3.25

497. **Bottle Rests,** of **porcelain;** to stand under bottles containing acids, oils, etc., to protect the table.

Dia.	3¾	5¼ in.
Each	.35	.35

498. — of **hard rubber** ..... Doz. $2.00
499. — of **felt** ..... " 1.00

500n. **Boxes, turned wood,** plain.

Capacity	1	2 Drams	½	1	2	3	4 oz.
Gross	.30	.40	.50	.75	$1.10	1.50	2.00

501n. — **seamless tin,** round.

Capacity	¼	½	1	2	3	4 oz.
Gross	.35	.55	.90	$1.50	2.00	2.25

502n. — **tin,** square, 4 in long, 3 in. wide, 1⅜ in. heigh ..... Doz. .35
503. — **pasteboard,** for assay samples, size 2½x3½x1 in ..... " .25
504. — **opal glass,** oblong; with lid, 1 oz ..... " 1.50
505. — **glass,** with nickel-plated **metal screw-cap.**

Capacity	1	2	4	8	16 oz.
Doz.	.85	$1.00	1.60	2.50	3.85

506. — **glass,** with glass lids.

Capacity	1	2	4	8	16 oz.
Doz.	.95	$1.20	1.50	2.20	3.20

507. — **glass,** with lid ground on.

Capacity	1½	4 oz.
Doz.	$1.35	2.00

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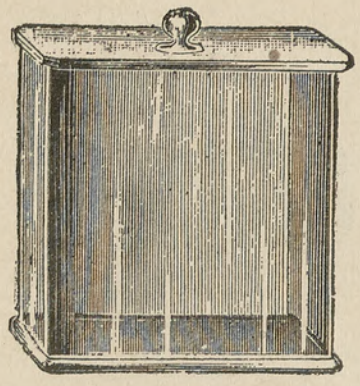

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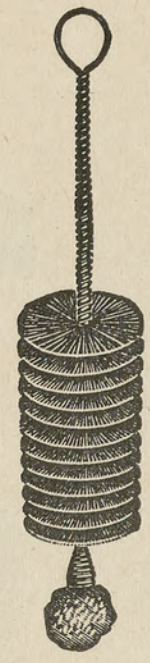

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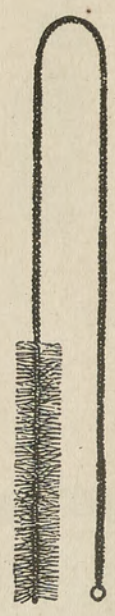

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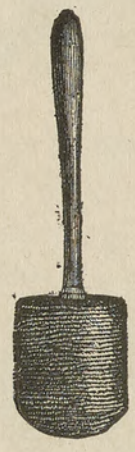

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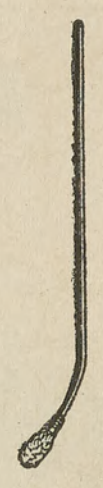

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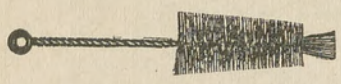

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526



525

No.

508. **Boxes, glass,** with lid ground on, and knob.

Height	4½	5¼	6	8 in.
Length	3½	4¾	3¼	6⅛ in.
Width	¾	1½	2½	2½ in.
Each	$1.50	1.75	2.00	2.50

509. **Brushes, spun glass,** for acids ..... each .25

510. — **camel hair.**

Size	Sml.	Med.	Lge.
Doz.	.25	.30	.60

511. — **camel hair,** extra large ..... each. .20

512. — **camel hair,** flat, with wood handle ; for cleaning scale pans.

Width	½	1	1½	2 in.
Each	.15	.20	.25	.30

513. — for cleaning **test tubes** ..... each .05, doz. .40

514. — for **test tubes,** with sponge end ..... " .10, " .85

515. — for cleaning **long tubes, Burette, etc.,** 3 feet long ..... " .25

516. — for cleaning **narrow tubes** ..... " .05, doz. .40

517. — large, for cleaning **cylinders, large tubes, bottles, etc.,** handles of wire.

Length	10	12	15	20 in.
Each	.20	.25	.30	.35

518. — **round stiff bristles,** for brushing out Platinum Crucibles, etc ..... each .15

519. — **wood handle,** for cleaning Beakers ..... " .20

520. — **probangs,** whalebone with sponge end ..... " .10

521. — for **assay buttons, Freiberg,** pattern, genuine bristle ..... " .50

522. — for cleaning **iron plates of ore crushers.**

Width	3	4	4½ in.
Each	.60	.80	$1.00

523. — for cleaning **amalgam plates,** with handle ..... .50

524. **Buckets, Quicksilver or Amalgam,** of iron ; porcelain lined, with bale and spout.

Capacity	2	2½	3	4	6	8	10	12 quarts
Dia. at top	7½	7¾	8¼	9¼	10¼	11½	12½	13 in.
Doz.	$6.00	7.50	9.00	10.50	13.50	15.75	18.75	22.50

525. **Bulb Glass,** with tube for attesting rubber tubing for water or mercury reservoirs.

Capacity	200	500	1000	2000 cc.
Each	.50	.75	$1.00	1.50

526. **Bullion Punch** ..... each .75

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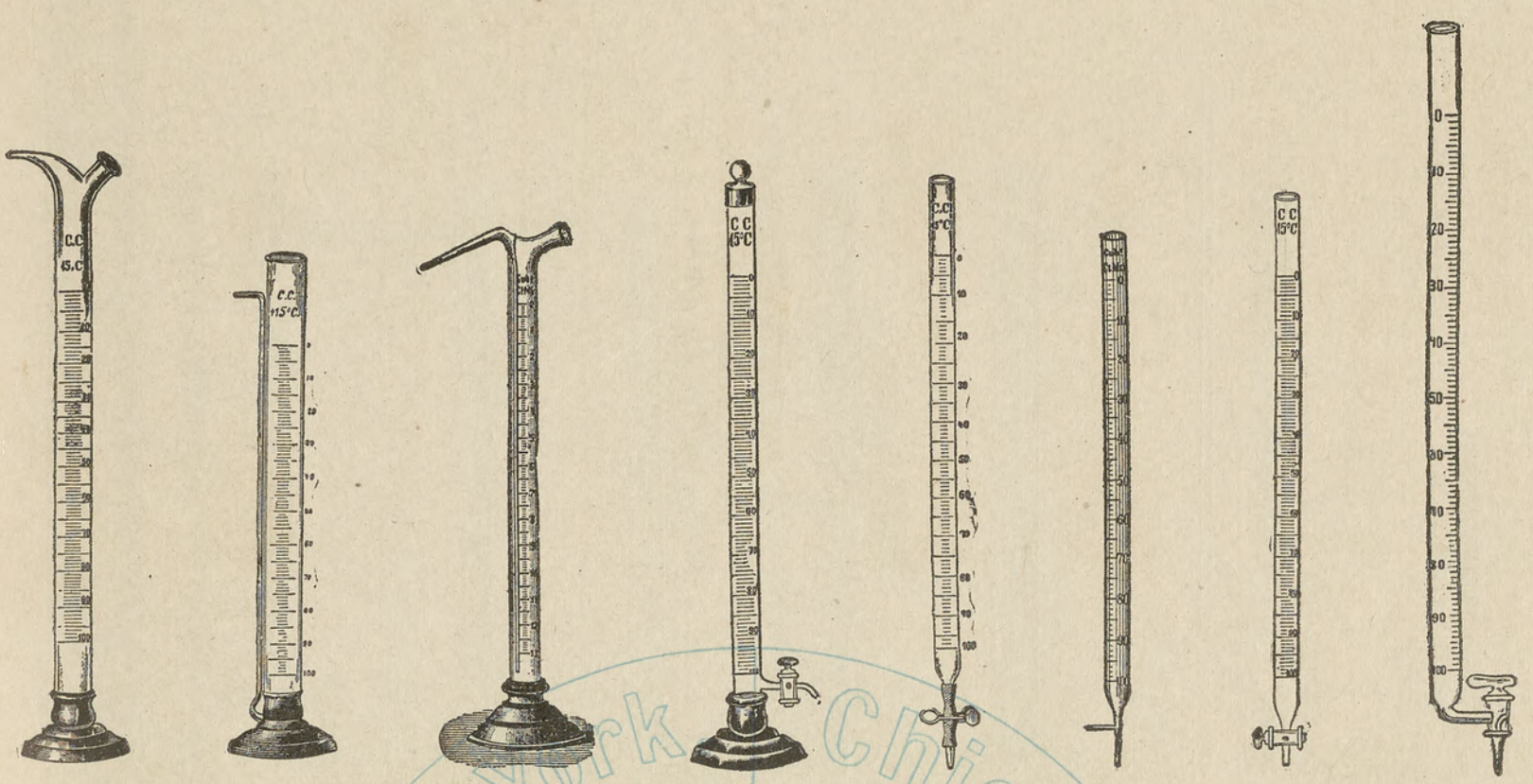

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BURETTES, FOR SCIENTIFIC WORK.

No.

527. **Burettes, Bink's or English form,** on polished wooden base.

Capacity	10	25	50	100 cc.
Grad.	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$ cc.
Each	.90	$1.10	1.50	2.40

528. — **Gay Lussac's,** on polished wooden base.

Capacity	25	50	100 cc.
Grad.	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$ cc.
Each	$1.15	1.60	2.40

529. — **Geissler's Chameleon,** with inside tube running to the bottom, on wooden base.

Capacity	25	50	100 cc.
Grad.	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$ cc.
Each	$1.25	1.75	2.50

530. — **Geissler's Support Burette.**

Capacity	25	50	100 cc.
Grad.	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$ cc.
Each	$2.00	2.50	3.10

531. — **Mohr's,** most accurately graduated, for pinchcocks; with tip and rubber connection.

Capacity	10	25	50	50	75	100	100 cc.
Grad.	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$ cc.
Each	.70	.90	$1.30	1.20	1.75	2.00	1.80

532. — **Mohr's,** for pinchcocks, and with **side filling tube,** with tip and rubber connection.

Capacity	10	25	50	50	75	100	100 cc.
Grad.	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$ "
Each	$1.00	1.20	1.60	1.50	2.10	2.30	2.10

533. — **Mohr's,** with **glass stopcock.**

Capacity	10	25	50	50	75	100	100 cc.
Grad.	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$ "
Each	$1.40	1.50	2.00	1.85	2 50	2.75	2.40

534. — **Fresenius',** with **glass stopcock,**

Capacity	25	50	50	100 cc.
Grad.	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{10}$ "
Each	$1.50	2.00	1.85	2.75

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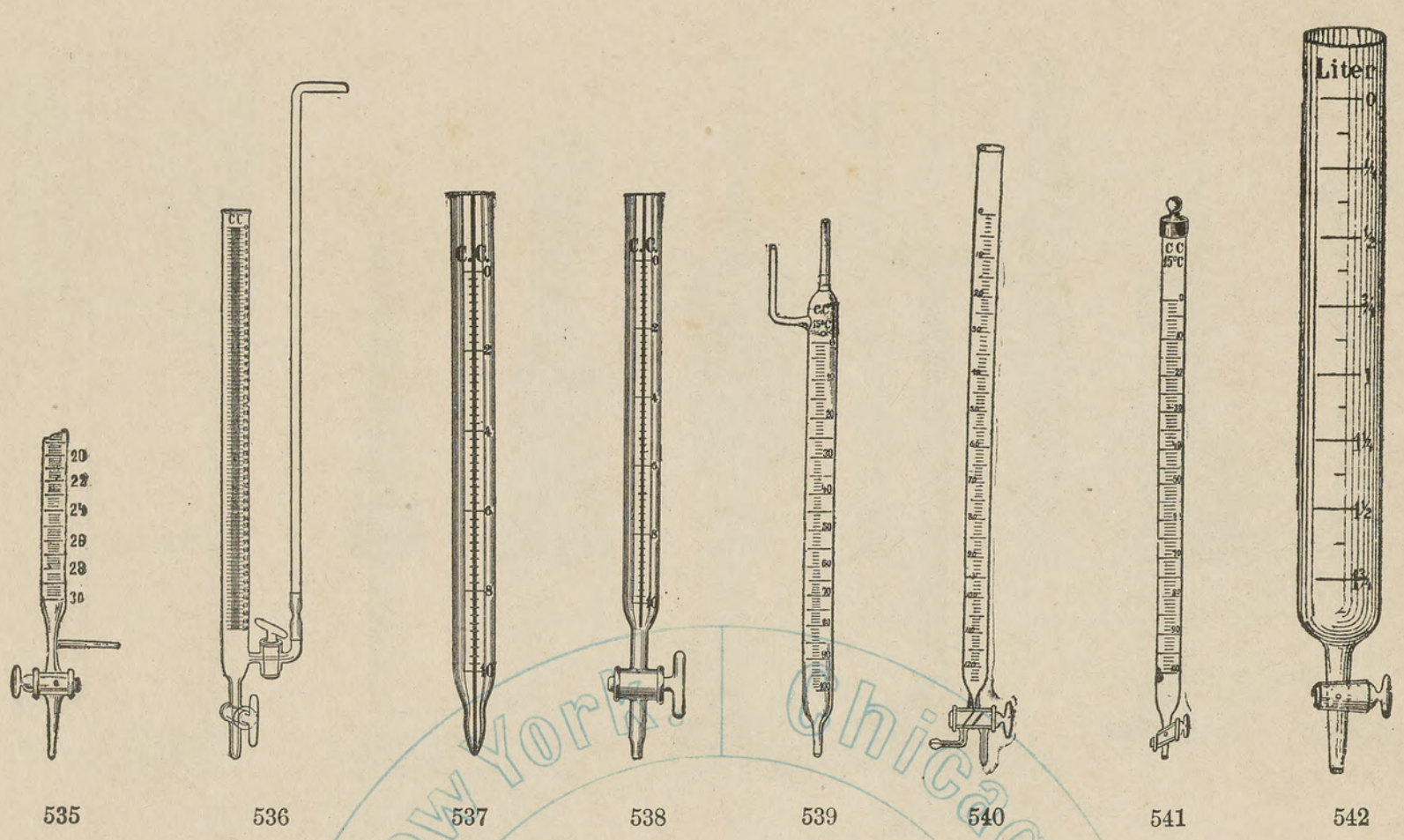

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No.

535. **Burettes, Mohr's,** with **Glass Stopcock** and **side-filling tube.**

Capacity	10	25	50	50	75	100	100 cc.
Grad.	1/10	1/10	1/10	1/5	1/10	1/10	1/5 "
Each	$1.70	1.80	2.30	2.15	2.80	3.10	2.75

536. — **Gawalowsky,** with glass stopcock and glass side tube; with stopcock for filling from reservoir.

Capacity	25	50	75	100 cc.
Grad.	1/10	1/10	1/10	1/10 "
Each	$3.00	3.50	4.00	4.25

537. — **Schellbach,** with dark enamelled stripe on white enamelled background, giving a definite meniscus; with tip and rubber connections.

Capacity	25	50	50	100	100 cc.
Grad.	1/10	1/10	1/5	1/10	1/5 cc.
Each	$1.50	1.75	1.60	2.50	2.40

538. — **Schellbach,** as above; with **Glass Stopcock.**

Capacity	25	50	50	100	100 cc.
Grad.	1/10	1/10	1/5	1/10	1/5 "
Each	$2.00	2.75	2.40	3.50	3.20

539. — **Rammelsberg,** with side tube, to connect with reservoir.

Capacity	25	50	50	100 cc.
Grad.	1/10	1/10	1/5	1/5 cc.
Each	$1.20	1.60	1.50	2.00

540. — With **3 ways glass stopcock** and tube for filling from reservoir.

Capacity	25	50	100 cc.
Grad.	1/10	1/10	1/5 "
Each	$2.25	3.00	3.50

541. — With **Glass stopcock, angle of 45°.**

Capacity	25	50	100	50	100 cc.
Grad.	1/10	1/10	1/10	1/5	1/5 "
Each	$2.40	2.80	3.50	2.70	3.30

542. — For **dispensing** liquids in larger quantities; with glass stopcock.

Capacity	250	500	1000 cc.
Each	$3.00	4.00	5.00

— **Winklers and Hempel's,** for Gas Analysis; see Part II. Gas Analysis.

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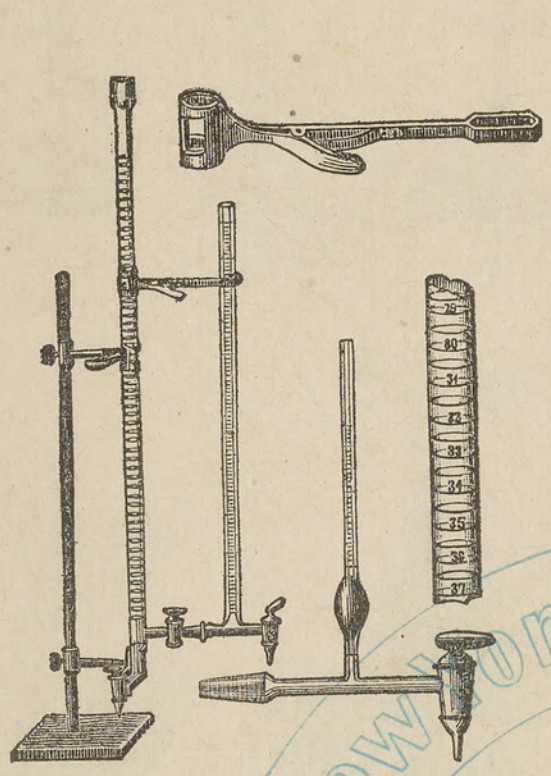

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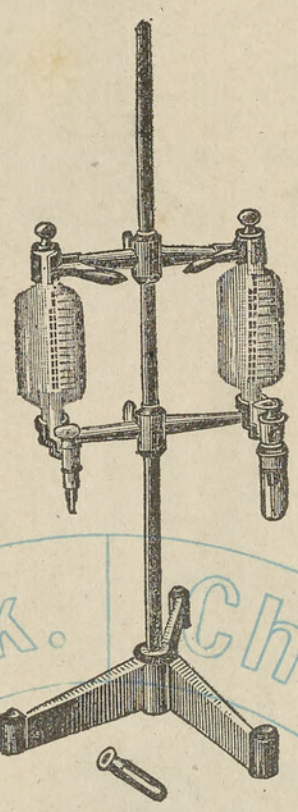

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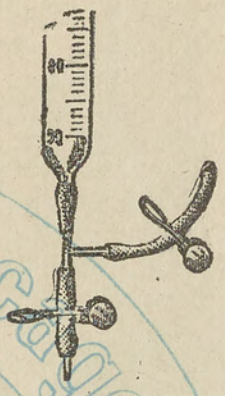

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546



546a



546b



546c



547

No.

543. **Burettes,** For **Control** after **Meinicke,** 2 glass stopcocks; capacity, 60 cc., with cc. mark around tube, and ground in graduated Control Pipette divided in $\frac{1}{100}$ cc.; with glass stopcock. **$10.00**

543a. — **Control Pipette for above,** with "0" Point divided into $\frac{1}{100}$ cc. **4.50**

543b. — **Support for above,** with clamps. **3.50**

544. — **For weighing, Ripper's, complete,** viz., 2 burettes, with support and Aluminum suspenders. **18.00**

545. **Burette Attachment,** for connecting the burette with reservoir, complete as per sketch ..... **.60**

546. **Burette Caps,** to protect contents from dust ..... per doz. **.50**

546a. **Burette Float, Erdmann's** ..... **.25**

546b. — **Float, with points,** to prevent adhering to walls ..... **.50**

546c. — **Float, Beutell's** ..... **.50**

(Jl. Anal. Chem.; 889, p. 170).

Burette Clamps, See Clamps.

Burette Supports, see Supports

547. **Burette Tips,** ..... each **.05** Doz. **.50**

Other Burettes, see Index.

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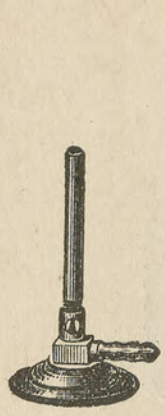
GLASS BLOWING.

We beg to announce that we have in our employ practical Glass Blowers to do all kinds of Glass Blowing, Repairing, Grinding, Etching, etc., who are capable of filling all orders in this line with the greatest promptitude and exactness.

We are using special chemical glass tubing for all apparatus, and will be pleased to quote prices for this class of work on application.



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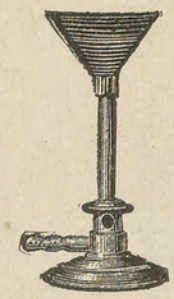

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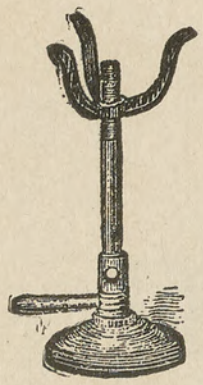

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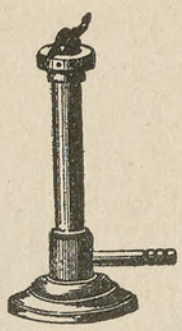

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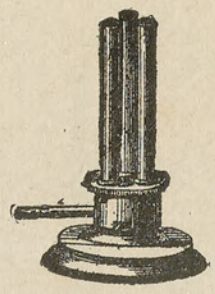

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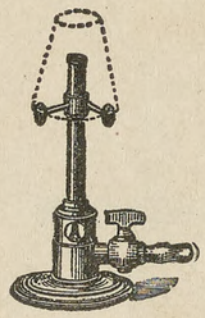

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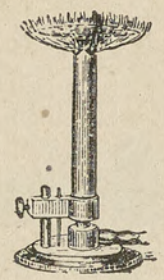

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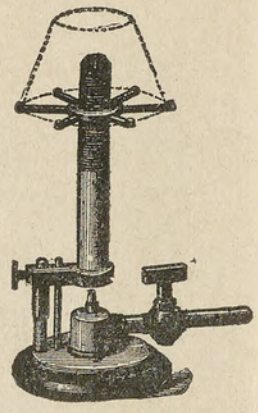

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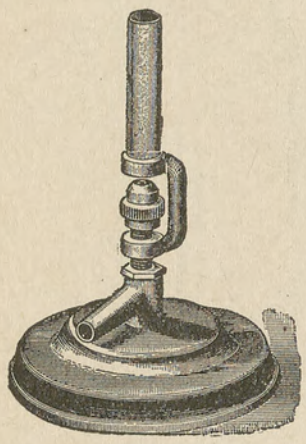

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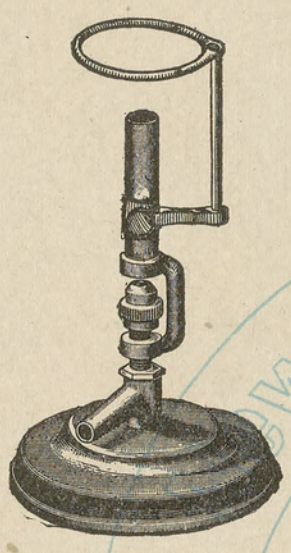

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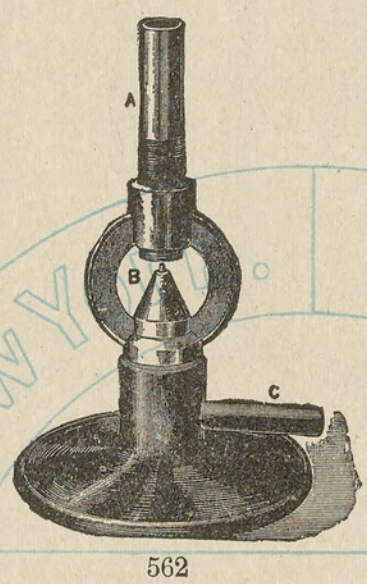

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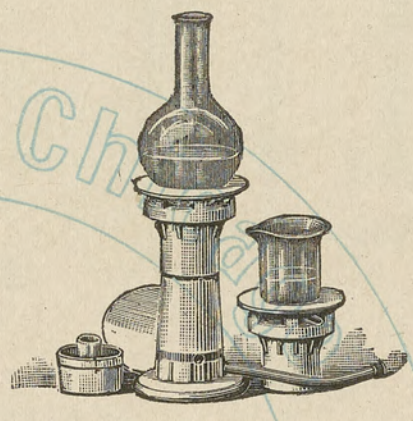

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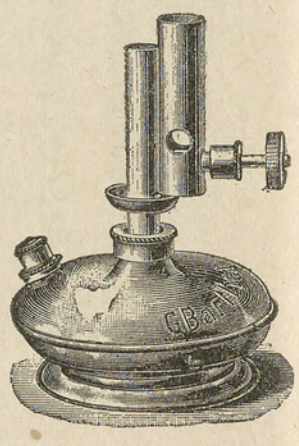
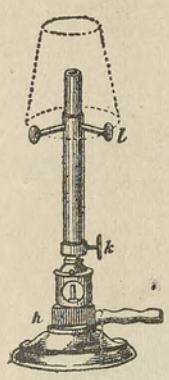


564

BURNERS.

No.			
548.	**Burner, Bunsen's,**	with air regulator	$ .45
549.	——	" larger tube, ½ in. bore	.60
550.	——	" with **wing top,** for bending tubes	.70
551.	——	" with **tripod,** for supporting dishes	.70
552.	——	**Griffin's,** with crown top	.90
553.	——	**Bunsen's,** with **2 tubes,** and air regulators	1.00
554.	——	" with **3 tubes** " "	1.50
555.	——	" with **4 tubes** " "	2.00
556	——	" with **fork,** to attach to support	1.00
557.	——	" with **stopcock,** star and chimney	1.75
558.	——	**Terquem's,** small for gasolene gas	.75
559.	——	" large, with stopcock, star and chimney	2.50
560t.	——	**Adjustable Bunsen;** for burning gas of variable quality. The size of the orifice through which the gas escapes is adjusted by turning the milled cap-nut seen inside the arm which supports the upright tube. Its adjustability renders it a favorite burner for those using gasoline gas, or the mixture of gasoline vapor and air made by gas machines	1.25
561t.	——	**Adjustable,** same as No. 558 with support which can be raised or lowered, for dishes or platinum triangles	2.25
562t.	——	**Combination, Bunsen,** for gasoline gas	1.25
563n.	——	**Chaddock's,** of **porcelain; incorrodible;** a new Bunsen Burner especially designed for use in hoods where metal, on account of the smoky flame, soon corrodes; also desirable for all laboratory purposes, no retort stand and wire gauze being required. Complete with support for dishes, chimney and three asbestos pads	1.75
564t.	——	**Barthel's, for** use with **alcohol,** giving a temperature of 1100—1200° C	5.50
565t.	——	" **for** use with **benzine,** can also be used as a blastlamp giving a blue flame and complete combustion without the escape of any unpleasant gases. It has a temperature of 1300—1400° C. The fusing of silicates is accomplished in the shortest possible time. Directions furnished with each burner	8.00

RICHARDS & CO. LTD.



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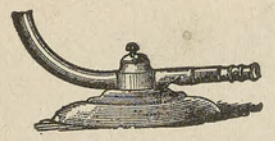

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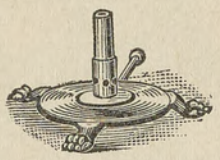

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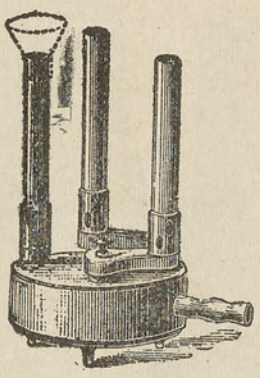

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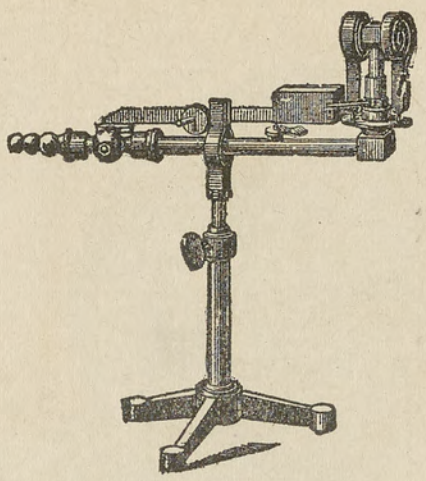

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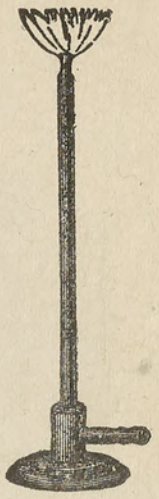

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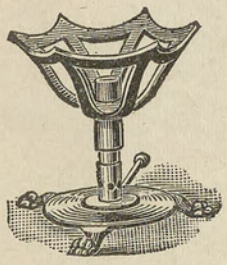

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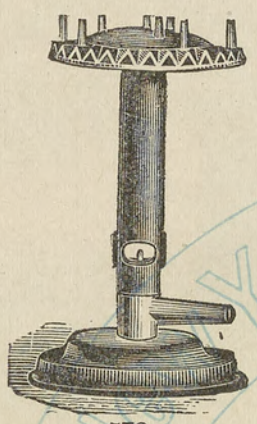

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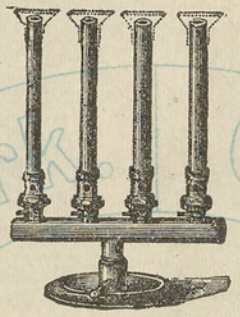

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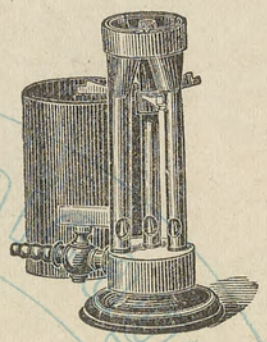

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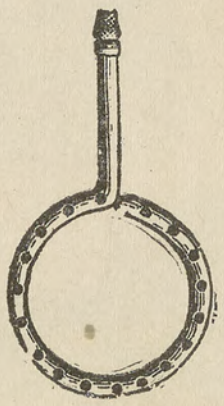

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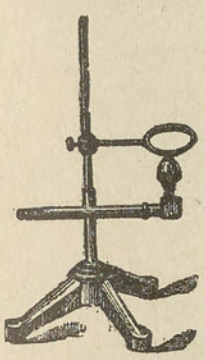

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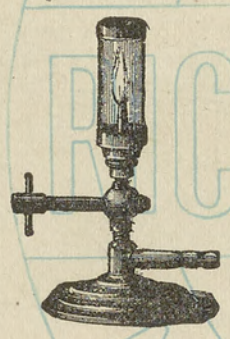

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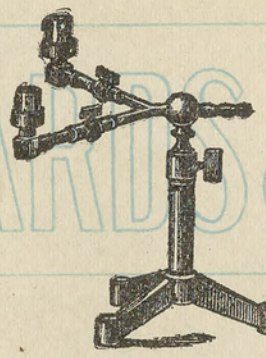

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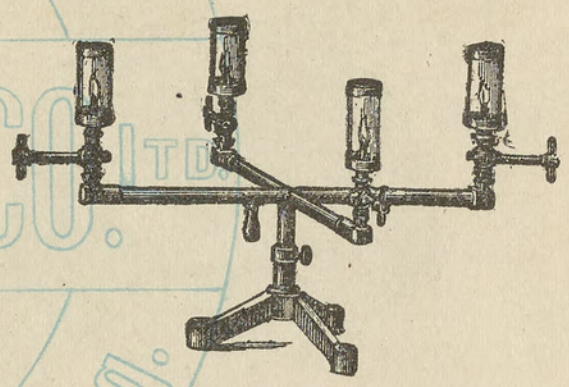


580

RICHARDS & CO. LTD. New York. Chicago. Newark. Hamburg.

No.			
566.	**Burner, Height adjustable,** with chimney		$1 50
567.	——	**Bunsen's, low shape,** with air regulator	.50
568.	——	" **very small,** 3 in. high	.40
569.	——	**Raab's,** with screw top, on movable arms, increasing and decreasing the heating surface	5.00
570.	——	**Safety,** with automatic stopcock to close the gas current off after the flame has gone out	15.00
571.	——	to **illuminate** the working table	1.00
572t.	——	**Fletcher's,** with **spider,** for holding dishes, etc	1.00
573t.	——	**Fletcher's Star flame,** crown top, with stand.	

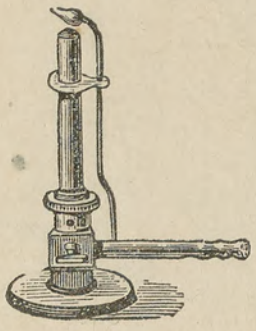
Size	$1\frac{1}{2}$	3	$3\frac{5}{8}$ in.
Each	.70	.80	.90

574.	——	**Bunsen's,** 4 burners in one row for heating long tubes	4.50
575.	——	" as No. 574 with stopcock for each burner	6.00
576.	——	**Babo's,** with 3 burners	3.50
577.	——	**Bunsen's Ring form,** to be attached to any support.	

Dia. of rings	3	4	5	6 in.
Each	$1.25	1.50	1.75	2.00
Same **with stopcock,**	2.00	2.25	2.50	2.75

577a.	——		
578.	——	for **microchemical** investigations, on support with ring	2.00
579.	——	**microchemical,** on base, with stopcock and chimney	3.00
580.	——	" on movable support, with stopcocks.	

With	2	3	4 flames
Each	$5.50	7.00	9.00



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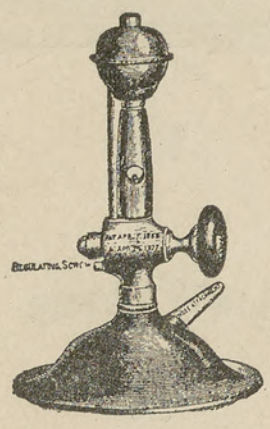

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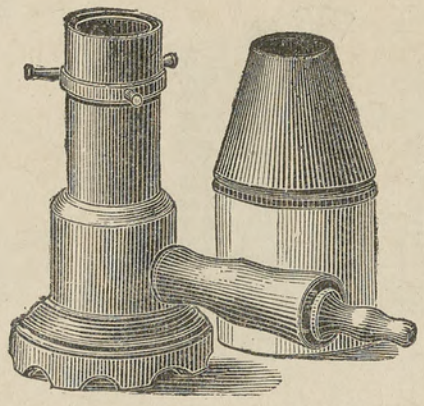

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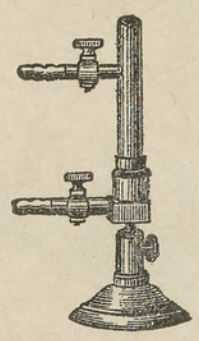

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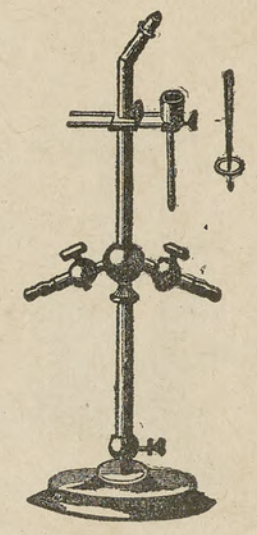

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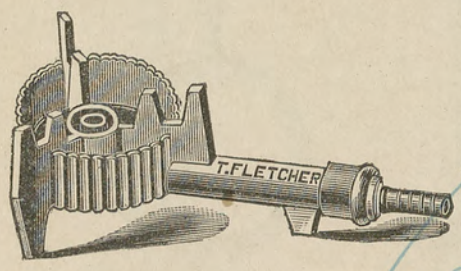

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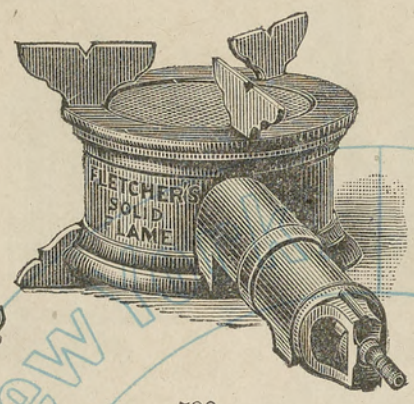

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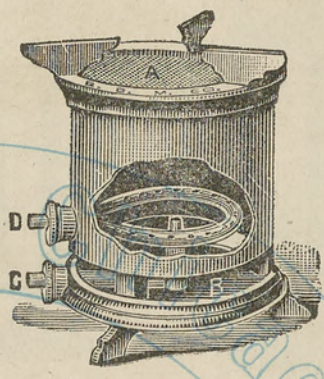

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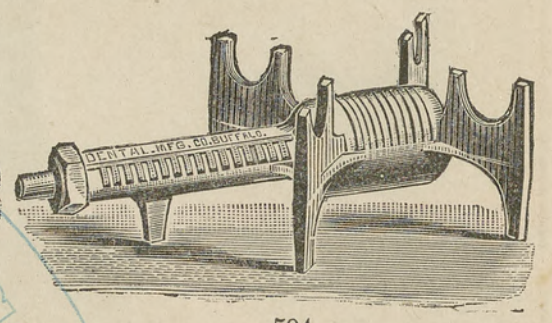

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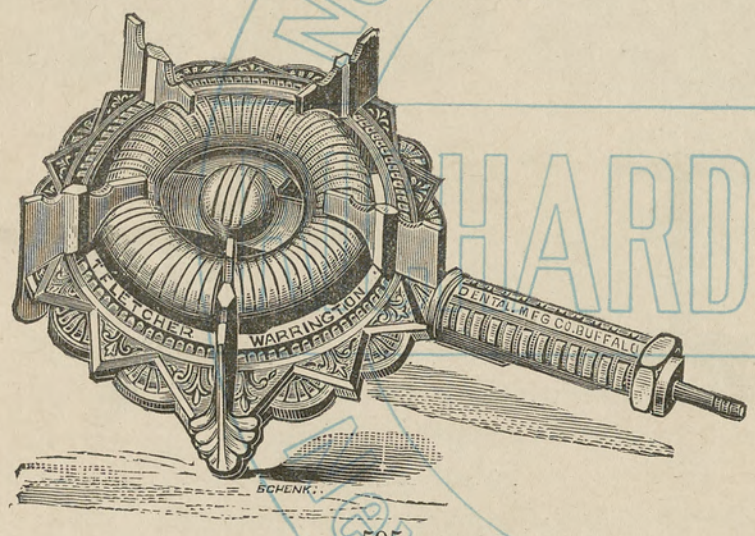

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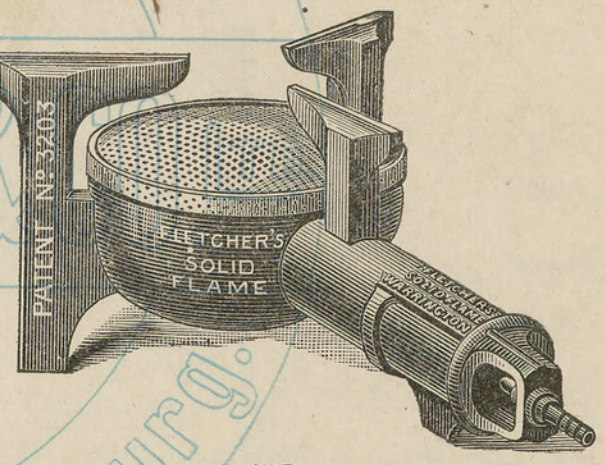
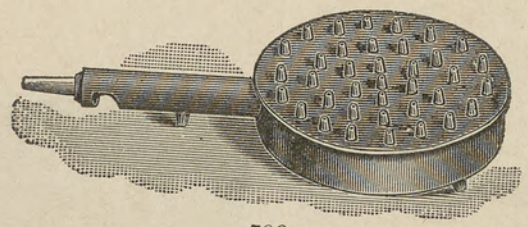


597

No.			
581.	**Burner, Self-lighting,** having a side jet, which keeps a small light when the burner is turned off		$2.00
582n.	——	**Bunsen's,** with constant flame; very practical for laboratory table	1.25
583.	——	**Erlenmeyer's,** giving an intensely hot flame	3.00
584.	——	" With clay and iron chimney	4.00
585.	——	For **high temperatures,** burning oxygen with illuminating gas	4.00
586.	——	**Drummond's Oxyhydrogen** for Calcium light, with movable lime holder	5.50
587.	——	" As above, **with 2 stopcocks**	7.50
588t.	——	**Fletcher's, Argand** Bunsen. Size $\frac{3}{8}$ $\frac{1}{2}$ $\frac{3}{4}$ in. Each .50 .75 $1.00	
589t.	——	" **Argand** Bunsen, with **tripod.** Size $\frac{3}{8}$ $\frac{1}{2}$ $\frac{3}{4}$ in. Each .65 .95 $1.25	
590t.	——	" **Solid Flame**	2.00
591t.	——	" **Solid Flame,** for **gasoline gas;** with wheel valve	2.95
592t.	——	" **for high or low temperature**	1.75
593t.	——	Same as foregoing; with blastpipe	2.00
594t.	——	**Fletcher's No. 3 R. Radial** Burner	1.00
595t.	——	" **Radial** Burner. Ring dia. $3\frac{3}{4}$ 5 in. Each $1.50 2.00	
596t.	——	" **Radial,** for **Gasoline Gas,** wheel valve regulator. Ring dia. $3\frac{3}{4}$ 5 in. Each $2.25 2.95	
597t.	——	" **Solid Flame, Boiling burner.** Small, $1.00; Large, 2.00.	
598t.	——	" **Solid Flame Boiling,** for **gasoline gas;** with wheel valve. Sml. Lge. $1.75 2.95	



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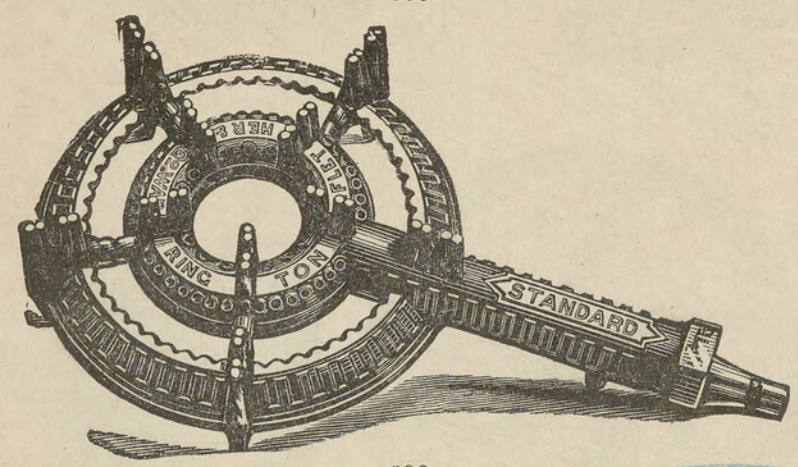

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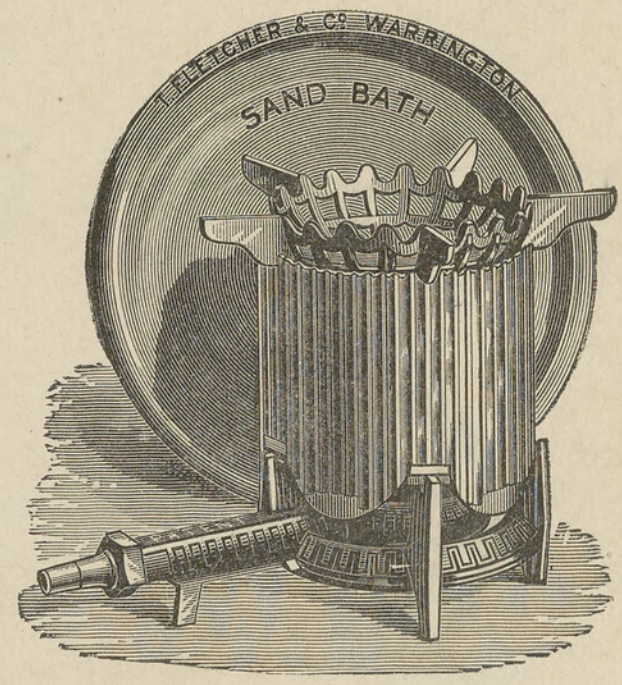

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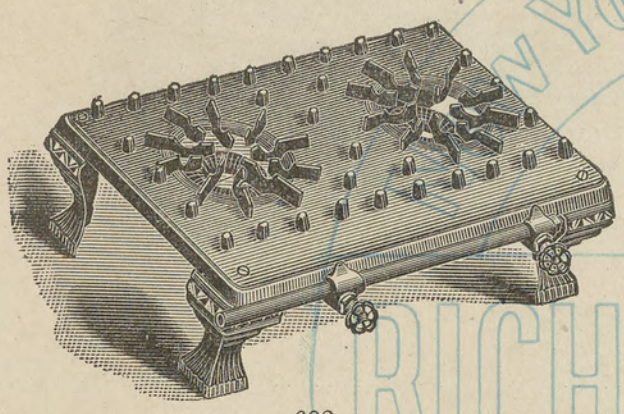

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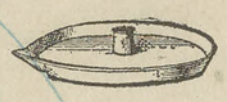

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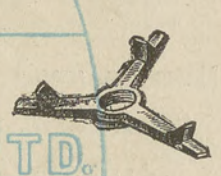


610



612

No.

599t. **Burner, Fletcher's** Cast Iron **Evaporating Burner.**

Sizes	4	5	6½ in.
Each	$1.00	1.25	2.00

600t. —— " Standard **Boiling** Burner.

Dia. for vessels	5½	7	8	10 in.
Each	$1.00	1.25	1.75	5.00

601t. —— " New **Laboratory Burner,** with stand for vessels and sandbath.

Support for flask	4½	5¼	7	8 dia.
" " vessels flat	6½	7½	9	11 "
Each	$2.25	2.90	3.60	6.80

602t. —— " **Hotplate,** with two Radial Burners. Size of top plate 11½ x 18¾ in. Distance between centre of burners 10 in. $5.00

602a.t. —— Same as No. 600, for **Gasoline gas** 5.50

603. **Burner Attachment, Blowpipe Tube** to set into the burner ..... .20

604. —— **Short tube** to set over the burner; with rest for the blowpipe ..... .20

605. **Burner Chimneys,** of Russian Iron ..... .20

606. **Burner Crowns,** for heating dishes ..... .45

607. **Burner Forks,** with attachment for burner ..... .50

608. **Burner Gauze Top,** giving a large round flame ..... .30

609. **Burner Plate,** of porcelain ..... .60

610. **Burner Stars,** for chimney supports ..... .20

611. **Burner Tripods,** for supporting dishes ..... .25

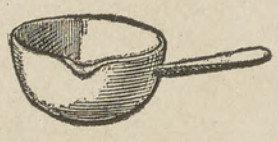
612. **Burner Wingtop,** for bending glass tubing ..... .25

Calipers, see Measures.

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



613



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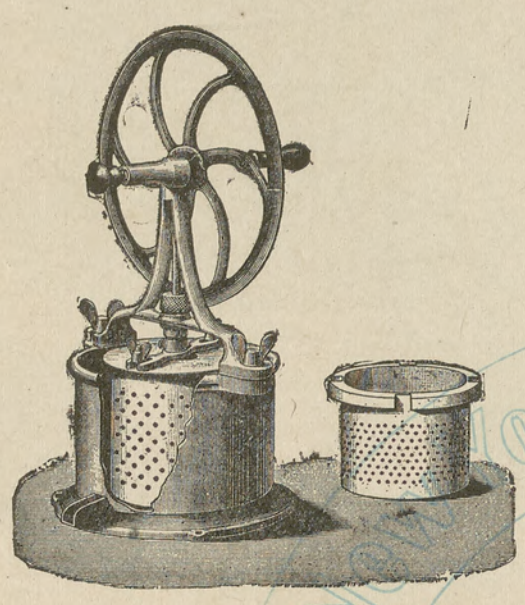

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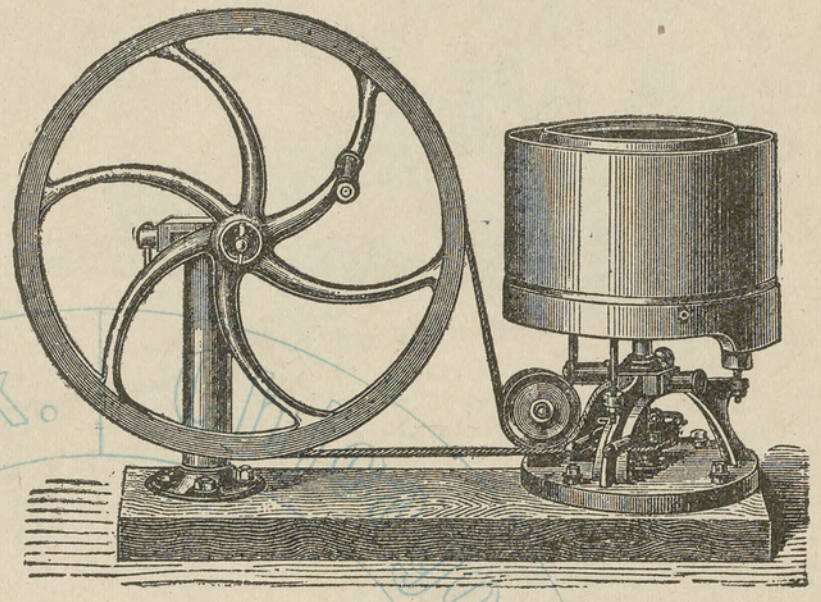

621

No.

613. **Candle Bombs,** small glass bulbs filled with colored liquids ..... Doz. $ .40

614t. **Candles, Standard,** for photometric test.

a, 6 long pieces to the lb. ..... lb. 2.50

b, 12 short " " ..... " 2.50

615n. **Carboy Rocker,** Stevenson's 3.00

616. **Casseroles, German Porcelain,** with porcelain handles.

Capacity	4	8	12	16	32 oz.
Each	.40	.50	.65	.75	$1.25

617. —— **Royal Berlin, Porcelain,** with porcelain handles.

No.	1	2	3	3a	4	5	6	7
Dia.	2	3	3½	4	4½	5½	6	7 in.
Capacity	1	3	5	8	13	24	44	72 oz.
Each	.35	.40	.50	.70	.85	$1.40	1.75	3.00

618. —— **German Porcelain,** with cover and wooden handles.

Dia.	3	4	4½	5¼	6½ in.
Capacity	4	8	12	16	32 oz.
Each	.50	.60	.70	.90	$1.60

619. —— **Iron, enamelled,** with lip and handle.

Dia.	4½	5	6	7 in.
Capacity	16	24	32 oz.	½ gal.
Each	.25	.35	.40	.50

620. **Centrifugal Machines,** for laboratories, of enamelled iron, with 2 sieve trays of porcelain.

Size, 6 x 9½ in. Capacity, ½ gal. 40.00

621. —— with removable sieve and inside cylinder, 12 x 7¼ in., with governor and brake 75.00

See also Motors.

622. **Chamois Skins.**

Size	Sml.	Med.	Lge.
Each	.25	.50	.75

623. **Chisels, Steel.**

Face	⅜	½	¾	1 in.
Length	5	5½	6½	7⅛ "
Each	.25	.35	.50	.65

RICHARDS & CO. LTD. Newark. Hamburg.



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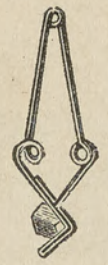

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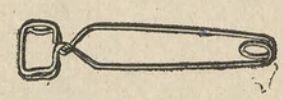
627 to 629



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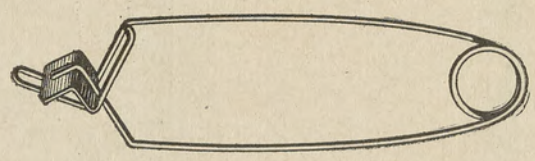

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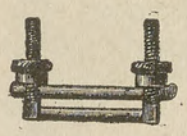

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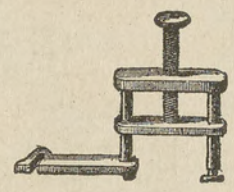

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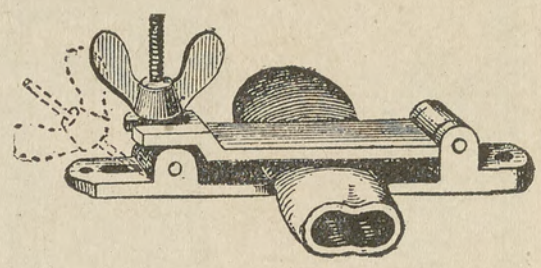

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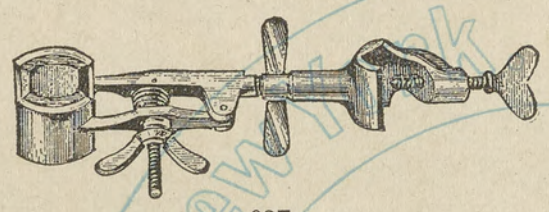

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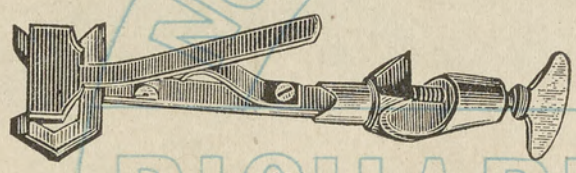

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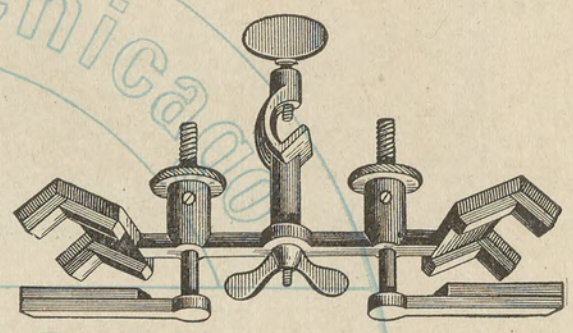


639

CLAMPS.

No.			
624.	**Clamps, Wood** for **test tubes,** with rubber band	Each	$ .15
625.	—— " **for large tubes,** with spring	"	.35
626.	—— **Bunsen's,** of brass, for small and large tubes		.30
627.	—— **Chaddock's,** for **test tubes**		.35
628.	—— " for **beakers**		.35
629.	—— " for **evaporating dishes**		.35
630.	—— **Stoddard's,** of brass wire; opens by pressure on the straight sides of the handle; its jaws open to the width of 5 cm., and it holds firmly any tube from 5 mm. up. It thus serves for ignition tubes as well as for all sizes of test tubes		.15
631.	—— **very strong for holding sugar flasks firmly ;** nickel plated		1.00
632.	—— **Bunsen's,** for rubber tubing		.50
633.	—— **Hofmann's,** for rubber tubing; nickel plated.		

Size	Sml.	Lge.
Each	.25	.30

634.	—— " improved form, can be used upon tubing without disconnecting apparatus		.40
635.	—— for **heavy rubber tubing,** can be screwed on table, etc		1.00
636.	—— **Mohr's Pinchcocks;** nickel plated.		

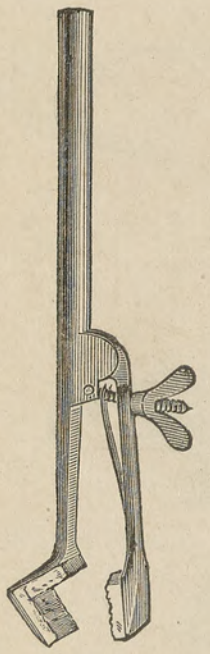
Size	Sml	Med.	Lge.
Each	.15	.20	.25

637.	—— **with set screws, cork lined,** to attach to a retort stand; an excellent clamp for burettes, etc.		

	of iron.	of brass.	nickel plated.
Each	.50	.75	.90

638.	—— **with strong spring** closing the movable jaw		.75
639.	—— **Hofmann's,** for 2 burettes or tubes		.75

RICHARDS & CO. LTD. New York Chicago Newark Hamburg



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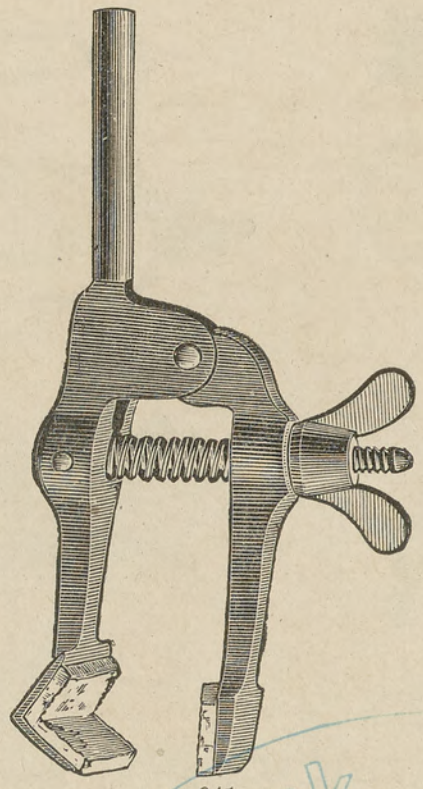

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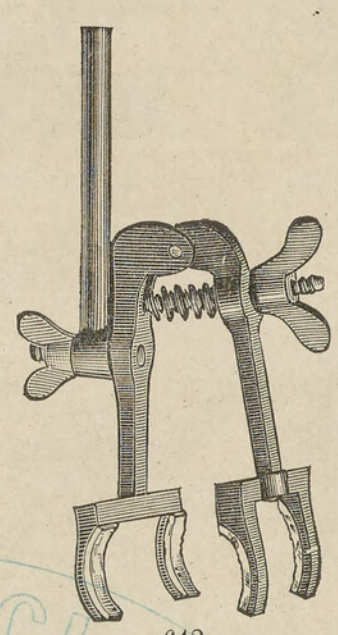

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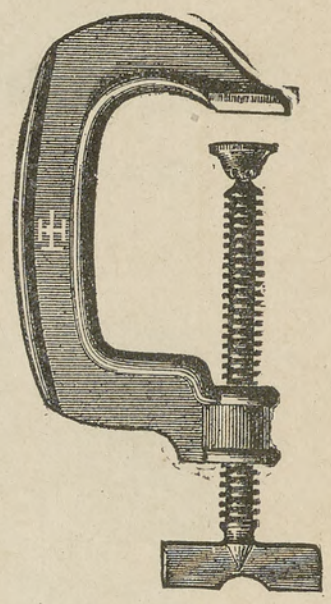

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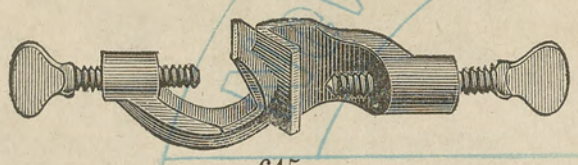

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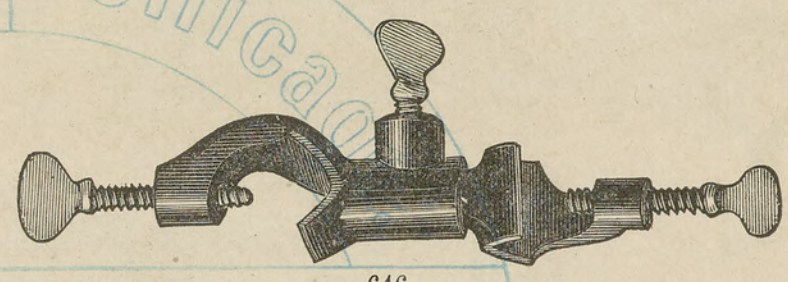

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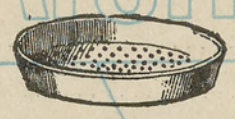

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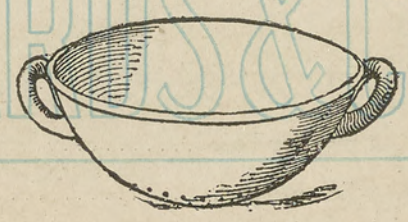

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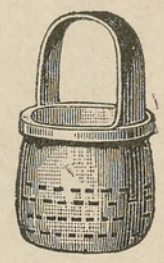


651

No.

640. **Clamps, for holding burettes or tubes in any position,** cork lined ..... $ .75

641. — **large size,** very strong iron 1.00

642. — **Universal,** iron, cork lined, the jaws adapting themselves to irregular shapes 1.00

643. — same as above, but larger, **for Condensers,** etc 1.25

644. — iron, **for fastening** apparatus **to** the **table.**

Sizes	2	3	4	5	6	8 in.
Each	.25	.40	.50	.60	.80	$1.30

645. **Clamp Holders,** for fastening clamps to supports.

Size	Sml.	Lge.
Each	.20	.25

646. — **Universal,** to set at any angle ..... .40

Clamps, for watch glasses, see Watch Glass Clips and Springs.

647. **Colanders,** porcelain, **hemispherical.**

Dia.	2½	3¼	4	5¼	6 in.
Each	.30	.40	.50	.75	$1.00

648. — porcelain, with **flat bottom** and straight sides.

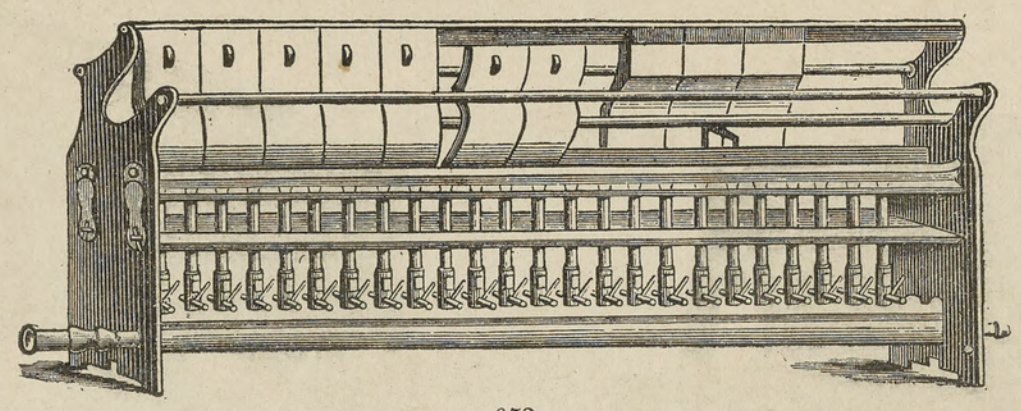
Dia.	4½	7½	9½	11½ in.
Each	.65	$1.00	1.50	2.00

649. — **Royal Berlin** porcelain, **with handle,** dia. 16 in 10.00

650. — **Porcelain, with handle, height,** 6½ in 2.50

651. — **Stoneware** 1.75

RICHARDS & CO. LTD. New York. Chicago. Newark. Hamburg.



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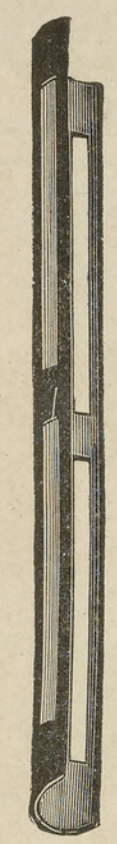

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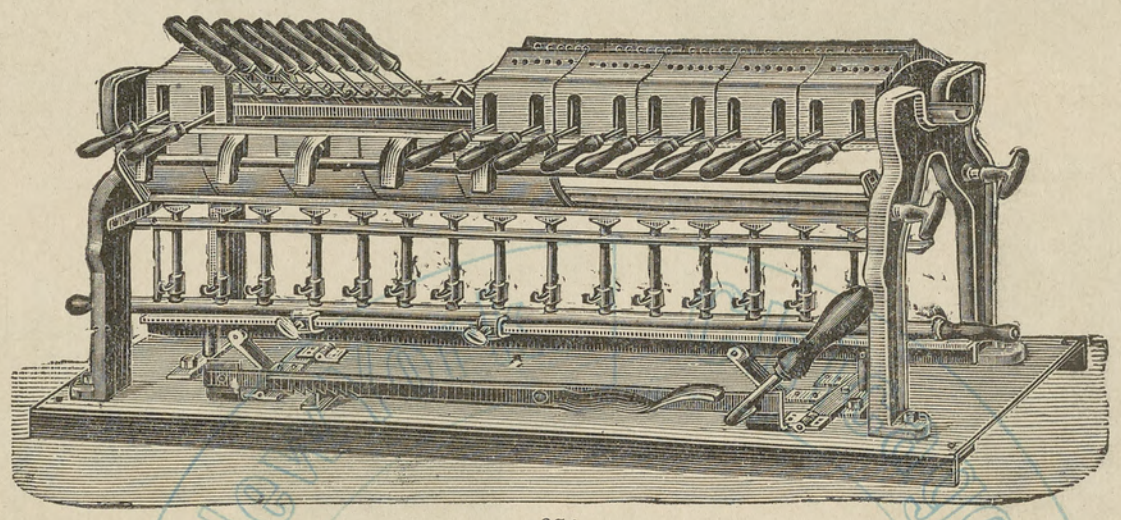

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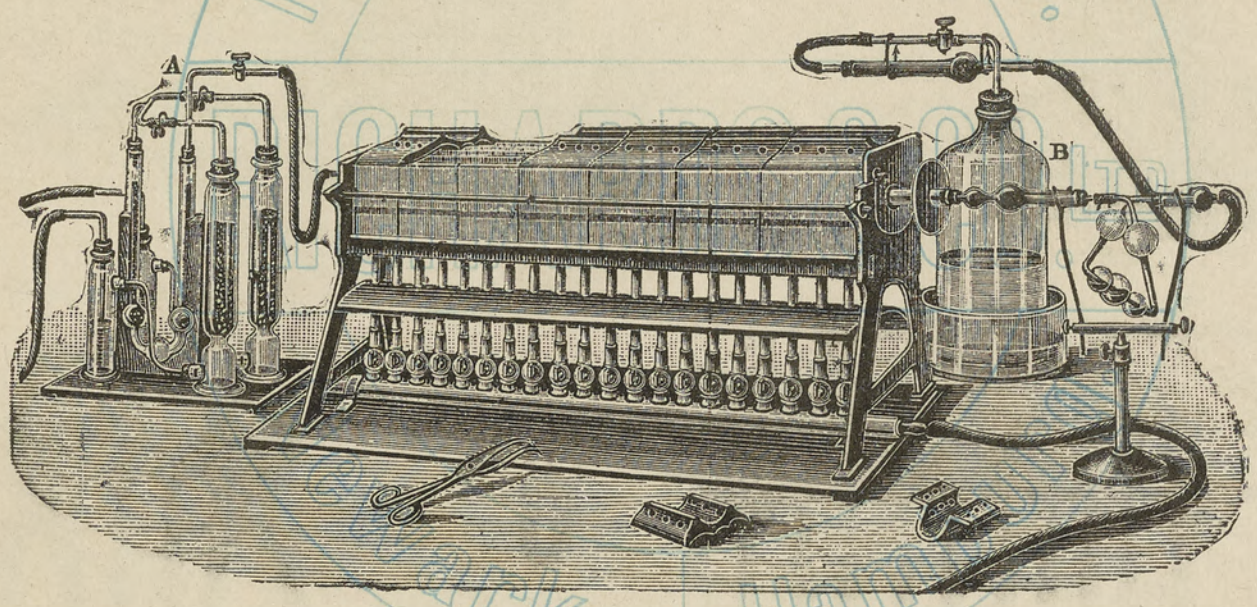


655

No.

652. **Combustion Furnace, Bunsen's,** each burner having separate stopcock.

Length	14	19	25	31 in.
With	10	15	20	25 Burners.
Each	**$18.00**	**24.00**	**30.00**	**36.00**

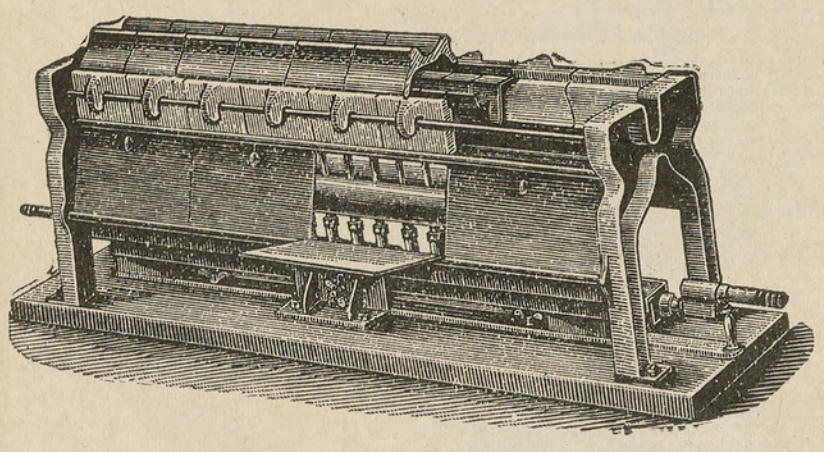
653. — **Bunsen's,** for gasoline gas.

With	10	15	20	25 Burners.
Each	**$20.00**	**25.00**	**32.00**	**40.00**

654. — **Dr. Fuchs.** Deutsch Reichs Pat. No. 66,281 complete as per illustration..... **$75.00**
(See Ber. d. Deutsch Ges., 1892, p. 2723.)

655. — **Glaser's,** with top and side plates of fire-clay; each burner with stopcock and air regulator.

Length	15	22	29 in.
With	10	15	20 Burners.
Each	**$30.00**	**37.50**	**45.00**



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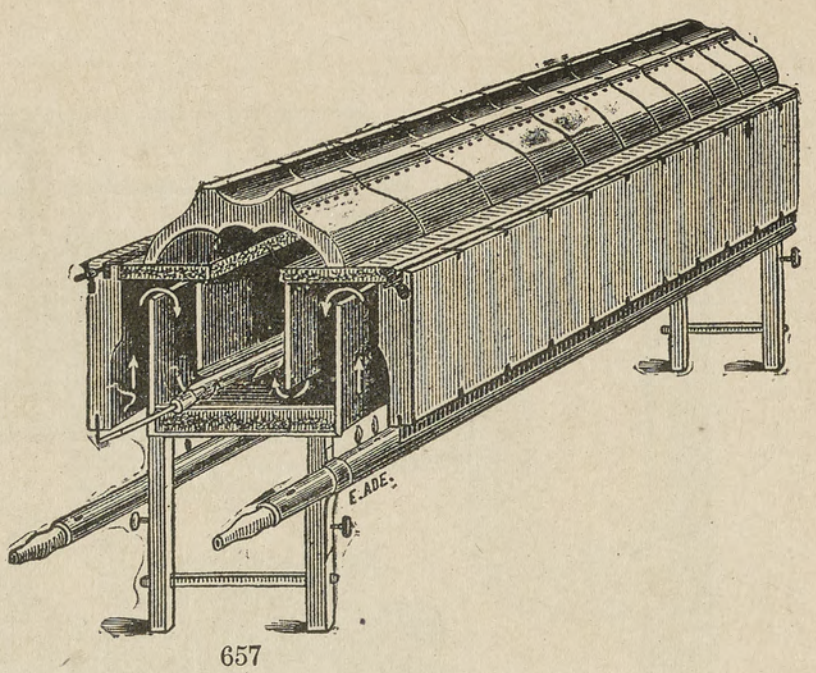

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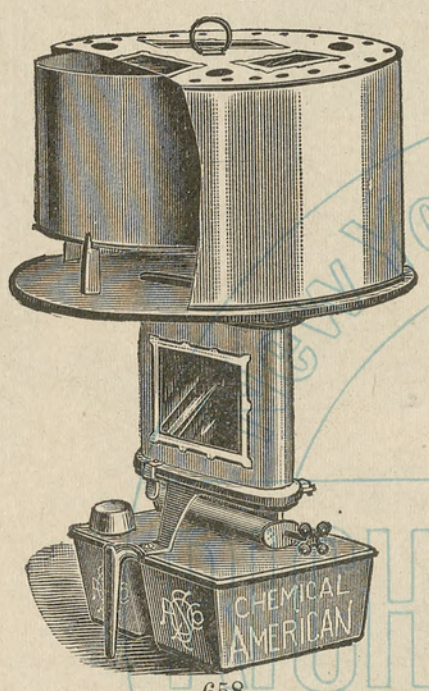

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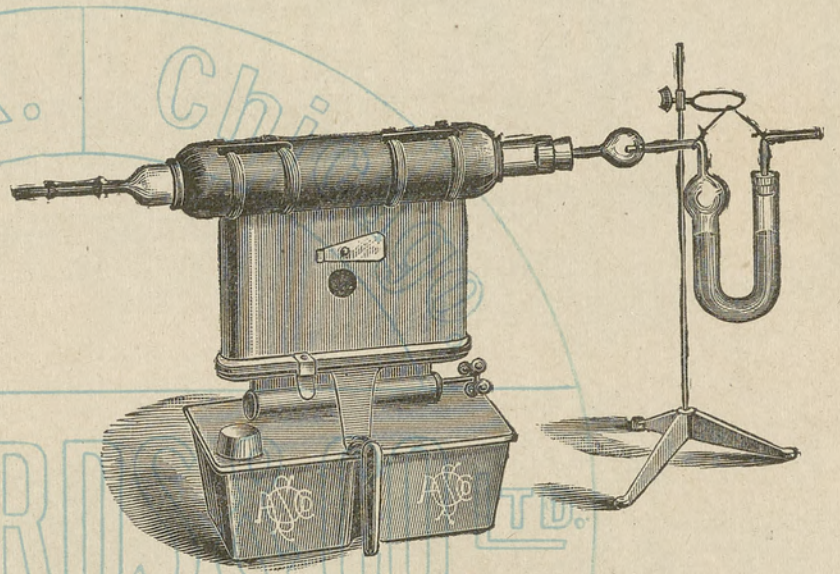

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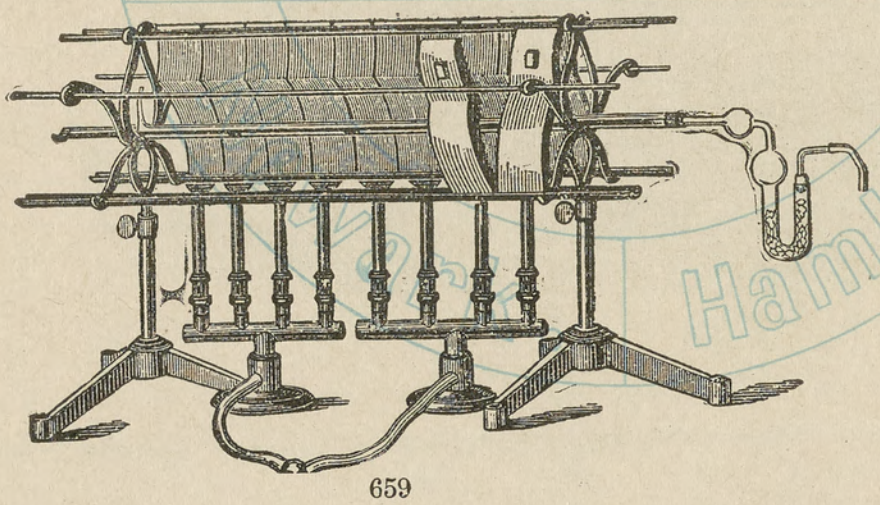

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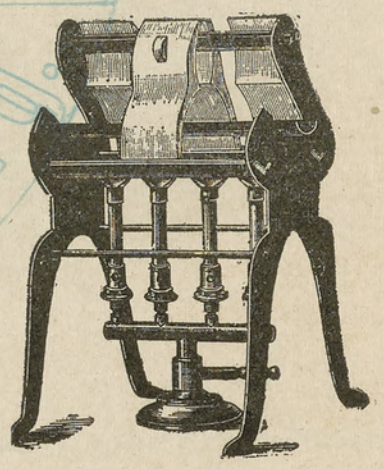


660

No.

656. **Combustion Furnace, Glaser's,** modified **by Anschuetz & Kekule,** with mica plates for watching the combustion.

Length	26	34	40 in.
With	16	21	26 Burners.
Each	**$32.50**	**40.00**	**50.00**

657. —— after **Lothar Meyer,** for tubes of different dimensions, and for operations made in tubes below a cherry red heat, for instance, reduction of Co_2 to Co. by means of zinc dust, preparation of Volatile Chloride, etc.

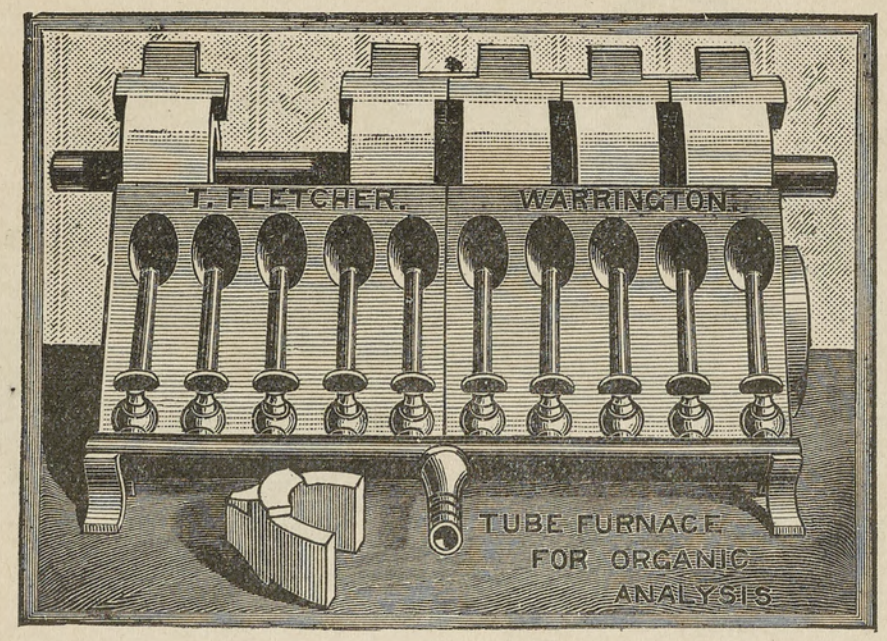
Length	20	24	32 in.
Each	**$25.50**	**28.50**	**31.50**

658. **Combustion Furnace and Chemical Stove,** consisting of lamp, iron plate, grate, oven with interior drum and extra chimney for heating tubes. The chimney and ovens are made of sheet brass. The inner surface of the inner drum is covered with Asbestos paper..... **$7 00**

659. —— with separate supports and frame, **dissectible,** admitting of change in length of furnace.

Complete with	2	3 four-tube burners.
Each	**$30.00**	**42.50**

660. —— after **Winkler,** Complete..... **21.00**



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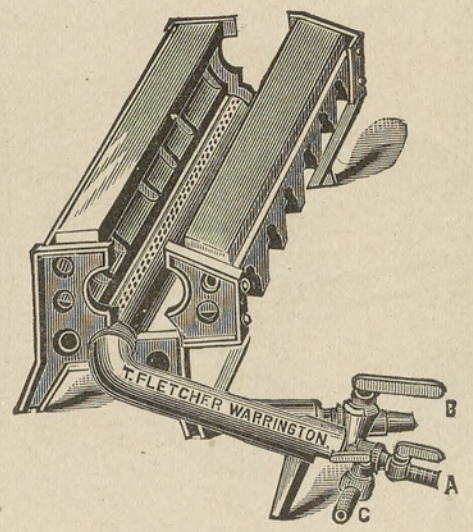

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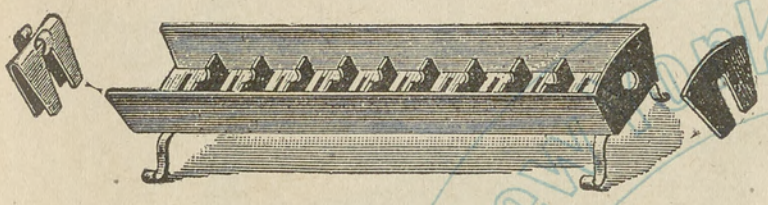

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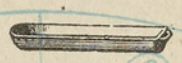

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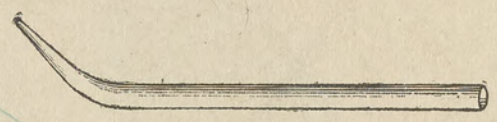

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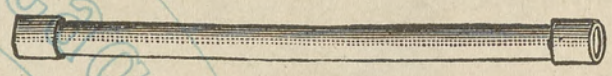


669

No.

660t. **Combustion Furnace, Fletcher's,** new tube pattern. The furnace body is in 6-inch sections, and can be made up to any length without any obstruction. The blocks and covers are sold separately, and the burners can be supplied in sections of 12, 24, and 36 in. Tube Furnace, per inch **$1.75**

662t. **Combustion Blast Furnace, Fletcher's,** low shape, with adjustable flame length; for coal gas or gasoline gas.

Length	12	18	24 in.
Each	**$12.00**	**16.00**	**20.00**

663. **Combustion Furnace,** for use with **charcoal.**

Length	18	24 in
Each	**$2.50**	**3.00**

664. **Combustion Boats,** Royal Meissen Porcelain.

No.	00	0	1	2	3	4
Length	14.5	10	7.5	7.5	13	4.5 ctm.
Dia.	2.8	1.8	1.5	1.1	0.7	1.2 "
Each	**.40**	**.30**	**.25**	**.25**	**.25**	**.20**

665. **Combustion Capsules, Royal Berlin** Porcelain.

No.	1	2	3
Dia.	32	42	48 millim.
Each	**.20**	**.25**	**.30**

666. **Combustion Tubes, infusible Bohemian** glass, with drawn out point; bore about 13 mm., or any other dia. or length made to order.

Length	14	16	18	20	24 in.
Each	**.20**	**.25**	**.30**	**.35**	**.40**

667. —— rounded ends for absolute determination of nitrogen.

Length	27	30 in.
Each	**.45**	**.50**

668. —— **German Porcelain,** bore $\frac{5}{8}$ in. dia.

Length	18	20	22	24 in.
Each	**$1.00**	**1.20**	**1.35**	**1.75**

669. —— **Royal Meissen** Porcelain, flanged, glazed inside and rough outside.

Length	26	26	26	26 in.
Bore	$\frac{4}{10}$	$\frac{7}{10}$	1	$1\frac{3}{5}$ in.,
Each	**$1.00**	**1.25**	**1.50**	**1.75**

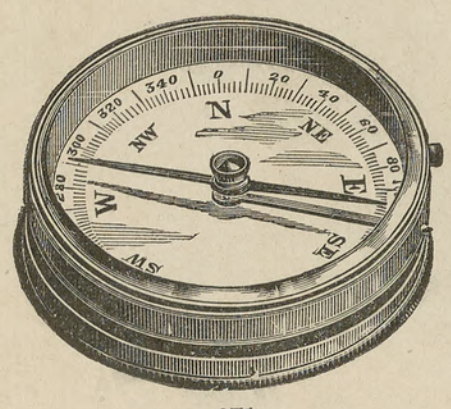
670. —— **Royal Berlin** Porcelain, glazed inside and outside; 24 in. long.

Bore	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{2}$	$1\frac{3}{4}$ in.
Each	**$3.00**	**4.00**	**5.00**	**6.00**	**7.00**	**8.00**

Combustion Spoons, see Deflagrating Spoons.

Combustion Tubing, see Glass Tubing.

New York. Chicago. RICHARDS & CO. LD. New York. Hamburg.



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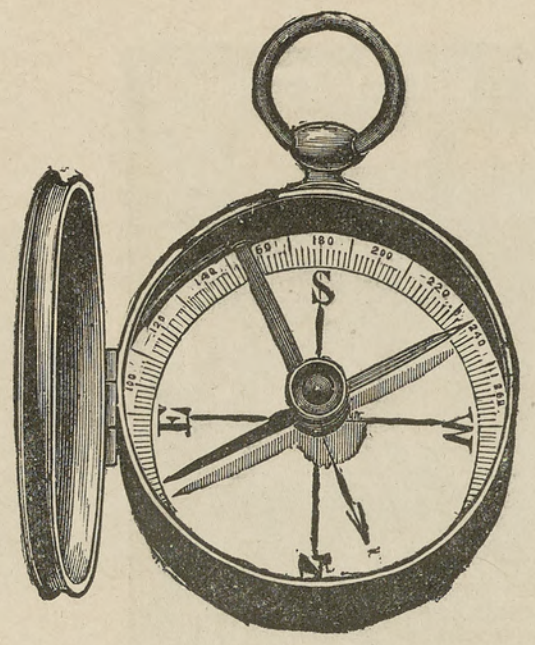

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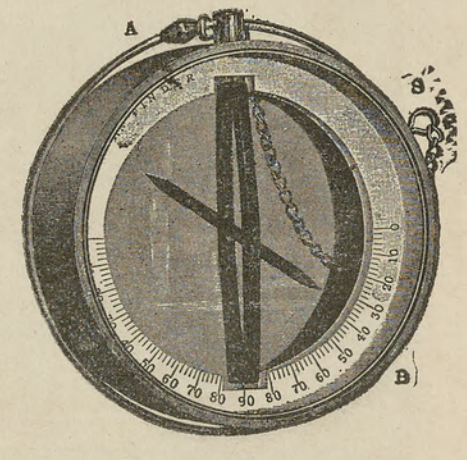

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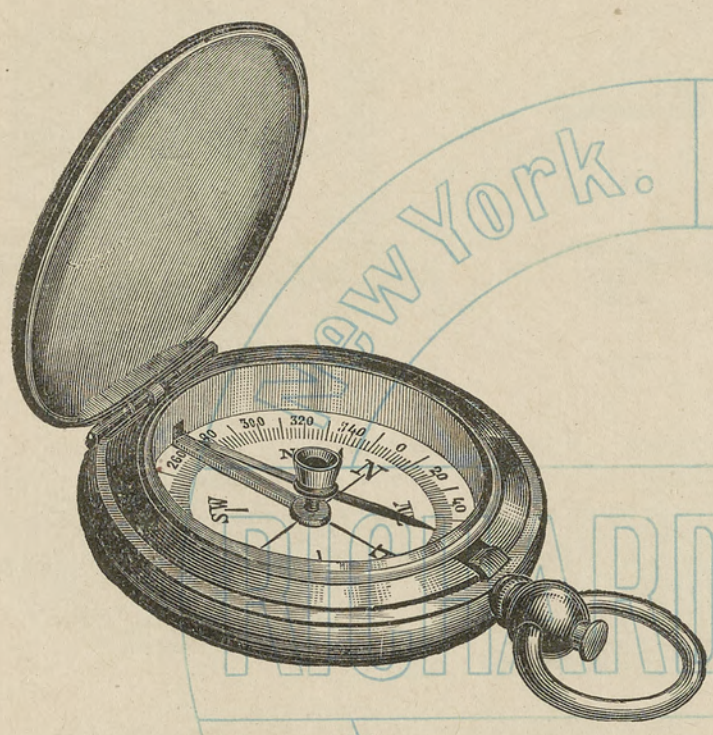

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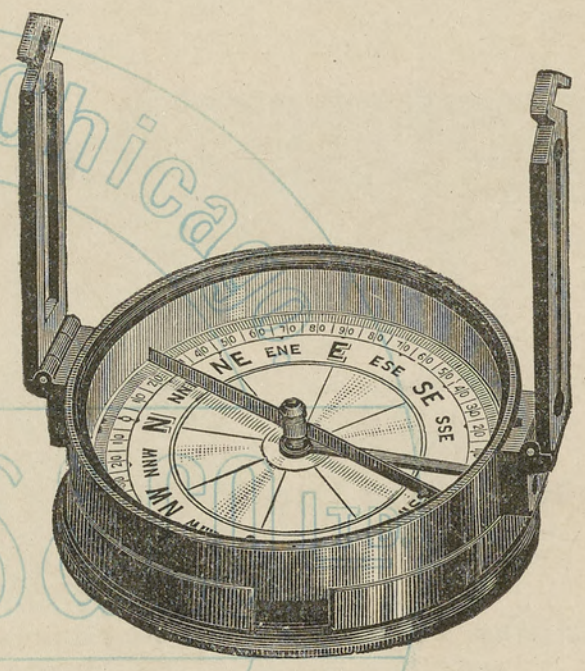


675

No.

671. **Compass, Pocket,** brass ; with cover, engraved silvered metal dial divided from 0° to 360°, brass cap and stop to needle, dia. 2 in **$1.25**

672. — **Pocket,** brass ; with ring and hinged cover, engraved silvered metal dial divided from 0° to 360°, brass cap and stop to needle, dia. 2 in **1.50**

673. — **Pocket,** brass, with cover, water and dust proof, engraved silvered metal dial with raised ring, divided from 0° to 90°, fine bar-needle with jewelled brass cap and stop, dia. 2 in **3.75**

674. — **Hunting,** nickel case with spring cover, engraved silvered metal dial, divided from 0° to 360°, agate cap and automatic stop to needle, dia. 2 in **3.75**

675. — **Surveying,** with cover and folding sights, engraved silvered metal dial, divided from 0° to 360°, bar-needle with jewelled cap and stop, dia. 2 in **5.50**

676. — **Surveying,** with pull-off cover and folding sights with angular hooks, engraved silvered metal dial, divided from 0° to each 90°, heavy bar-needle, with jewelled cap and stop, needle 2½ in.... **8.00**

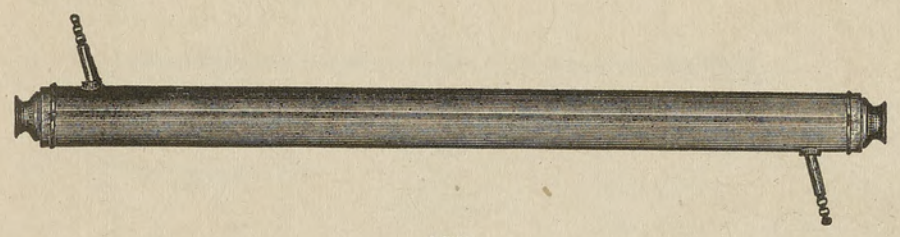
677. — **Surveying,** bar-needle, agate centre and stop, dia. 3 in.; in mahogany case **7.50**

678. — " Same as above, dia. 4 in. **9.00**

679. — **Miners,** or **Dipping Needle,** adjustable, and balanced, on agate centres ; in morocco case.. **16.00**

680. — **Geologists,** with clinometer-attachment, divided from 0° to 360°, jewel centre and stop. dia. 2½ in. **7.50**

981. — " Same as above, with sight in foot **12.00**



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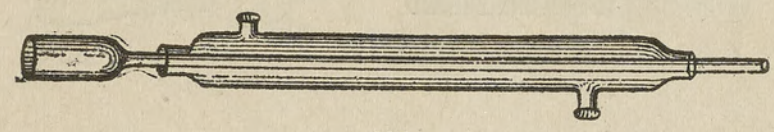

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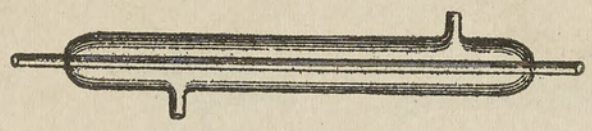

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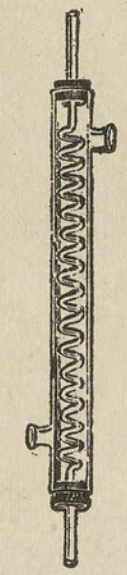

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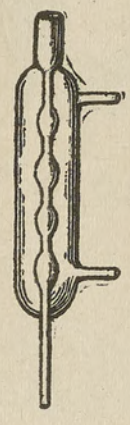

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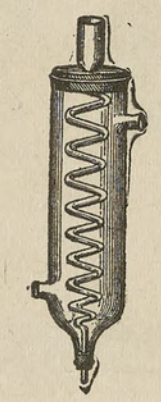

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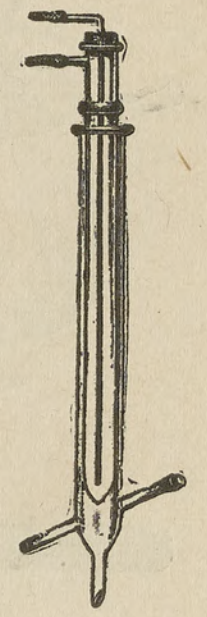

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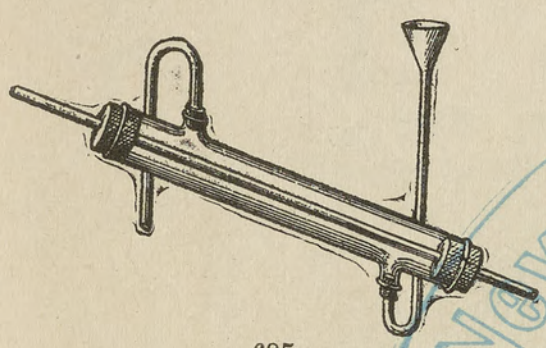

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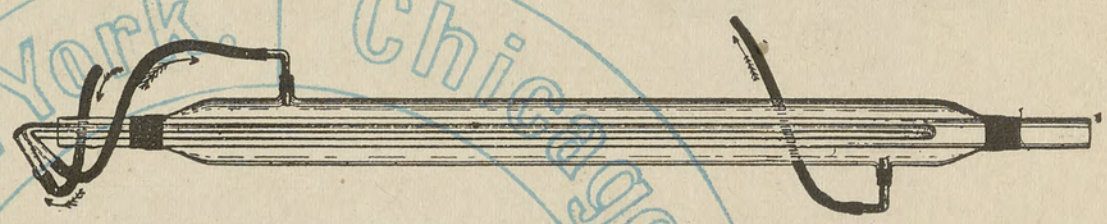


687

CONDENSERS.

No.

682. **Condenser, Brass,** inside tube of glass, fitted with rubber stoppers.

Length of brass body	12	15	20	30	40 in.
Each	2.50	3.00	3.50	4.50	5.00

683. — **Liebig's,** glass, with rubber connections.

Length of glass body	12	18	24	30	40 in.
Each	$1.00	1.20	1.50	2.50	3.50

684. — **Liebig's,** the condensing tube sealed in the glass body.

Length of glass body	8	10	12	15	20 in.
Each	.80	.90	$1.10	1.25	1.75

685 — **Mohr's,** glass, fitted with **corks.**

Length	12	15	20 in.
Each	$1.00	1.20	1.30

686. — " same as above, fitted with rubber stoppers at 20c. per oz. added to above prices.

687. — **Evers Noyes,** with double cooling tube. (Jl. Anal. Chem. Sept. 1892 P. 512.)

Length	12	18	24	30 in.
Each	$1.25	1.50	2.00	3.00

688. — **Allihn's,** glass, with bulb condensing tube.

Length	10	12	16	25	30 in.
Each	$1.25	1.35	1.50	2.50	3.50.

689. — a **glass spiral** inside a cylinder; fitted with rubber stoppers.

Height	10	14	18 in.
Each	$1.50	2.25	3.25

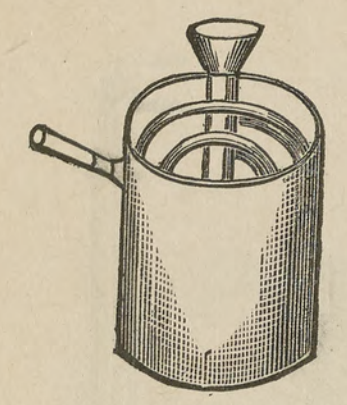
690. — **upright form,** with inlet and outlet tubes, and glass spiral.

Capacity	pt.	qt.	½ gal.
Each	$1.75	2.25	3.00

690a. Support for same. Each .75 $1.00 1.75

691. — after **Kreussler**..... $1.25

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



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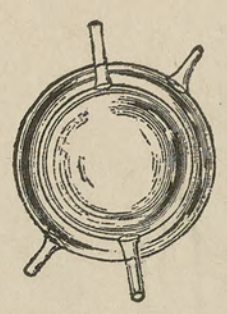

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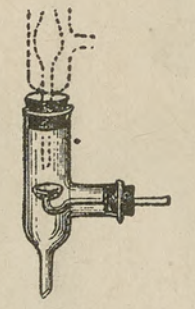

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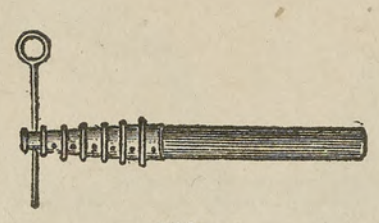

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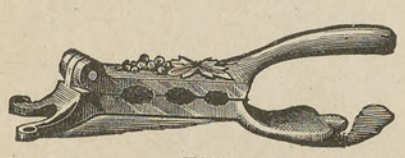

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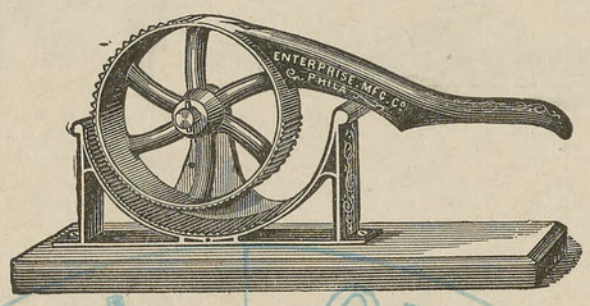

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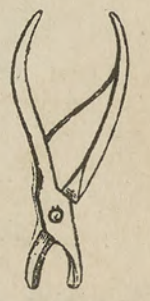


706

No.

692t. **Condenser, zinc,** with heavy block tin worm.

For	½	1	2	3	5 gal. still.
Each	$2.50	3.25	4.00	4.75	6.00

693. **Condenser, ball shape,** after **Soxhlet,** all glass.

Dia.	4	5 in.
Each	$2.50	3.00

694. **Condenser Adapter,** after **Wollny** (See Fres. Zeits., 1885, p. 50-56)..... $ .50

695. **Condenser tubes,** glass.

Length	20	25	30	35	40	50	60 in.
Each	.25	.35	.45	.55	.65	.85	$1.00

696. **Corks,** first quality, cut from selected wood, **long tapering XX quality.**

No.	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20
Dia. of large end	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8 in.
Per. gross	.38	.41	.48	.59	.70	.89	.96	$1.16	1.39	1.62	2.08	2.60	3.75	4.85	6.00

697. **Corks,** best quality, for wide mouth bottles, **short tapering.**

No.	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20	22	24	26
Dia. of large end	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2 in.
Per gross	.35	.38	.41	.48	.59	.70	.88	.96	$1.16	1.32	1.62	1.93	2.55	3.16	3.87	4.77	5.68	6.65

698. **Corks, flat, extra wide.**

Dia. of large end	2	2 1/4	2 1/2	2 3/4	3	4	5	6 in.
Per. doz.	.20	.25	.30	.40	.50	.70	$1.10	1.50

699. **Cork Borers,** of brass, finely finished.

In sets of	3	6	12
Each	.60	$1.10	2.00

700. **Cork Borer Sharpener**..... each 1.00

701. **Cork Knives**..... " .25

702. **Cork Plates,** size 4x11 in.

Thick	1/16	1/8	1/4 in.
Each	.10	.13	.25

703. **Cork Press,** lever model..... .30

704t. —— wheel model, taking cork of ¾ or 1¼ in. dia..... Sml., .50; Lge., .75

705. **Cork Screw**..... .30

706. **Cork Tongs,** of steel..... 1 25

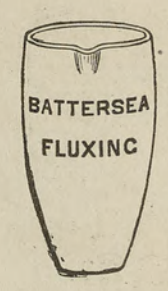
New York. Chicago. RICHARDS & CO. LTD. Hamburg.



707



709



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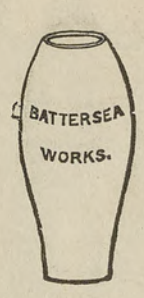

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714



715



717

CRUCIBLES.

No. 707. **Crucibles, Battersea, Round** form.

N. B.—The "**Battersea**" are suitable for all the operations in which the Hessian crucibles are used, and are greatly superior to them in **Absorbing but one-twelfth the weight of metal,** in resisting the action of highly corrosive fluxes, in shape in single sizes being sold at the same rate as nests, and in being less heavy.

No.	A	B	C	D	E	F	G	H	J
Height	2⅝	3	3½	4	4½	5	5⅝	5⅞	6⅝ in.
Dia.	1⅝	1⅞	2¼	2⅜	2⅞	3	3⅜	3¾	4⅜ "
Per 100	$1.85	2.25	3.25	3.60	5.75	6.25	8.60	9.00	13.00
708 — **Covers,** Per 100	2.25	2.25	2.25	2.25	3.25	4.25	5.50	6.50	6.50

707. No.	K	L	M	N	O	P	Q	R
Height	7¼	8	8½	9⅜	10	11	12	13 in.
Dia.	4¾	5¼	5¾	6½	7	7¾	8⅜	9⅜ "
Per 100	$13.50	24.00	28.00	39.00	58.00	64.00	73.00	100.00
708. — **Covers,** Per 100	8.75	8.75	10.75	13.00	15.00	17.25	17.25	21.50

Note.—Alternate sizes, as A, C, E, G, etc., and B, D, F, H, etc., form a nest. If E and G therefore, were, ordered they would take no more space in packing than G alone. Special prices in original packages.

709. — **Battersea, Triangle** form.

No.	S	T	U	V	W	X	Y	Z
Height	4½	4	3½	3¼	2⅝	2¼	2⅛	1¾ in.
Dia.	4⅛	3¾	3¼	2⅞	2⅝	2¼	2⅛	1¾ "
Per 100	$8.75	6.50	4.75	3.60	3.00	2.25	2.00	1.50
710. — **Covers,** Per. 100	6.50	6.50	5.50	4.25	4.25	3.25	3.25	2.25

711. — **Battersea Fluxing,** identical with the French in form, quality, and capacity.

No.	1	2	3	4	5	6	7	8	9	10	12
Height	2⅛	2⅜	2¾	3⅛	3½	3⅞	4¼	4¾	5¼	5⅞	7¼ in.
Dia.	1¼	1½	1⅝	1¾	2	2⅛	2½	2⅝	2⅞	3⅛	3¾ "
Per 100	$2.25	3.00	3.40	4.00	5.00	5.50	6.25	6.75	7.50	11.25	19.50
712. — **Covers,** Per 100	$2.25	2.25	2.25	2.25	2.25	2.25	3.25	3.25	3.25	4.25	5.50

713. — **Battersea Skittle Pots.** These are particularily well suited for all refining purposes, the contracted form preventing the ebullition of the fluxes.

Height	3	4	5	6	7	8	9 in.
Per 100	$6.50	8.60	10.75	13.00	15.00	19.25	26.00
Height	10	11	12	14	16	18	20 in.
Per 100	32.00	38.50	51.25	77.00	103.00	180.00	256.00

714. — **Battersea Assay,** for **Iron.**

No.	A	B	C
Height.	3⅜	3¾	4¼ in.
Width.	1⅞	2⅛	2⅜ "
Per 100	$3.60	4.75	6.50

715. — **Battersea Assay,** for **Tin.** Height 3¼ in., dia. 3 in..... .....per 100 **$25.00**

716. — **Covers** for same..... ..... „ **9.00**

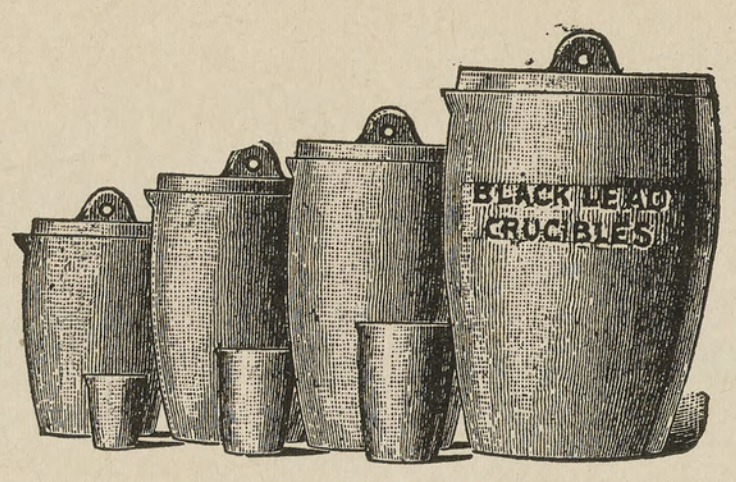
717. — **Battersea Assay,** for **Copper,** Cornish form and quality—Juleff's; all sizes and shapes to order.

Nest of 2 :—		
Height	3⅜	2⅝ in.
Dia.	3¼	2⅜ "
Per 100	$8.60	8.60

718. — **for Copper, Large Second,** Height 2½ in., dia. 2⅞ in.,..... ..per 100 **3.25**



719



721



723

No.

719. **Crucibles, Battersea, Colorado Assay,** for **Lead,**

These are made in the same material as the Battersea Round Crucibles, and are known as "**Hard**"; they are also made in the same material as the Battersea Fluxing, and are then known as "**Soft**."

Soft, No.	AA	A	B
Capacity	5	10	20 gram.
Height	$2\frac{3}{4}$	$3\frac{1}{8}$	$3\frac{5}{8}$ in.
Dia.	$2\frac{1}{4}$	$2\frac{1}{2}$	3 "
Per 100	**$2.25**	**2.75**	**3.60**

720. — **Hard,**

No.	AA	A	B
Capacity	5	10	20 gram.
Height	$2\frac{3}{4}$	$3\frac{1}{8}$	$3\frac{5}{8}$ in,
Dia.	$2\frac{1}{4}$	$2\frac{1}{2}$	3 "
Per 100	**$2.75**	**3.50**	**4.50**

721n. — **Black Lead or Plumbago.** Our Black Lead Crucibles are guaranteed of the best quality.

No.	0	00	000	$\frac{1}{2}$	1	2	3	4	5	6	7	8
Height.	2	$2\frac{1}{4}$	$2\frac{1}{2}$	$3\frac{1}{4}$	4	$4\frac{1}{2}$	5	$5\frac{1}{4}$	$5\frac{3}{4}$	6	$6\frac{1}{4}$	$6\frac{3}{4}$ in.
Dia.	2	$2\frac{1}{8}$	$2\frac{1}{4}$	3	$3\frac{1}{2}$	4	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{5}{8}$	$4\frac{3}{4}$	5	$5\frac{3}{8}$ "
Cap. of Liq. Meas.	—	—	—	4	8	12	16	20	24	28	32	40 oz.
Each	**.10**	**.10**	**.10**	**.10**	**.15**	**.18**	**.21**	**.24**	**.27**	**.30**	**.33**	**.35**

722n. — **Covers,** Each **.10 .10 .10 .10 .10 .10 .10 .10 .10 .15 .15 .15**

721n. —

No.	9	10	12	14	16	18	20	25	30	35	40	45
Height	7	$7\frac{1}{8}$	$7\frac{1}{4}$	$8\frac{1}{2}$	$9\frac{1}{4}$	10	$10\frac{1}{2}$	11	$11\frac{1}{2}$	12	$12\frac{1}{2}$	13 in.
Dia.	$5\frac{1}{2}$	$6\frac{1}{2}$	7	$7\frac{1}{4}$	$7\frac{3}{4}$	8	$8\frac{1}{8}$	9	$9\frac{1}{2}$	10	$10\frac{1}{4}$	$10\frac{3}{4}$ "
Cap. of Liq. Meas.	3	4	5	6	7 pts.	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$ gal.
Each	**.38**	**.40**	**.42**	**.45**	**.48**	**.54**	**.60**	**.75**	**.90**	**$1.05**	**1.20**	**1.35**

722n. — **Covers.** Each. **.15 .15 .18 .18 .18 .20 .20 .25 .30 .35 .40 .45**

721n. —

No.	50	55	60	65	70	80	90	100	125	150	200
Height	$13\frac{1}{2}$	$13\frac{3}{4}$	14	$14\frac{1}{4}$	$14\frac{1}{2}$	15	$15\frac{1}{2}$	16	17	$18\frac{1}{2}$	20 in.
Dia.	11	$11\frac{1}{4}$	$11\frac{1}{2}$	$11\frac{3}{8}$	$11\frac{3}{4}$	$12\frac{1}{2}$	$12\frac{3}{4}$	$13\frac{1}{4}$	14	$14\frac{3}{4}$	$15\frac{3}{4}$ "
Cop. of Liq. Meas.	$2\frac{3}{4}$	$2\frac{7}{8}$	3	$3\frac{1}{8}$	$3\frac{1}{4}$	$3\frac{1}{2}$	4	$4\frac{1}{4}$	$5\frac{1}{2}$	$6\frac{3}{4}$	$9\frac{1}{8}$ gals.
Each	**$1.50**	**1.65**	**1.80**	**1.95**	**2.10**	**2.40**	**2.70**	**3.00**	**3.75**	**4.50**	**6.00**

722n. — **Covers,** Each. **.50 .55 .60 .65 .70 .80 .90 1.00 1.25 1.50 2.00**

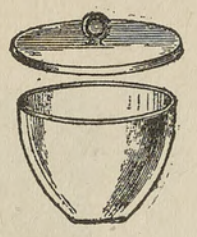
Crucible skimmers, stirrers and sockets, see page 69.

723. — **Royal Meissen** Porcelain, with Covers, glazed inside and outside.

No.	1	2	3	4	5	6	7	8	9	10	11
Dia.	$3\frac{1}{4}$	$2\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{3}{4}$	$1\frac{5}{8}$	$1\frac{3}{8}$	$1\frac{1}{4}$	1	$\frac{3}{4}$	$\frac{1}{2}$ in.
Capacity.	6	$4\frac{1}{2}$	$3\frac{1}{2}$	2	$1\frac{1}{2}$	$1\frac{1}{4}$	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$ oz.
Each	**.60**	**.45**	**.35**	**.28**	**.22**	**.20**	**.17**	**.16**	**.15**	**.13**	**.12**

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.


724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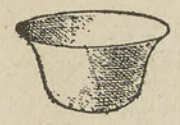
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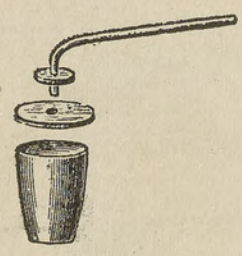
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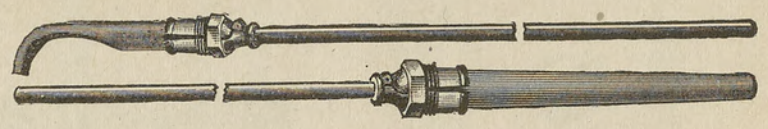

738

No.

724. **Crucibles, Royal Meissen** Porcelain, flat Bottom with Cover..... $ .20

725. — **Royal Berlin** Porcelain, with Covers, glazed inside and outside.

No.	000	00	0	1	2	3	4	5
Dia.	1	1¼	1½	1¾	2	2½	3	3½ in.
Capacity	¼	½	⅝	1	1¾	3½	6	10 oz.
Each	.12	.18	.25	.30	.40	.50	.60	.70

726. — **Royal Meissen** Porcelain, **Plattners,** with flanged rim.

Sizes	1¼x2½	1x1¾ in.
Each	.20	.25

727. — **Royal Meissen** Porcelain, **Roses,** with perforated cover and tube.

Size	2x2½	1½x1¼ inch.
Each	$1.50	.75

728. — **Gooch, of Royal Meissen** Porcelain, with perforated bottom..... .75

729. — Unglazed Porcelain, large sizes.

Capacity	¼	½	1 pt.	1 qt.
Each	.30	.40	.65	$1.50

730. — **Copper,** with Cover.

Size	2½x2	2¾x2¼	3¼x2½ in.
Each	.75	$1.00	1.50

731. — **Brass,** with Cover. Size 2x¾ in..... .35

732. — **Pure Silver,** with cover.

Capacity	20	30	50	75	100	150	200 cc.
				per oz.	$3.00		

Crucible Platinum, see Platinum.

733. — **light wrought Iron,** with cover.

Capacity	½	1	2	4 oz.
Dia.	1½	2⅛	2½	3⅛ in.
Height	1	1⅛	2	2⅜ "
Each	.45	.60	.75	$1.00

734. — **Cast Iron,** with Cover.

Capacity	¼	½	1	2 pt.	½	1 gal.
Each	.75	$1.00	1.50	2.00	3.00	4.50

735. — **wrought Iron, very heavy,** for Belgian Lead assay..... 2.50

736n. **Crucible Stirrers,** black lead.

	small	large
Each	.25	.30

737n. **Crucible Skimmers**.....Each .30

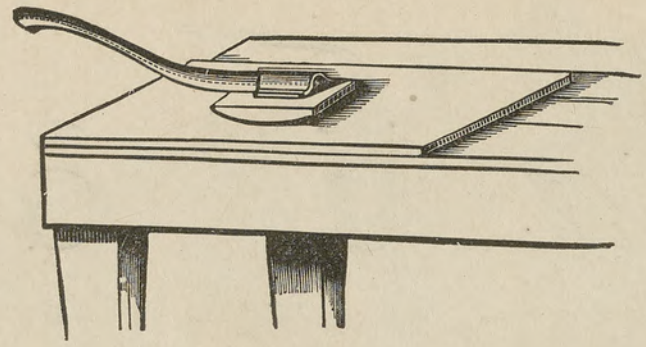
738n. **Crucible Sockets** or Iron Heads..... " 1.50

Crucible Tongs, see Tongs.

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



747



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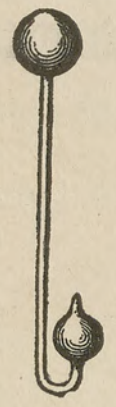

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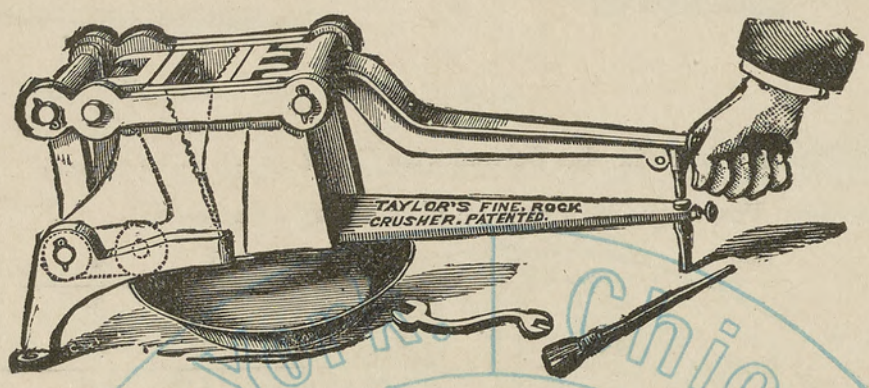

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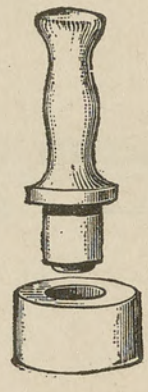


749

No.

739. **Crusher, Plate and Rubber,** for quickly reducing ores to a fine powder.

Size	18x24	24x36 in.
Each	$9.00	15.00

740. **Extra Rubber** for above plates, large size ..... $ 4.50

741n. **Crusher, Bosworth's,** for use in laboratory, hand power 30.00

742n. —— " with pulley attachment 35.00

743. —— **Gates,** for laboratory and sampling purposes; it will cruch 250 lbs. of ore down to $\frac{1}{8}$ in. per hour .. 125.00

744n. —— **Taylor's** Hand, weight complete 95 lbs. 25.00

745n. **Extra Jaws,** per set 1.25

746. **Cryophorus.**

	Sml.	Med.	Lge.
Each	$1.00	1.35	1.75

747. **Cupels.** Our XX brand of Cupels are made from the best bone ash and have the proper absorbing qualities; they are packed 6 doz. in a box and guaranteed free from breakage.

To absorb about	10	20	30	50	72 grammes.
Dia.	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2 in.
Doz.	.25	.35	.45	.65	.90

748. **Cupel Machine** for pressing all sizes of cupels. 3 to 400 cupels per hour can easily be made with it 90.00

749. **Cupel Moulds,** brass, latest pattern.

Size	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2 in.
Each	$2.25	2.50	2.75	3.00	3.75

750. **Cupel Rake,** iron, 24 in. long ..... .50

750a. **Cupel Shovel,** iron, 24 in. long ..... .50

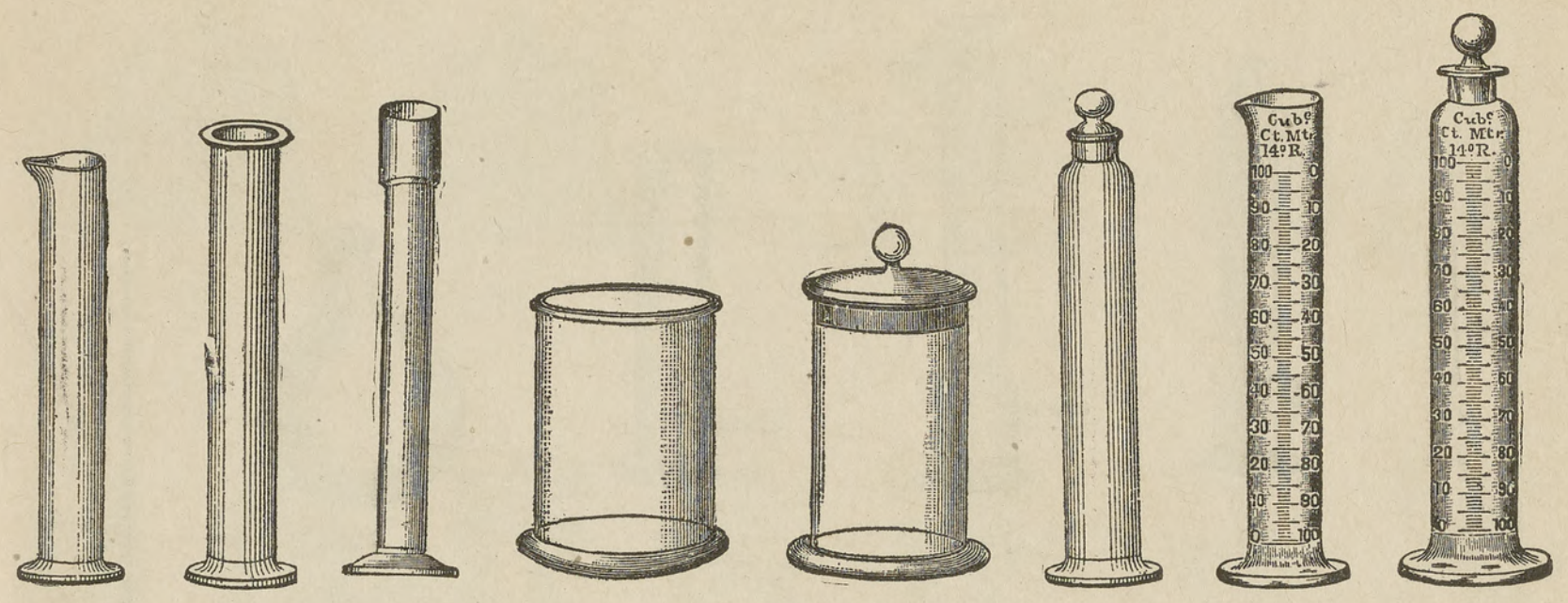
Cupel Tongs, see Tongs.

751. **Cupel Trays,** cast-iron, 16 shallow square depressions 1.25

752. **Cups, Miner's,** Agate Ware.

Dia.	5	6 in.
Each	.60	.75

RICHARDS & CO. LTD. New York. Chicago. Newark. Hamburg.



753 754 755 756 757 758 760 761

CYLINDERS.

No.

753. **Cylinders, glass, on foot, with lip.**

Height	5	6	7	8	10	12	12	15	18	20 in.
Dia.	1	1¼	1¼	1½	1½	1½	2	2	2	2 "
Each	.15	.20	.25	.30	.35	.40	.45	.55	.75	.90

754. — **glass, on foot, with ringneck.**

Height	4	5	5	6	6	8	10	12	15	16	18	20 in.
Dia.	1	1	1½	1¼	2	1½	1½	1½	1½	2	2	2 in.
	.15	.18	.20	.25	.28	.30	.35	.40	.50	.60	.80	$1.00

755. — **with enlarged top.**

Height	12	16	18	20 in.
Dia.	1½	1½	1¾	2 "
Each	.40	.55	.75	$1.00

756. — **glass, on foot, extra wide,** with ground rims for glass plates.

Height	8	10	12	12	15	18	20	25	30	30 in.
Dia.	4	4	3	4	3	2½	2½	3	3	4 "
Each	.80	$1.00	.80	$1.25	1.00	1.25	1.75	2.50	3.50	4.50

757. — **extra wide,** with **glass stopper.**

Height	8	10	12	16 in.
Dia.	2½	2½	2½	2½ "
Each	.75	.85	$1.00	1.20

758. — **with neck** and **glass stopper.**

Height	7	9	10	13	15 in.
Dia.	¾	1	1¼	1½	1⅝ "
Each	.25	.30	.35	.45	.50

759. — **glass, on foot with lip,** graduated **in ounces and fractions.**

Capacity	1	2	4	8	16	32 ozs.
Each	.50	.70	$1.00	1.50	2.00	3.00

760. — **glass, on foot, with lip, double graduation,** reading up and down.

Capacity	5	10	25	50	100	200	250	300	500	1000	2000	2500 cc.
Each	.30	.35	.50	.65	.95	$1.10	1.35	1.65	1.85	2.75	4.50	5.25

761. — **glass,** with well **ground stopper, double graduation,** reading up and down.

Capacity	5	10	25	50	100	200	250	300	500	1000	2000	2500 cc.
Each	.40	.50	.60	.80	$1.00	1.25	1.60	1.85	2.00	3.00	5.00	6.00

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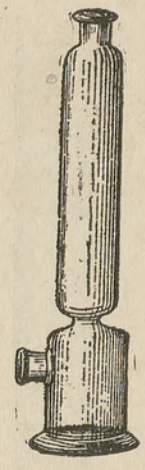

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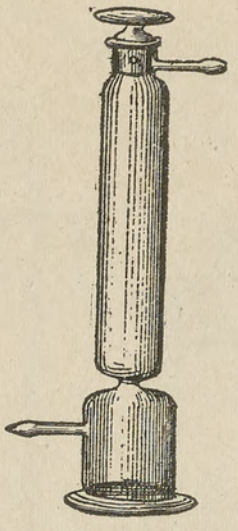

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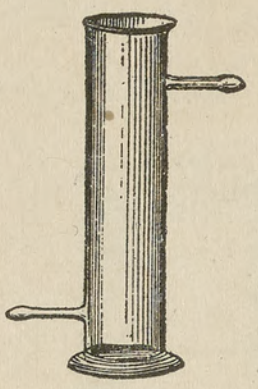

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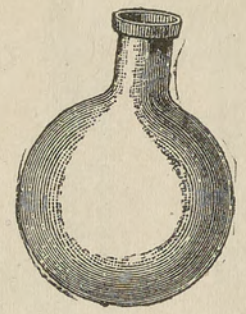

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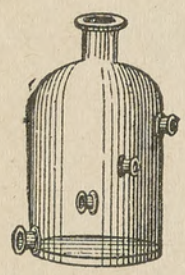

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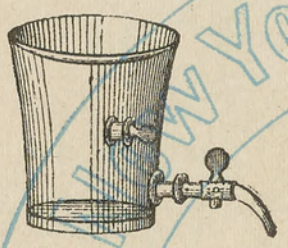

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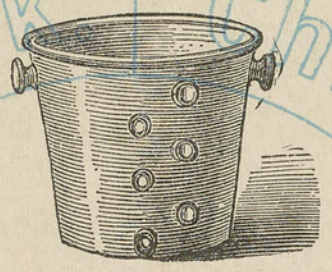

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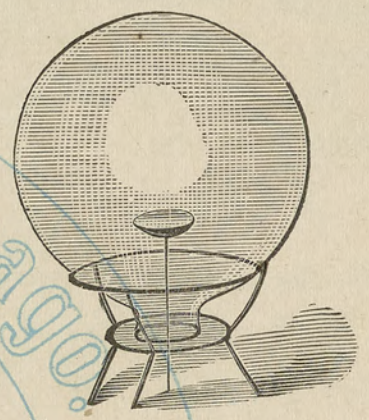

770

No.

762. **Cylinders for Chloride Calcium,** small size, lamp work..... $ .50

763. —— for **Chloride Calcium,** plain.

Height	8	10	12	16	18	24 in.
Each	.50	.60	.75	$1.20	1.75	2.50

764 —— **for drying,** with perforated glass stopper.

Height	11	14 in.
Dia.	1¾	2 "
Each	$2.00	2.25

765. —— **plain,** with **2 side tubes.**

Height	8	12 in.
Dia.	1½	1¾
Each	.60	.75

Other Cylinders, see Jars.

766. **Decanting Bottles.**

Capacity	½	1 gal.
Each	$2.25	3.50

767. **Decanting Jars, glass,** with 2 tubulatures and glass stoppers.

Capacity	¼	½	1	1½ gal.
Each	$1.00	1.50	2.00	4.50

768. —— **porcelain,** with tubulatures and handles.

Capacity	¾	1½	2 gal.
Each	$3.50	4.00	6.00

769. **Deflagration Globes,** of well annealed glass ; with ringneck.

Dia.	8	12 in.
Each	$1.25	2.10

770. —— as above, **stand** and **cup.**

Dia.	8	12 in.
Each	$2.00	2.85

771. **Deflagration Spoons,** brass, nicely finished.....each .25

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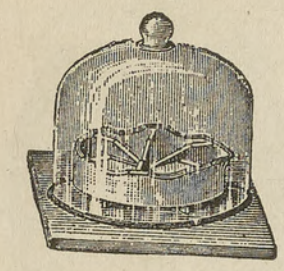

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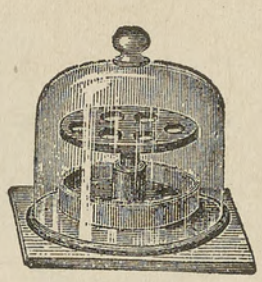

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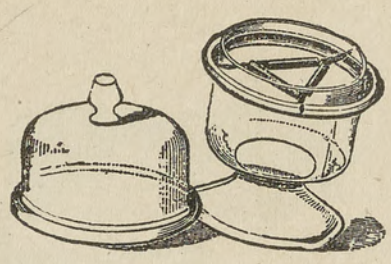

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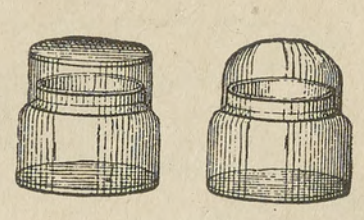

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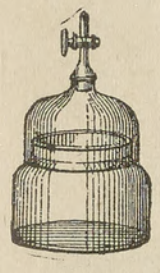

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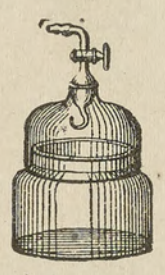

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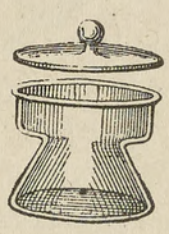

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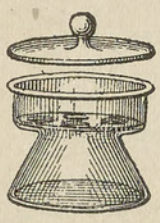

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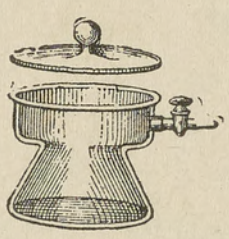

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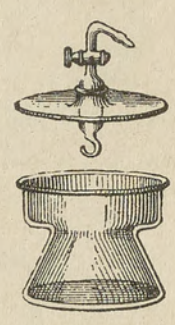

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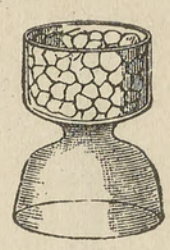

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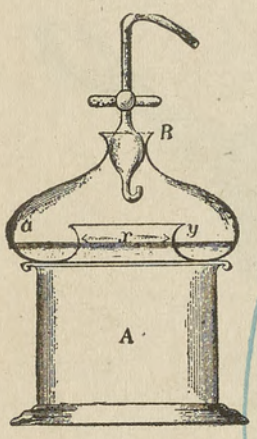

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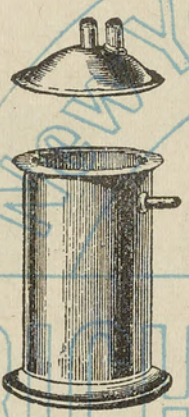

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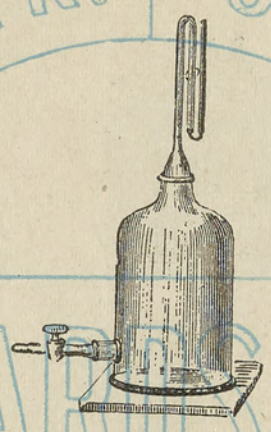

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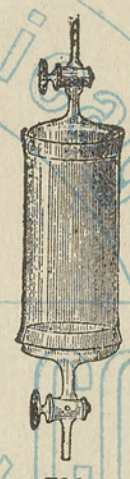

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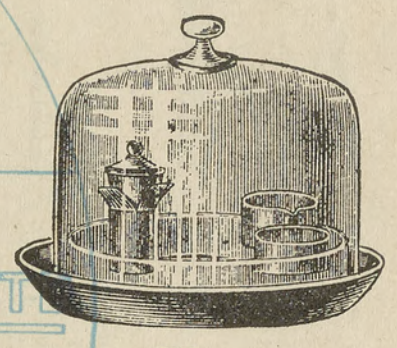


787

New York. Chicago. RICHARDS & CO. Ltd. Newark. Hamburg.

DESSICATORS.

No.

772. **Dessicator,** consisting of a porcelain Acid Dish, and bell glass ground air tight to a heavy glass plate.

Dia. of bell jar	6	8	10 in.
Each	$3.00	3.50	4.00

773. — **with perforated stand,** dia. of bell jar 6 in $3.00

774. — **Atwater's,** with triangle 2.00

775. — **Fresenius,** with **flat top** 1.00

776. — " with **round** top 1.00

777. — " 5 in. dia., with **stopcock** ground in top tubulature 3.00

778. — **Fresenius-Schiff,** 5 in. dia. with **stopcock** and hook 3.50

779. — **Scheibler's,** with knob top ground air-tight ..... Dia. 4 in., .65; 6 in., 1.25

780. — " **knob-top** ground air tight, and **with porcelain plate,** dia. 6 in 3.00

781. — " dia. 5½ in. with **side tube** and stopcock ground in 2.50

782. — " dia. 6 in. with **stopcock** and **hook** ground **in top** tubulature 2.75

783. — **Hempel's,** a most perfect dessicator, from the fact that water vapor has a lower specific weight than air and therefore accumulated in the upper part of a dessicator, which is overcome by placing the drying material right in the lower part of the cover. Size 6x6 in 3.60

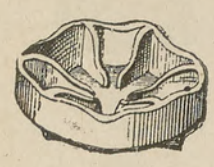
784. — **Cylinder form,** with side tubulature for exhausting with air pump, and two tubulatures in cover for thermometer and connections. Size 8x4 in 3.00

785. — **with Manometer,** glass stopcock and ground glass plate 7.00

786. — **Cylindrical, for beets,** 4½ in. long by 2½ in. dia.; with 2 ground in. stoppers and 2 stopcocks. 3.00

787. — **Bonsdorf's;** belljar, 2 glass dishes, beaker, crystallizing dish, an evaporating dish, and crucible of porcelain. Dia. 10 in.; height 8 in 9.00

788. — for placing inside of **scale cases.** Dia. 2 in ..... .60



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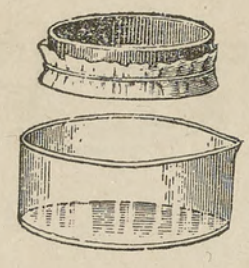
789a



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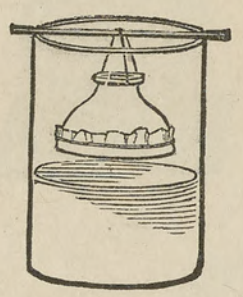

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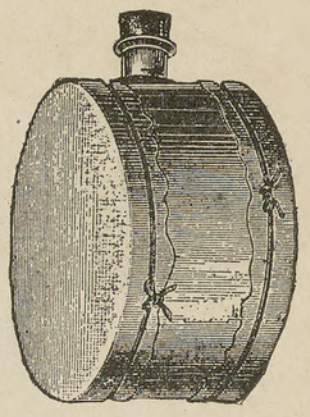

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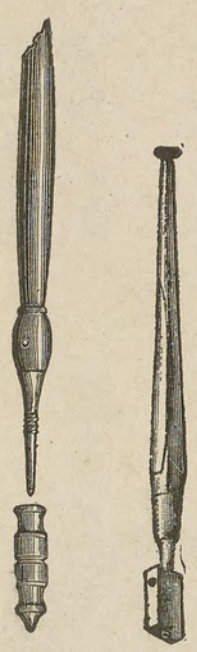

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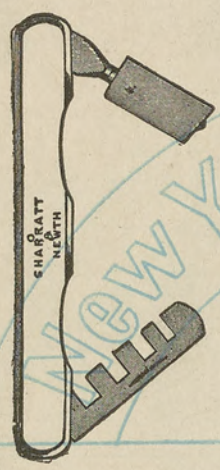

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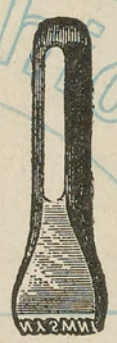

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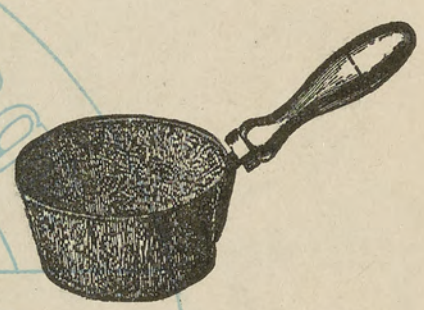


802

No.

789. **Dessicator Dishes** or Acid Dishes, of porcelain, with partitions.

Dia.	4¾	5¾	6½ in.
Each	$1.00	1.15	1.40

789a. — **Plates,** see under Plates.

790. **Dialyser, Graham's;** two glass parts, the larger one with lip, the smaller one with parchment paper and rubber ring.

Dia.	4	6	8 in.
Each	$2.00	3.00	4 00

791. — **Bellglass form,** complete.

Dia. of Bellglass	3¼	4¼	6 in.
Each	$1.25	1.50	2.00

792. — **Ring form,** with tubulature. Size 7¼ x 3¼ in. $2.00

793. **Dialyser Tubing of Parchment Paper,** a very convenient form for dialytic experiments.
Dia. 40 mm. In bundles of 10 yds ..... per bundle .50

794. **Diamonds;** Splinters, in quantities not less than $1.00 .....

795. — in handle, for **writing** on glass 2.50

796t. — in handle, for **cutting** glass 4.50

797t. — Pocket folding, metal handle; for cutting glass 7.00

798. **Diamond Ink,** for writing on glass ..... per bottle .50

799. **Dies, Figures,** of steel; for stamping bullion, etc.

Face	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2 in.
Per set	.90	$1.00	1.25	1.50	1.75	2.50	3.50	4.50

800. — **Letters,** of steel.

Face	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2 in.
Per set	$2.70	2.70	3.75	4.50	5.25	7.50	10.50	13.50

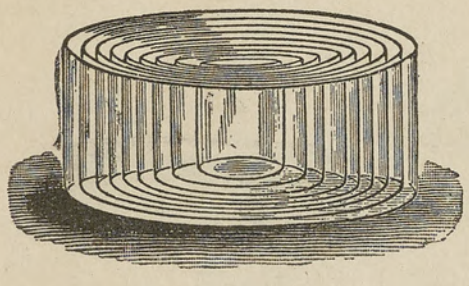
801. — **Steel Stamp;** letters or figures in one piece.

Size	1/8	1/4	5/16	3/8	1/2 in.
Each letter	.20	.35	.40	.45	.50

802. **Dippers, of Agate Ware,** with wooden handle.

Size	4¼ x 3	5¼ x 3¼	6 x 3½	6¾ x 3¾ in.
Each	.75	.90	$1.00	1.25

New York. Chicago
RICHARDS & CO. LTD.
Newark. Hamburg



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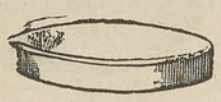

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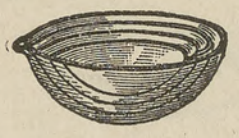

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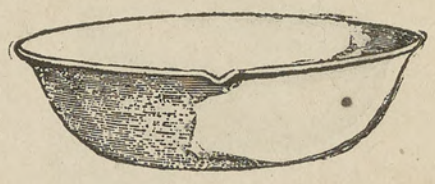

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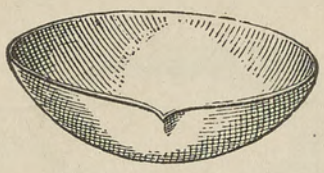

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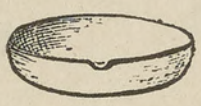

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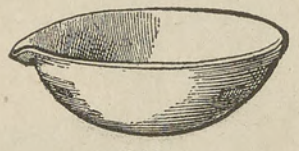

809

DISHES.

No.

803. **Dishes, Crystallizing,** of Bohemian **glass,** with flat bottoms and straight walls.

No.	1	2	3	4	5	6	7	8	9	10	41	12
Dia.	2⅜	2¾	3¼	3¾	4	4½	5	5½	6	6½	7½	8½ in.
Each	.12	.15	.20	.25	.30	.35	.40	.45	.50	.60	.70	.80

803a. Same in nests, of Nos. 1 to 4 ..... $ .60

803b. Same in nests, of Nos. 1 to 8 ..... 1.75

803c. Same in nests, of Nos. 1 to 12 ..... 3.75

804. — **Crystallizing, Porcelain,** with lip.

No.	1	2	3	4	5	6	7
Dia.	16½	13½	12	10½	9⅛	8	6½ in.
Each	$4.00	2.75	2.00	1.40	1.00	.80	.60

805. — **Evaporating,** Bohemian glass, hemispherical, with lip.

No.	1	2	3	4	5	6	7	8	9	10
Dia.	2⅜	2¾	3¼	3¾	4	4½	5	5½	6	6½ in.
Each	.12	.15	.20	.25	.30	.35	.40	.45	.50	.60

805a. Same in nests, Nos. 1 to 6 ..... 1.00

805b. Same in nests, Nos. 1 to 10 ..... 2.25

Dishes of Glass, shallow form, see Watch glasses.

806. — **Evaporating, Royal Meissen** Porcelain, with lip and flat bottom.

No.	000	00	0	1	2	3	4	5	6	7	8	9	10	11
Dia.	16	14½	13½	12	11	10	8¾	7½	6½	5½	5	4½	3½	2½ in.
Capacity	2⅓	1⅔	1¼	1	¾	½	¼ gal.	2	1	½ pt.	6	4	2	1 oz.
Each	$6.50	5.50	3.65	2.65	2.00	1.75	1.40	1.00	.75	.50	.40	.30	.20	.15

807. — **Evaporating, Royal Berlin** Porcelain, with lip. No. 00 to 5 round bottom, glazed inside and outside.

No.	00	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Dia.	2¼	3	3¼	3½	4	4¼	4¾	6	7	8½	10½	12¼	14	16	18½ in.
Capacity	2	3	4	5	6	8	10 oz.	1	2	3	5 pts.	1	1½	2½	4½ gal.
Each	.15	.20	.30	.35	.40	.45	.55	75	.90	$1.20	1.75	2.75	3.65	8.50	12.00

808. — **Evaporating, Royal Berlin** Porcelain, with lip. Shallow form.

No.	1	2	3	4	5	6	7
Dia.	2¾	3¼	3½	4	4¾	5½	6 in.
Capacity	1	2	4	6	8	12	20 oz.
Each	.25	.35	.40	.50	.60	.75	$1.00

809. — **Evaporating,** best German Porcelain, glazed inside.

No.	1	2	3	4	5	6	7	8	9
Dia.	6	5½	5¼	4½	4	3½	3¼	2¾	2½ in.
Capacity	20	16	12	8	6	5	4	3	2 oz.
Each	.50	.45	.40	.35	.30	.28	.25	.20	.15

809a. Same in nests of 6, from 2 to 8 oz 1.50

809b. Same in nests of 9, from 2 to 20 oz. 2.50

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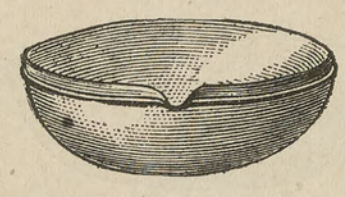

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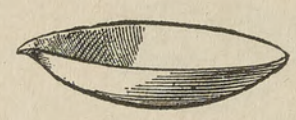

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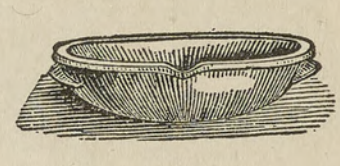

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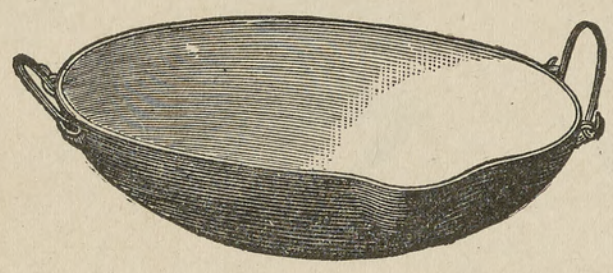

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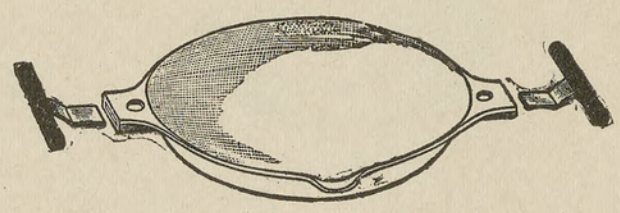

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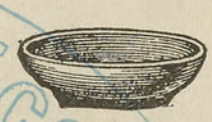
817



818



819

No.

810. **Dishes, Evaporating,** best German Porcelain, glazed inside, with **heavy rim.**

No.	000	00	0	1	2	3	4	5	6	
Dia.	24	17	14	12½	11½	10½	9½	8½	7½	in.
Capacity	6	3	2	1 gal.	3	2	1½	1	¾	qts.
Each	$12.00	4.00	3.50	2.00	1.60	1.30	.90	.80	.70	

811. — **Evaporating,** best German Porcelain, **shallow** form, with light rim.

No.	00000	0000	000	00	0	1	2	3	4	5	
Dia.	2	2½	3	3½	4¼	5½	6½	7¾	9	10½	in.
Capacity	¾	1¼	2	3	4	8	16	32	48	64	oz.
Each	.12	.15	.20	.25	.30	.35	.45	.55	.70	.85	

812. — **Evaporating and Crystallizing,** of **Stoneware.**

Capacity	1	1½	2	3	4 gal.
Each	.80	$1.10	1.35	1.85	2.25

813. — **Evaporating, Iron,** porcelain lined, with heavy ring.

No.	00	0	1	2	3	4	5	6	7	8	
Dia.	16	14	12½	11	10	9½	8¼	7½	6½	5½	in.
Capacity	3	2	1 gal.	¾	½ gal.	3	2 pts.	24	20	16	oz.
Each	$5.00	3.50	2.10	1.75	1.30	1.00	.85	.75	.65	.55	

814. — **Evaporating, Iron,** porcelain lined, with drop handle.

Dia.	6	8	10	12	14	16	18 in.
Each	.65	.85	$1.00	1.20	1.60	2.20	3.00

815. — **Evaporating, Iron,** porcelain lined, with **detachable handles.**

Dia.	7	8	10	13	16	18 in.
Capacity	1½ pt.	1 qt.	½	1	2	3 gal.
Each	$1.00	1.20	1.50	2.20	4.25	5.75

816. — **Evaporating, Agate Ware.**

Capacity	pt.	qt.	½	1	2	3	4	5	6 gal.
Each	.50	.75	$1.00	1.65	3.00	4.00	5.75	8.50	11.00

817. — **Evaporating, pure Silver.**

Dia.	1½	2	2½	3	3½	4	5	6 in.
Per oz.				$3.00				

Dishes, German Silver, see Part II. Apparatus for Sugar Analysis.

" **Platinum,** see Platinum.

818. — **of Lead, shallow form.**

Dia.	2	2½	3	4	5	6 in.
Each	.15	.20	.25	.30	.35	.40

819. — **of Lead, deep form** with cover and rest, for etching with hydrofluoric acid..... $4.00

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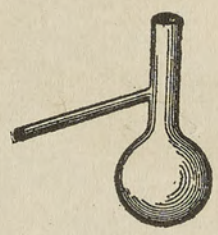
820



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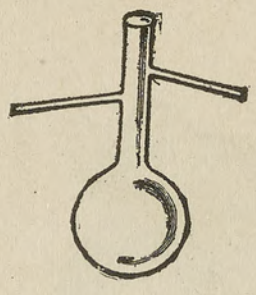

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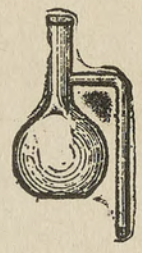

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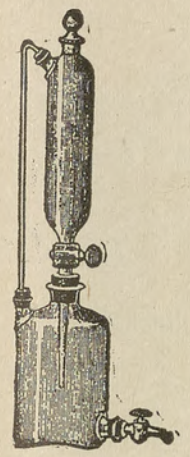

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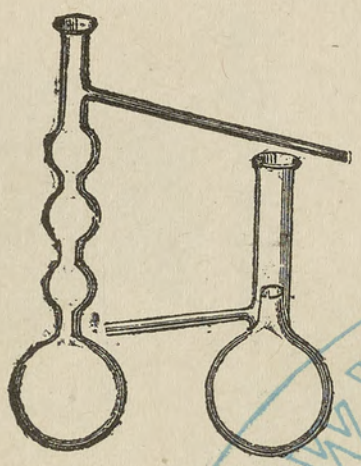

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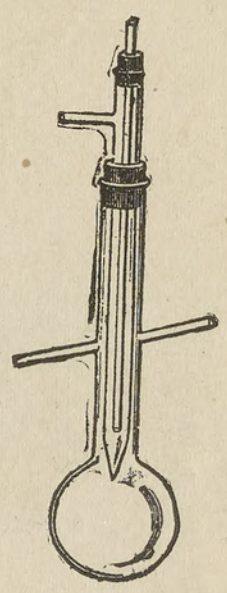

829

No.

820. **Displacement Bottle, Guiborgs.**

Capacity	pt.	qt.	½	1 gal.
Each	$5.00	6.00	8.00	10.00

821. — — **Robiquets.**

Capacity	2	4	8 oz.
Each	.70	.80	$1.00

Distilling Apparatus, see Part II.

822. **Distilling Flask,** with side tube.

Capacity	1	2	4	8	16	32	64 oz.
Each	.20	.25	.30	.35	.45	.65	$1.00

823. — after **Hofmann,** with 2 side tubes, for distilling in a gas current.

Capacity	1	2	4	8	16 oz.
Each	.30	.35	.40	.50	.65

824. — with **bent side tube.**

Capacity	1	2	4	8 oz.
Each	.20	.25	.30	.35

825. — after **Ladenburg,** with bulbed neck, and side tube.

Capacity	3	6	16	32 oz.
Each	.45	.65	$1.00	1.20

826. — after **Lunge.**

Capacity	2	4	8	16 oz.
Each	.40	.50	.70	.90

827. — after **Anschuetz,** used for substances that congeal quickly.

Capacity	1	2	4 oz.
Each	.40	.50	.65

828. — after **Emery,** with bent tube to prevent liquids spouting over.

Capacity	1	2	4	8	16	32 oz.
Each	.25	.30	.35	.40	.50	.70

829. — after **Kreusler,** with condenser. (Fres. Zeits. 1885, P. 80.)

Capacity of flask Completed	8	16	32 oz.
	.90	$1.20	1.60

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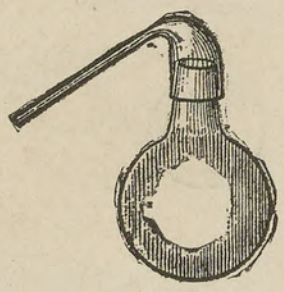

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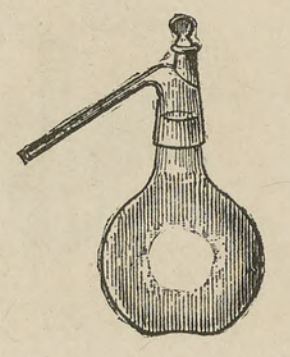

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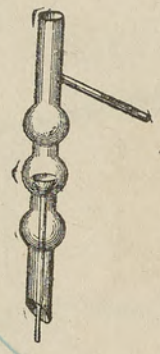

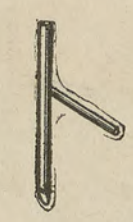

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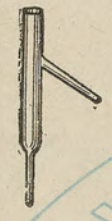

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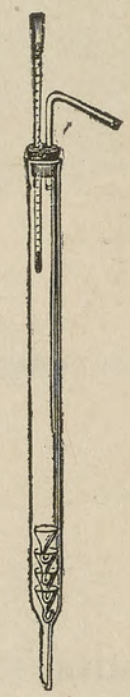

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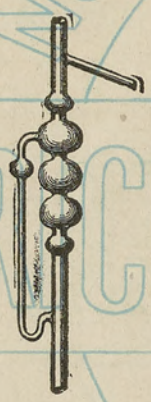

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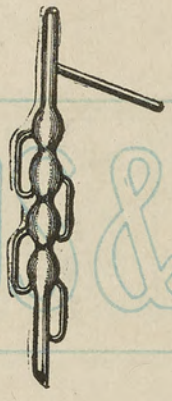

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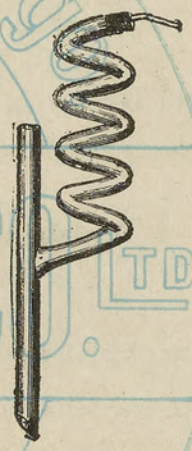

838

No.

830. **Distilling Flasks,** or **Alembics,** of glass, with hood ground on.

Capacity	8	16	32 oz.
Each	.90	$1.10	1.50

831. —— " **glass stoppered.**

Capacity	8	16	32 oz.
Each	$1.00	1.30	1.75

832. **Distilling Tubes.** form.

	A	B	C	D
Each	.25	.30	.35	.40

833. —— after **Belohoubek** ..... $ .75

834. —— after **Linnemann** ..... .40

835. —— after **Glinsky** 1.25

836. —— " " with glass valves 2.00

837. —— after **Lebel & Henninger.**

With	2	3	4	5	6 bulbs
Each	$1.00	1.35	1.55	1.75	2.50

838. —— after **Hart,** spiral form 1.50

839. —— " " for fractional distillation with 8 funnels (without thermometer) 2.25

(Jl. Anal. Chem., 1889 P. 90.)

Distilling Apparatus, see Part II.

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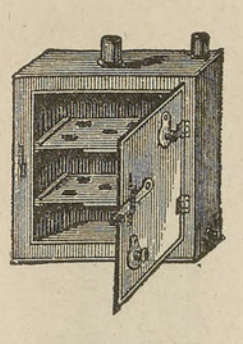

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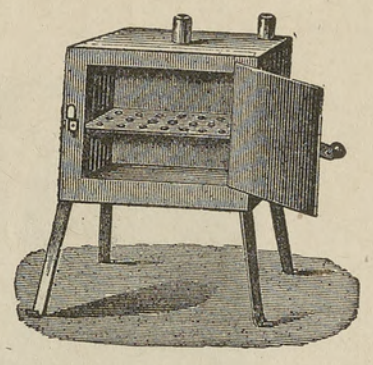

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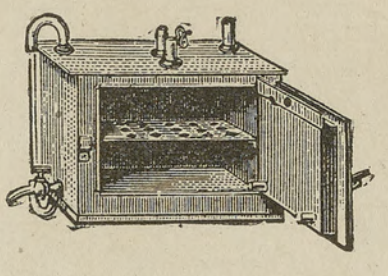

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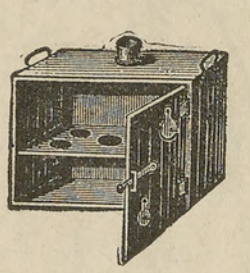

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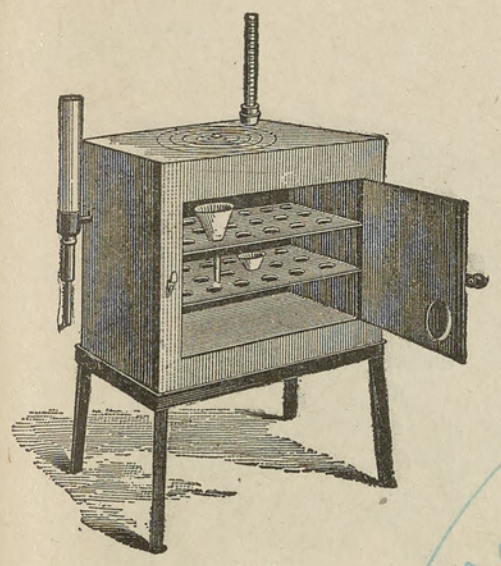

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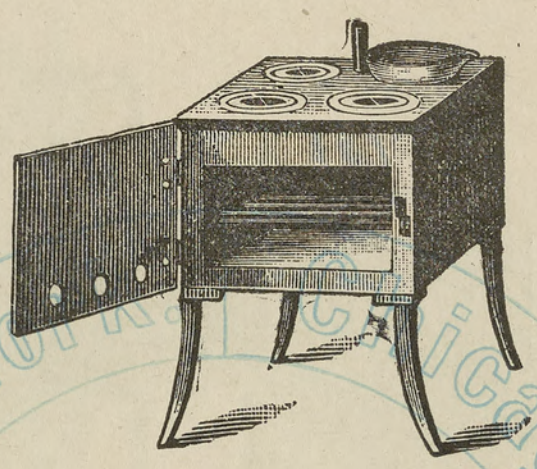

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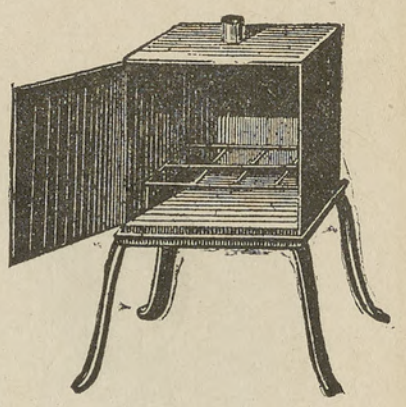


844a

DRYING BATHS, DRYING OVENS, AIR BATHS, Etc.

No.

840. **Drying Bath,** of copper; **double walls,** with inlet for water, etc., and opening for thermometer, movable shelf, ventilators in door, and extra sheet iron bottom.

Size	6x8	8x10	10x12 in.
Each	$6.50	9.00	12.00

840a. With detachable iron support on 4 legs — $7.50 | 10.00 | 13.00

841. — same as No. 840, with constant level water attachment.

Size	6x8	8x10	10x12 in.
Each	$9.00	11.00	14.00

841a. With detachable iron support on 4 legs Each — $10.00 | 12.00 | 15.00

842. — of copper, **double walls,** with extra water bath on top, opening for thermometer, movable shelf ventilators in door Kékulé, constant level water attachment and extra sheet iron bottom.

Size	6x8	8x10	10x12 in.
Each	$11.00	13.00	16.00

842a. With detachable iron support on 4 legs Each — $12.00 | 14.00 | 17.00

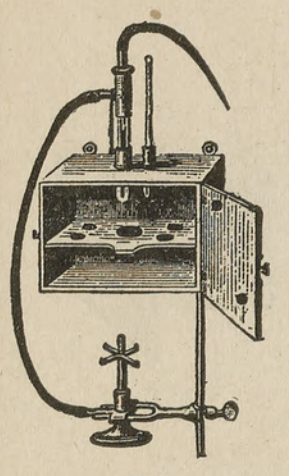
843. **Drying Oven,** of copper, **double walls,** with four water bath openings on top with concentric rings, size 10x12 in., mounted on detachable support $18.00

844. — or **Air Bath,** of copper, **single walls,** opening for thermometer, movable shelf, ventilator in door, and extra sheet iron bottom.

Size	6x8	8x10	10x12 in.
Each	$4.00	6.00	9.00

844a. with detachable iron support on 4 legs Each — $5.00 | 7.00 | 10.00

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



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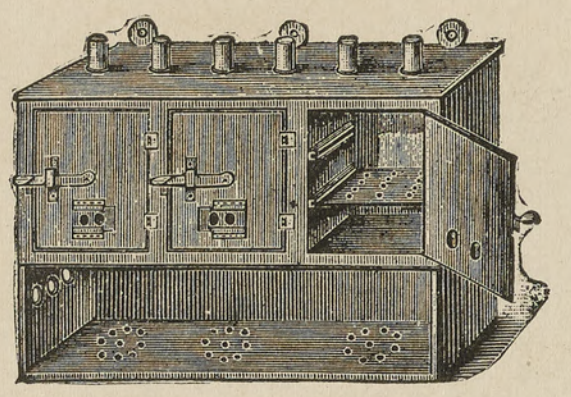

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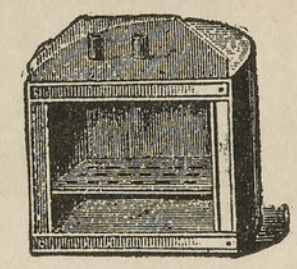

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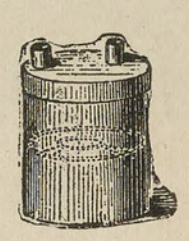

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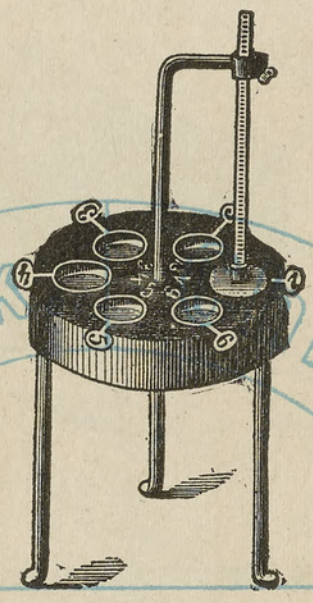

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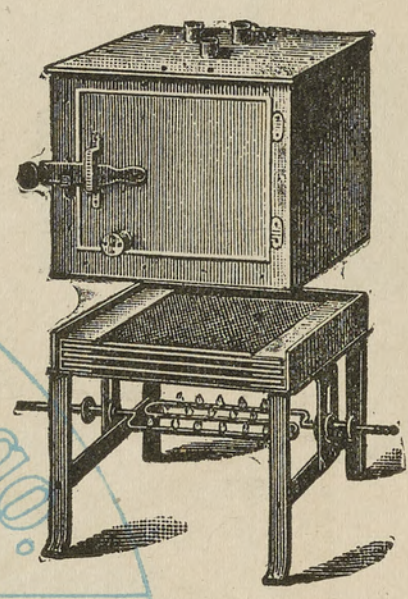


851

No.

845. **Drying Oven** or **Air Bath,** of copper, **single walls,** with extra sliding rod for Bunsen Burner, and arranged to hang on wall. Opening for thermometer, movable shelf, ventilator in door, and extra sheet iron bottom.

Size	6x8	8x10 in.
Each	**$6.00**	**8.00**

845a. { with detachable iron support on 4 legs — Each **$7.00** **9.00**

846. —— of heavy copper, **with 3 separate compartments,** each about 7½ in. and with 2 tubulatures, extra ventilators, the whole resting on a sheet iron support, which holds the burner..... **$24.00**

847. —— **after Carius,** of copper, with **2 tubulatures on top,** moveable shelf, and sliding glass front..... **3.50**

848. —— **after Rammelsberg,** a cylindrical copper vessel, with cover, 2 tubulatures and shelf in centre Dia. 4½ in., height 5½ in..... **3.50**

849. —— **after Victor Meyer,** for drying at constant temperatures by means of liquids of constant boiling points, for instance : (about 4 to 8 cc. being sufficient for supplying the bath.)

Chloroform, 60°; Methyl-Ethyl alcohol 3:7, 70°; Ethyl alcohol, 75°; Ethyl propyl-alcohol 7:4, 80°; Ethyl propyl-alcohol 1:8, 90°;

Water, 100°; Toluol, 107°; Xylol, 136°; Anisol, 150°; Cumol, 161°; Anilin, 180°; Naphtalin, 200°; Diphenylamin 310° Celsius

Apparatus complete, with tripod, burner, condenser, and crucible support.

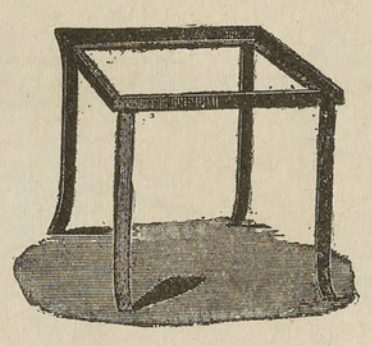
Inside Height	3½	3¾ in.
Inside Width	3¼	4¾ "
Each	**$12.50**	**14.00**

850. —— **or Dessicating Disc, after Fresenius,** 8 in. dia. and 1½ in. deep, with 6 cylindrical cavities 2¼ in. in dia. in which are placed brass pans with handles..... **10.00**

851. —— **after Ruedorff,** of copper, with adjustable coil burner and 3 wire gauze slides for maintaining an even temperature.

Size	8x10	10x12 in.
Each	**$21.00**	**25.00**

RICHARDS & CO. LTD. New York. Chicago. Mark. Hamburg.



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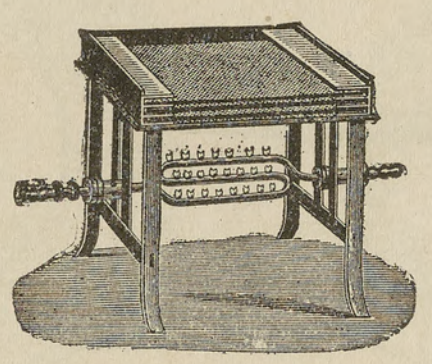

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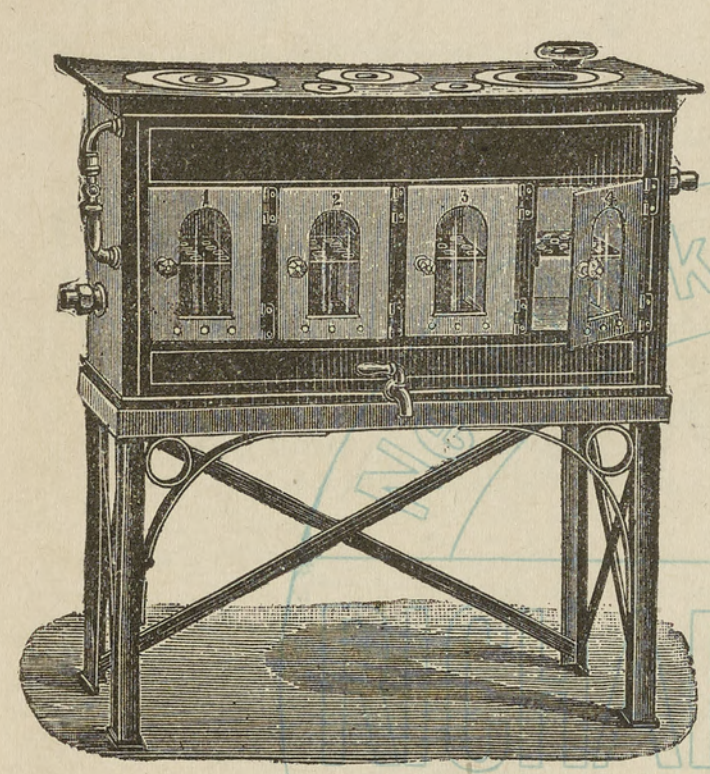

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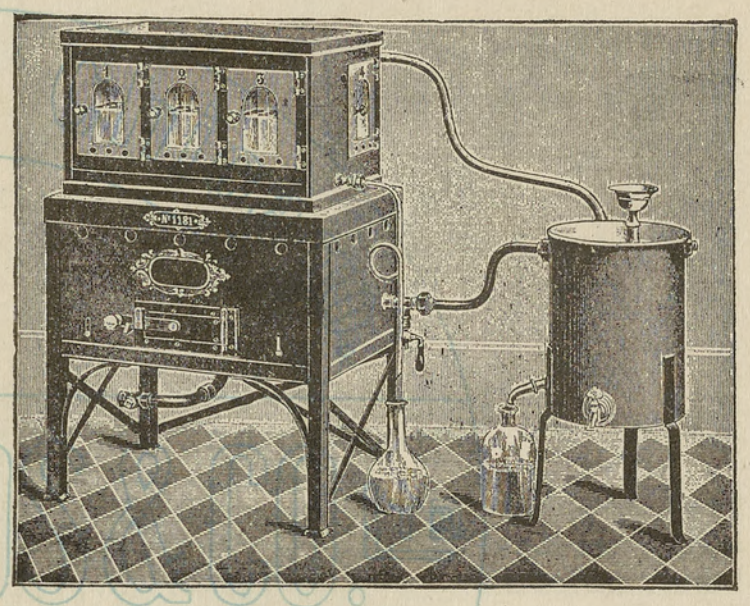

854

No.

852. **Drying Oven,** of copper, tin-lined, **with 4 separate chambers,** each 8x6x10 in. with glass windows, steam inlet and outlet ; 5 set of rings on top for water-bath, on support complete..... **$120.00**

853. —— same as No. 852 of sheet iron..... **90.00**

854. —— **Distilling Apparatus** and **Steam Drying Bath,** combined, of copper, with 3 Drying chambers in front, each 8x6x7¼ in. and one at side 8x6x22 in., size of Steam Drying or Sand Bath 16x24 in., mounted, with constant water level..... **300.00**

855. **Drying Oven Support,** of iron with 4 set screws by which the oven is held firmly, also arranged to fasten to table,

Size	6x8	8x10	10x12 in.
Each	**$1.00**	**1.00**	**1.00**

856. —— with **adjustable Coil Burner,** arranged with 3 wire gauze slides for maintaining even temperatures.

Size	8x10	10x12 in.
Each	**12.00**	**15.00**

Double Wall Sterilization Apparatus, and any kind of Ovens for Bacteriological work we will be pleased to quote for you on request.



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861



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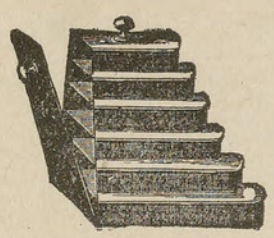
862



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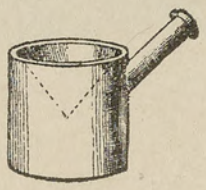

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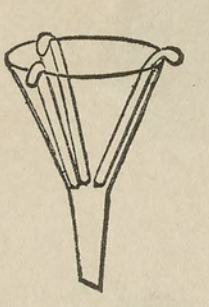

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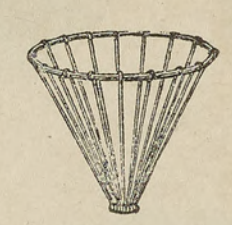

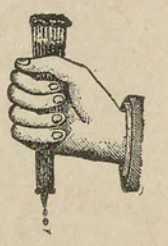

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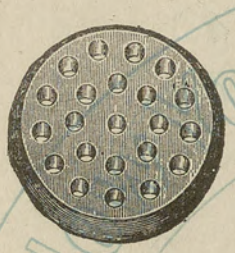


867



869



870

No.

857. **Emery Cloth,** per sheet ..... $ .10

858. **Emery Paper,** per sheet ..... .05

859. **Files, Rattails,** round with fine points.

Length	3	4	5	6	8 in.
Each	.12	.15	.20	.25	.35

860. —— **Triangular,** best quality, for cutting glass tubings.

Length	3	4	5	6	8 in.
Each	.12	.15	.20	.25	.35

861. —— **Flat,** best English.

Length	3	4	5	6	8 in.
Each	.15	.20	.25	.30	.40

862. **File handles** ..... Per doz. .60

863. **Filter Cases,** of japanned tin, holding 5 sizes of cut filters from 3 to 7½ in. 2.50

864. **Filter Drying Bath,** of Porcelain 1.50

865. **Filter Hooks,** of glass.

For	5	6	8	10	12 in. funnels
Doz.	.60	.70	.80	.90	$1.00

866. **Filter Racks,** Patent Filter and Squeezer combined.

Length	5	7	9	12 in.
Each	.35	.45	.65	.75

867. **Filter Plates,** of glass, perforated, with polished rim ; dia. 1½ in. ..... .50

868. —— of porcelain, small holes, dia. 1½ in. ..... .25

869. **Filter Rings,** of porcelain.

With	1	2	3 arms.
Each	.20	.25	.35

For Filter Cones, Filter Stands, Filter Tubes, etc., see Index.

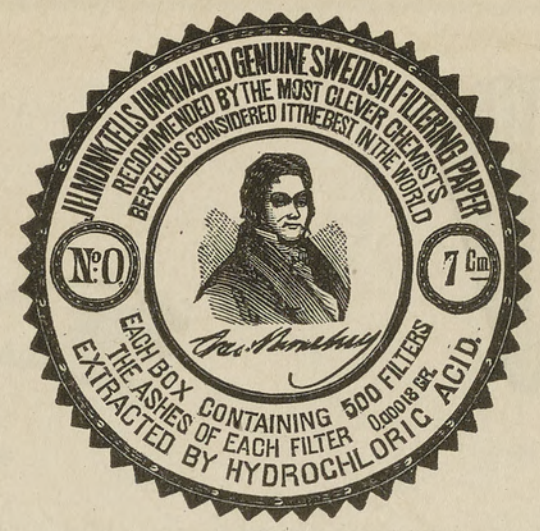
870n. **Filters Felt,** best white wool.

No.	1	2	3	4	5	6	7	8	9	10
Size	7½x8	8½x8	8½x9	11x12	13x15	14x16	16x19	18x21	20x23	22x25 in.
Capacity	¼	½	¾	1	1¼	1⅔	2	3	4	5½ gal.
Each	.50	.60	.70	.95	$1.20	1.40	1.65	1.90	2.30	3.50

NEW YORK. CHICAGO. RICHARDS & CO. LTD. NEWCASTLE-UPON-TYNE



871



872



876

FILTER PAPER.

No.

871. **Filters, Richards' Peerless**; a strong, uniform and rapid filter for qualitative and pharmaceutical work; cut in circles, 100 filters in a package,

Dia.	7½	9	11	13	15	20	25	33	38	45 ctm.
"	3	4	4½	5	6	8	10	13	15	18 in.
Per 100	.08	.11	.13	.15	.18	.25	.35	.50	.75	$1.10

In sheets 48 x 48 ctm. (19x19 in.) .....Per Ream **$5.50**. Per Quire **$ .35**

872. — **Munktell's Swedish. No. O. Washed with Hydrochloric Acid,** removing traces of iron, alumina, lime, etc. The ash is reduced to a minimum, and a high standard of purity is secured. A uniform and quick filter, retaining fine precipitates, adapted to the most precise requirements of analytical work.
Cut in round filters. 100 filters in a package, 5 packages in a box.

Dia.	5.5	7	9	11	12.5	15 ctm.
Weight of ashes of one filter	.00011	.00018	.00029	.00044	.00056	.00081 grammes
Per 100	.19	.27	.42	.55	.63	.85

873. — **Munktell's Swedish. No. 1 F.**—Uniform in thickness; best linen material; most perfect filtering paper made; leaves the smallest amount of ash of any unwashed paper. Very strong, adapted to the highest grade of chemical work. The finest precipitates are retained.
Cut in round filters. 100 filters in a package, 5 packages in a box.

Dia.	5.5	7	9	11	12.5	15	18.5 ctm.
Weight of ashes of one filter	.00025	.00040	.00089	.00098	.00127	.00183	.00278 grammes
Per 100,	.11	.16	.25	.32	.36	.45	.70

In sheets, 43x53 ctm. Weight 5 Kilo ..... Per Ream **$19.00**. Per Quire **1.10**

874. — **Munktell's Swedish No. 2.**—A pure white linen paper, not as closely woven, therefore more rapid in filtration. A superior paper for laboratory work.
Cut in round filters, 100 filters in a package, 5 packages in a box.

Dia.	5.5	7	9	11	12.5	15	18.5 ctm.
Per 100	.10	.13	.21	.28	.32	.40	.60

In sheets, 43x53 ctm. Weight 6,4 Kilo.....Per Ream **$17.00**. Per Quire **1.00**

875. — **Munktell's Swedish No. 3.**—A pure white paper of superior quality, heavier than No.2, filters rapidly. Fully equal to the high grade German papers, but at less cost than other paper of same quality and weight.
Cut in round filters, 100 filters in a package.

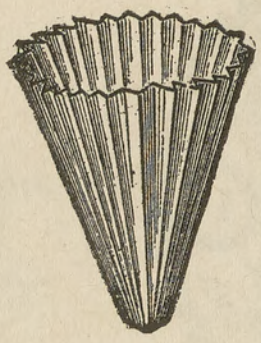
Dia.	5.5	7	9	11	12.5	15	18.5 ctm.
Per 100	.08	.11	.18	.22	.27	.33	.50

In sheets, 43x53 ctm., Weight 7,6 Kilo.....Per Ream **$14.50** Per Quire **.85**

876t. — **Schleicher & Schuell's S & S. No. 595**, a good, light paper, free of chlorine.
Cut in circles, 100 filters in a package.

Dia.	5½	7	9	11	12½	15	18½	24	31	38½ ctm.
Per 100	.12	.15	.20	.23	.25	.30	.45	.70	$1.20	1.35

In sheets, 19 x 21 inches.....Per Ream **$10.00** Per Quire **.60**



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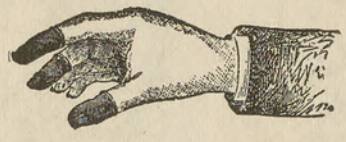


886

No.

877t. **Filters, S. & S. No. 597**, a heavy paper perfectly white and quick filtering.

Cut in circles, 100 filters in a package.

Dia.	5½	7	9	11	12½	15	18½	24	32	38½ ctm.
Per 100	.18	.20	.28	.30	.35	.42	.55	.85	$1.30	1.75

In sheets, 23x23 inches..... Per Ream **$18.50.** Per Quire **$1.00**

878t. — **S. & S. No. 575. Hardened Filters.** These filters possess, even in a damp state, a hardness and durability which almost equals that of parchment! They stand a pressure of 2 to 3 atmospheres, and serve for washing out upon them large quantities of sediments, at the same time retaining the finest particles when subjected to exhaustion by the aid of mercury or water air pump, as well as for filtering larger quantities of liquids, without fear of tearing.

Cut in circles, 100 filters in a package.

Dia.	5	7	9	11	12½	15	18½	24	27	32	38½	50 ctm.
Per 100	.60	.65	$1.00	1.10	1.25	1.40	1.85	2.75	3.65	4.45	5.80	9.60

879. — **S. & S. No. 589. Washed with hydrochloric and hydrofluoric Acid,** filtering rapidly and retaining the finest precipitates. (Uranium phosphate, Calcium oxalate, etc.)

Cut in circles, 100 filters in a package.

Dia.	5½	7	9	11	12½	15 ctm.
Weight of ashes of one filter,	0,00004	0,00007	0,00011	0,00017	0,00021	0,00025 grammes
Per 100,	.60	.70	.90	$1.10	1.35	1.60

880. — **S. & S. No. 590. Washed with hydrochloric and hydrofluoric Acid,** in which the washing has been carried to the utmost limit.

Cut in circles, 100 filters in a package.

Dia.	5½	7	9	11	12½	15 ctm.
Weight of ashes of one filter,	0,00003	0,00005	0,00008	0,00013	0,00016	0,00019 grammes
Per 100,	.75	.80	$1.25	1.45	1.65	2.00

881. — **S. & S. No. 589 "Black Ribbon."** Prepared especially for use in Iron Analysis.

Cut in circles, 100 filters in a package.

Dia.	5½	7	9	11	12½	15 ctm.
Weight of ashes of one filter,	0,00004	0,00007	0,00011	0,00017	0,00021	0,00025 grammes
Per 100	.70	.80	$1.10	1.20	1.45	1.70

882. — **S. & S. No. 588. Folded filters.** Cut in circles.

Dia.	12½	18½	24	32	38½	50 ctm.
Per 100	.35	.55	.75	$1.00	1.55	2.50

883. — **S. & S. No. 588. Folded filters, with parchment points.** Cut in circles.

Dia.	32	39½	50 ctm.
Per 100	$1.40	1.70	2.70

884. — **S. & S. No. 591. Filtering paper,** very heavy. For lacquers, fruit juice, Syrups and Oils.

In sheets, 21¼x23 in..... Per Ream **$24.00.** Per Quire 1.50

885. **Filter Paper, Chinese Rice,** very substantial and quick filtering.

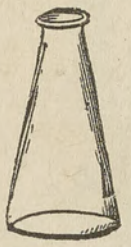
In sheets, 18x28 in..... Per Ream **$12.00.** Per Quire .75

886. **Finger Cots,** of rubber,..... per Doz. .50

Filter Pumps, see Air Pumps for Water.



887



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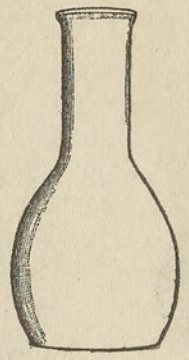

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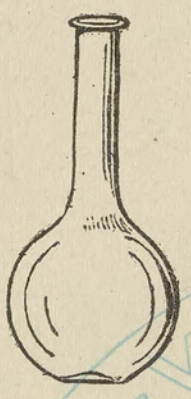

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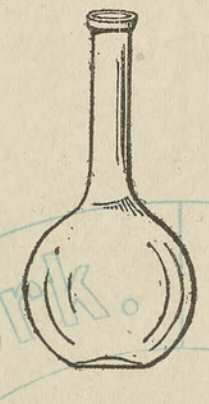

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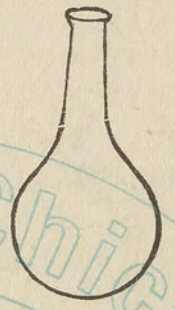

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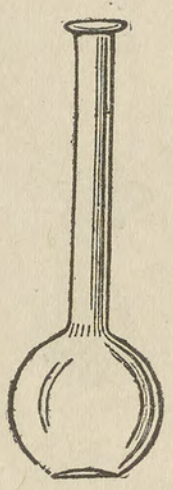


897

FLASKS.

No.

887. **Flasks, Assay or Parting,** Bohemian glass, conical form, with ring.

Capacity	2	4	8 oz.
Each	.15	.20	.25

888. — **Assay** Bohemian glass, new form, without neck.

Capacity	2	4	8	16 oz.
Each	.15	.20	.25	.30

889. — **Assay** Bohemian glass, French form, with long neck.

Capacity	1	2	4 oz.
Each	.15	.20	.25

890. — **Assay** Bohemian glass, Pear shape, capacity 1 oz.....Per doz **$1.50**

891. — **Beaker,** Bohemian glass, with lip for precipitation and filtration.

Capacity	4	8	16	24	32 oz.	½	1 gal.
Each	.20	.25	.35	.40	.50	.75	$1.10

892. — **Carbonic Acid,** with extra wide and low necks.

Capacity	1	2	4 oz.
Each	.14	.20	.25

893. — **Chemical, heavy** Bohemian glass, vial mouth, flat bottom, for wash bottles.

Capacity	16	32 oz.
Each	.30	.40

894. — **Chemical,** Bohemian glass, vial mouth, flat bottom, best annealed glass.

Capacity	½	1	2	4	6	8	12	16	24 oz.
Each	.8	.9	.10	.12	.15	.18	.20	.25	.30

Capacity	32	48 oz.	½	¾	1	1½	2	3	5 gal.
Each	.35	.40	.45	.55	.70	.85	$1.00	1.45	2.90

895. — **Chemical,** Bohemian Glass, flat bottom, ring neck to bear corkings.

Capacity	1	2	4	8	16	32 oz.	½	1	2 gal.
Each	.9	.10	.12	.18	.25	.35	.45	.70	$1.00

896. — **Chemical,** Bohemian Glass, round bottom, vial mouth.

Capacity	1	2	4	8	16	24	32 oz.	½	1	2	3	5 gal.
Each	.10	.12	.15	.20	.25	.30	.35	.50	.75	$1.10	1.50	3.00

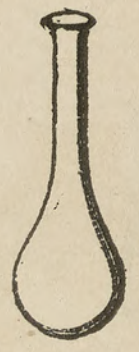
897. — **Chemical,** Bohemian glass, with flat bottom, neck 1¼ in. dia. 7 in. long.

Capacity	16	32 oz.
Each	.30	.40

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



898



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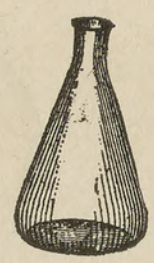

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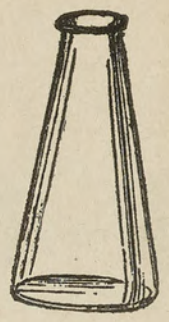

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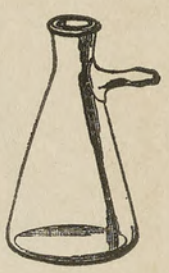

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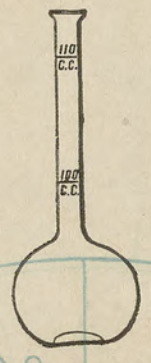

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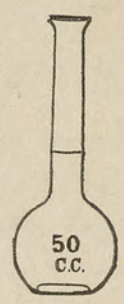

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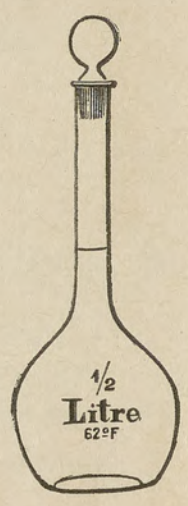


910

No.

898. **Flasks, Copper Oxide,** for storing Cu O prepared for organic analysis.

Capacity	8	16 oz.
Each	.50	.75

899. — **Digesting,** Bohemian hard glass, for use in Kjeldahl's nitrogen determination. Capacity 200 cc. **$ .30**

900. — **Dissolving.** Bohemian glass, with contracted neck, for dissolving substances by agitation.

Capacity	1	2	3 qts.
Each	.60	.80	$1.00

901. — **Erlenmeyer,** Bohemian glass.

Capacity	1	2	4	6	8	12	16	24	32 oz.	½	1 gal.
Each	.10	.12	.15	.20	.25	.30	.35	.40	.45	.70	.90

902. — **Filtering,** conical very heavy glass, for use with water air pump.

Capacity	8	16	32 oz.
Each	.30	.35	.55

903. — **Filtering,** as above, with side neck.

Capacity	8	16	32 oz.
Each	.35	.40	.60

904. — **"Joliet,"** heavy, used in Iron and Steel analysis. Capacity 16 oz. ..... .30

905. — **Pressure,** for Digestions, of heavy glass, well annealed with Patent stopper.

Capacity	4	8 oz.
Each	.75	$1.00

906. — **Saccharometric Polarization,** after **Kohlrausch,** with mark on neck.

Capacity	50	100	200 cc
Each	.30	.40	.65

907. — **"Sugar Flasks,"** with 2 graduations.

Capacity	50 and 55cc	100 and 110cc	200 and 220cc
Each	.30	.40	.65

908. — **"Sugar Flasks,"** as above neck with dark enameled stripe, on white enameled background, giving a definite meniscus.

Capacity	50 and 55cc	100 and 110cc	200 and 220cc
Each	.40	.50	.75

909. — **Volumetric, "Liter Flasks"** most accurately graduated.

Capacity	5	10	15	20	25	50	100	200	250	300	500	1000	2000cc
Each	.10	.12	.15	.18	.20	.25	.30	.35	.40	.50	.60	.75	$1.00

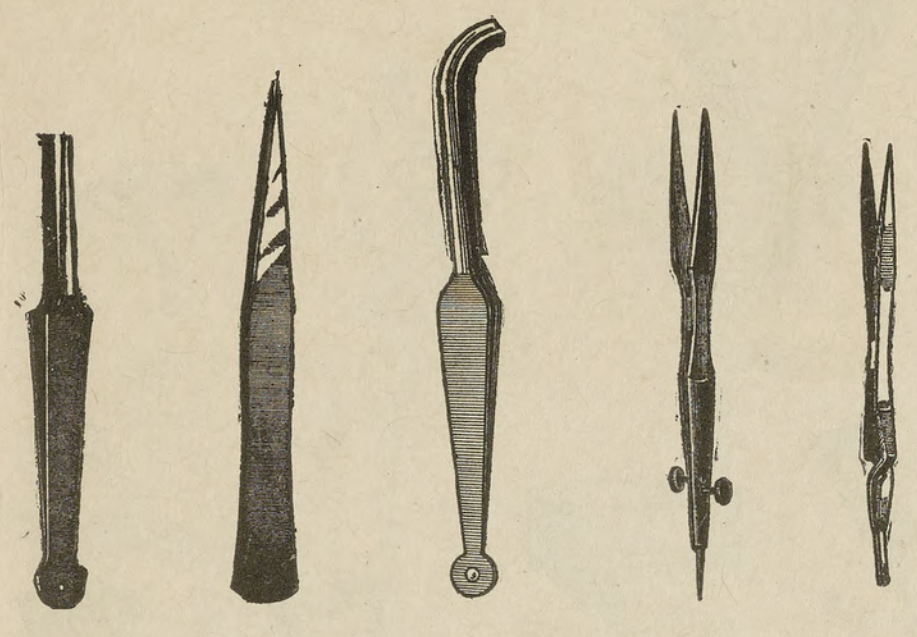
910. — **Volumetric,** with glass stopper.

Capacity	10	25	50	100	200	250	300	500	1000	2000cc
Each	.20	.25	.30	.35	.50	.60	.65	.75	.90	$1.20

911. — **Volumetric,** neck with dark **enameled** stripe on white enameled background, giving a definite meniscus.

Capacity	100	250	500	1000cc
Each	.40	.50	.75	$1.00

New York. Chicago
RICHARDS & CO. LTD.
Newark, Hamburg.



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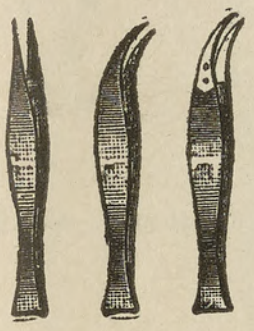

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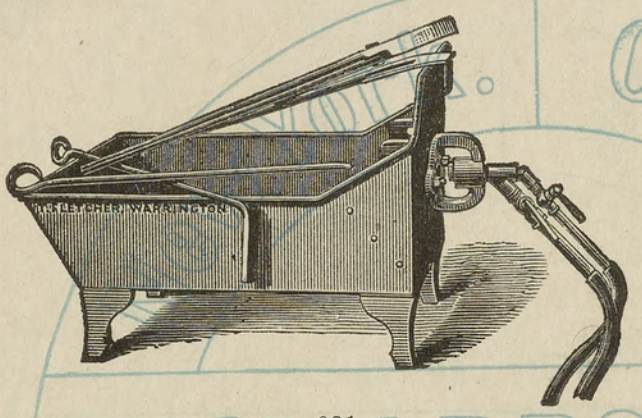

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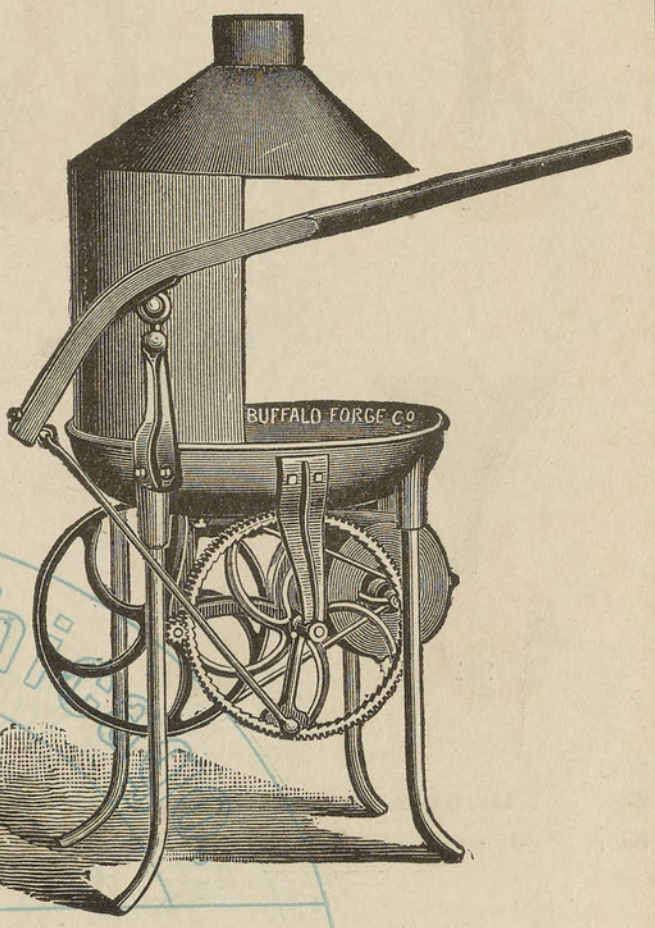


923

FORCEPS.

No.			
912.	**Forceps,**	brass, ends **straight**	$0.25
913.	——	" " **bent**	.25
914.	——	" " " nickel plated	.30
915.	——	" stout, straight	.50
916.	——	" " " nickel plated	.55
917.	——	" ends bent, with ivory tips	.65
918.	——	steel, fine points	.25
919.	——	" plain.	

Length	3	4	5	6 in.
Each	.12	.15	.20	.25

920.	——	**Goosenecks,** nickel plated brass, 6 in. long	.50
921.	——	**Plattners,** nickel plated, with platinum tips	2.00
922.	——	**French** style with platinum tips	2.00

Forges, for sharpening Picks and Drills, and melting down Assays and Bullion in Crucibles.

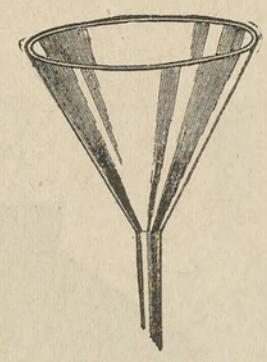
No.		Dia. of Fan.	Size of Hearth.	Height of Fireplace.	Weight.	Price.
923.	0,	half open hood	14 in.	28x40 in.	30 in.	250 hand,	$50.00
924.	0,	" " "	14 "	28x40 "	30 "	250 power.	54.00
925.	1,	" " "	10 "	21x27 "	29 "	140 lbs.	40.00
926.	2,	entirely closed hood	10 "	21x27 "	29 "	150 "	42.00
927.	3,	with dash	10 "	21x27 "	29 "	130 "	36.00
928.	4,	half open hood	6 "	18 in. diam.	33 "	75 "	27.90
929.	5,	with dash	6 "	18 "	33 "	70 "	24.00
930.	6,	entirely closed hood	6 "	18 "	33 "	80 "	30.00

931t. **Forge, Fletcher's, Gas or Gasoline.** As used at Woolwich Arsenal, England. Invaluable for small forgings. Size of hearth, 15x18 in. By this simple arrangement, steel tools can be forged without injury, by the use of gas. It will be found a perfect arrangement for small Forgings and Repairs.

Forge with No. 8e Blowpipe	10.00
Blowpipe, No. 8e	5.50
Hearth	4.50
Forge complete, with Foot-Blower, Blowpipe, and 6 ft. Rubber Tubing	19.00

RICHARDS & CO. LTD. Newark. Hamburg. Chicago.


932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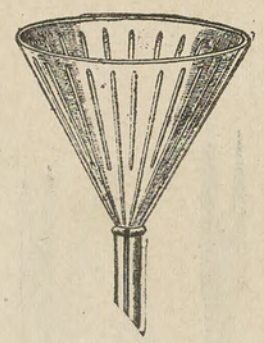
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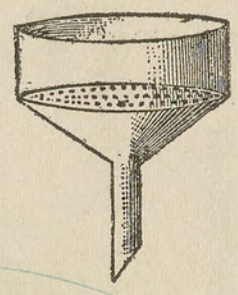
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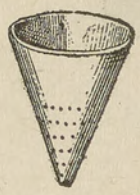

945


946

FUNNELS.

No.

932. **Funnels, lamp made,** of very thin glass. Dia., ½, 1 and 1½ in.....per set of 3 **$0.25**

933. — **best German Glass,** angle 60°, stem ground to a point.

Dia.	1	1½	2	2½	3	3½	4	5	6	7	8	9	10 in.
Each	.07	.08	.10	.12	.15	.18	.20	.25	.30	.40	.50	.60	.70

934. — **Glass, "Normal" exact 60° angle, for Analytical work.**

Dia.	4	5	6	7	8	9	10 ctm.
Each	.15	.15	.18	.22	.24	.27	.30

935. — **Bohemian Glass,** angle 60°, with ground edge, and stem ground to a point.

Dia.	1½	2	2⅛	2¾	3⅜	4	4¾	5⅛	6½	7¼ in
Each	.12	.15	.18	.20	.25	.30	.35	.40	.50	.65

936. — **Bunsen's** Bohemian Glass, angle 60°, with thin and extra long stems, top ground even, and stem ground to a point.

Dia.	1½	2	2⅜	2¾	3⅛	4 in.
Each	.12	.15	.18	.20	.25	.30

937. — **Glass, ribbed.**

Dia.	3½	5	6	7	8	8½ in.
Capacity	4	8	16 oz.	qt.	½	1 gal.
Each	.10	.15	.20	.25	.30	.50

938. — **Royal Berlin, porcelain,** angle 60°.

Dia.	4	5	6 in.
Each	.75	$1.00	1.20

939. — **Porcelain,** plain, with handle.

Dia.	4	5	6½	7½ in.
Each	.50	.70	$1.00	1.50

941n. — **Hard Rubber.**

Capacity	½	1	2	4	8 pts.
Each	.35	.40	.75	$1.40	2.80

942. — **Agate Ware.**

Capacity	½	1	2	4	8 pts.
Each	.35	.45	.55	.75	$1.15

943. — **for filtering by pressure,** with fixed perforated porcelain plate.

Dia.	2	2¾	3½	4 in.
Each	.75	.90	$1.05	1.35

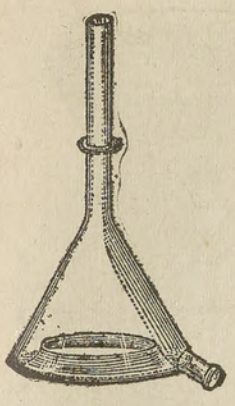
944. — **Porcelain, Buechner's,** with fixed perforated porcelain plate. Dia. 4 in. Sides, 1¼ in... **2.00**

945. — **Porcelain,** with perforated sides.

Dia.	4¾	5¼	6½	8 in.
Each	.75	$1.00	1.50	2.00

946. — **Porcelain,** with large oval slits at sides.

Dia.	4¾	5¼	6½	8 in.
Each	.75	$1.00	1.50	2.00



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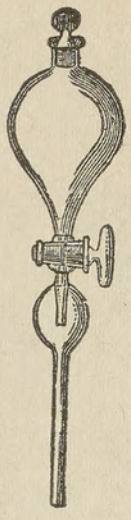

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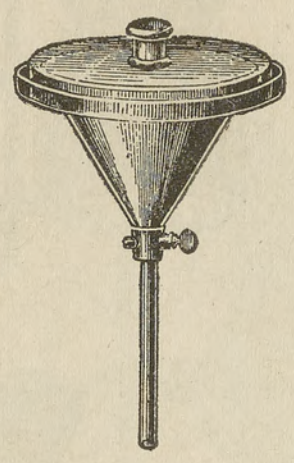

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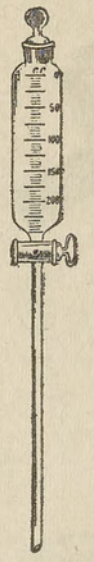

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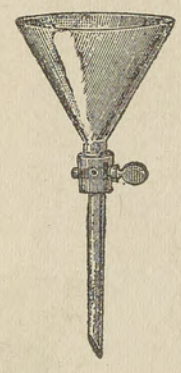

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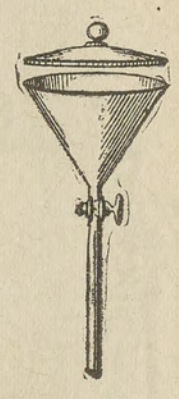

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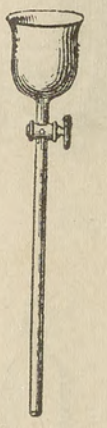

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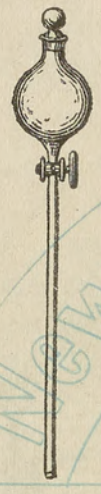

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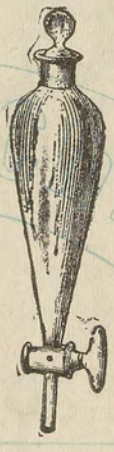

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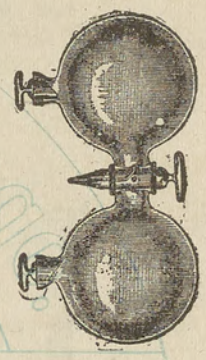

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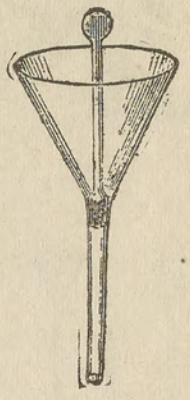


959

No,

947. **Funnels, Glass, Victor Meyer's,** to suspend over evaporating dishes, with tubulature.

Dia.	6	8 in.
Each	$1.25	1.50

948. — **"Dropping," Walter's** for examining single drops. Capacity, 60 cc..... **$2.00**

949. — **Extraction,** with tubulated cover and rim for mercury seal, with stop-cock.

Capacity	1	2 pts.
Dia.	5	6 in.
Each	$2.50	3.00

950. — **Separatory, Cylindrical,** light graduated 100 cc..... **2.00**

951. — **Separatory,** glass, usual form angle 60°, with stop-cock, **open top.**

Capacity	½	1	2	4 pts.
Dia.	4	6	6	8 in.
Each	$1.50	2.00	2.50	3.00

952. — **Separatory,** glass as above, **with covers.**

Capacity	½	1	2	4 pts.
Dia.	4	5	6	8 in.
Each	$1.75	2.30	2.85	3.50

953. — **Separatory, Bellshape.**

Capacity	2	4	6	8 oz.
Each	$1.00	1.25	1.50	1.75

954. — **Separatory, Cylindrical shape.**

Capacity	2	4	5	8 oz.
Each	$1.00	1.25	1.50	1.75

955. — **Separatory, globe shape,** glass, stoppered.

Capacity	1	2	4	6	8	16 oz.
Each	.80	.90	$1.00	1.25	1.40	2.25

956. — **Separatory** heavy glass, **globe shape,** stoppered.

Capacity	Pt.	Qt.	½	1 gal.
Each	$2.25	2.75	3.25	4.25

957. — **Separatory, Squibb's,** with stopcock.

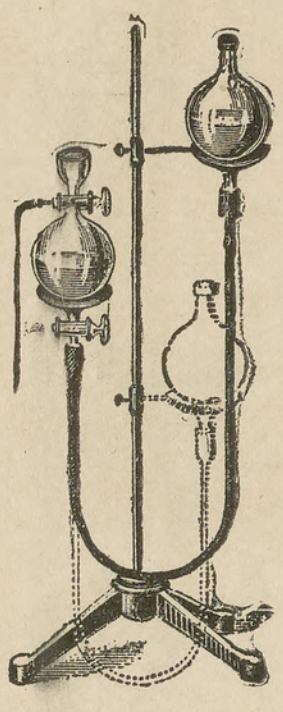
Capacity	4	8 oz.
Each	$1.25	2.00

958. — **Separatory, Schuetze's** (Jl. Anal. Chem., 1888, P. 79.)..... **2.50**

959. — **Separatory, Hare's,** with ground in glass rod.

Dia.	3	4	5	6 in.
Each	.50	.60	.70	.90

RICHARDS & CO. LTD. New York Chicago Wien Hamburg



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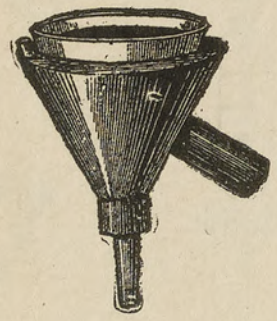

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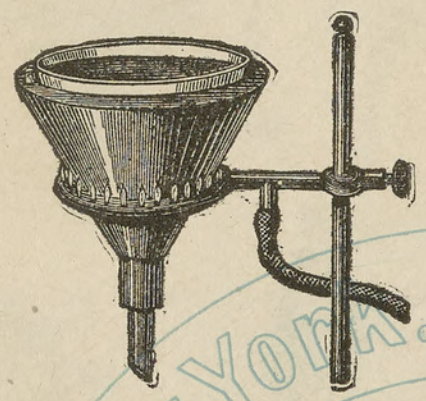

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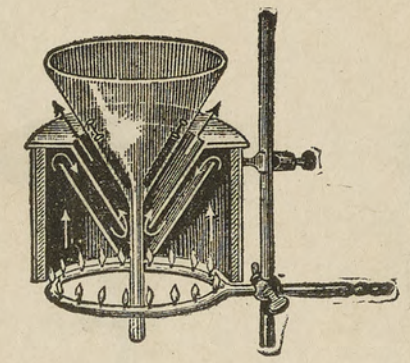

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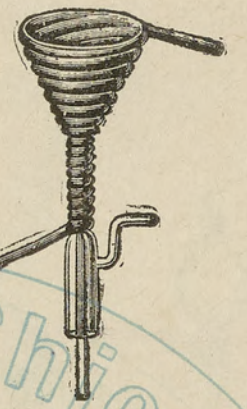

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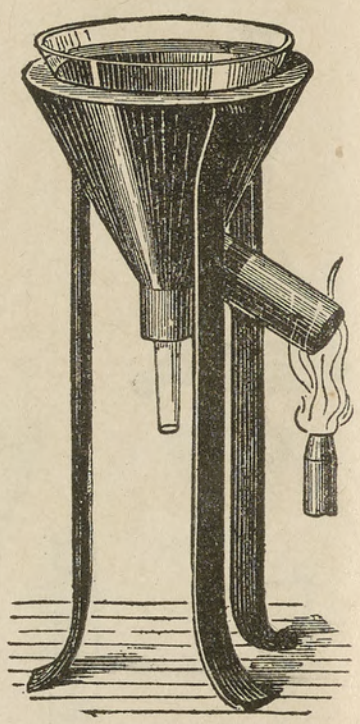

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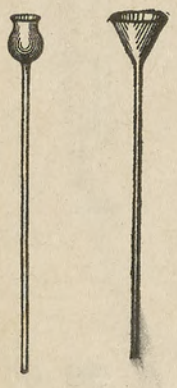

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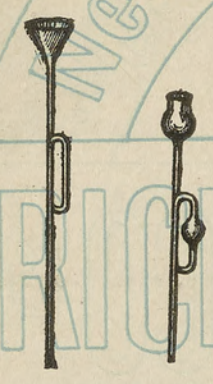

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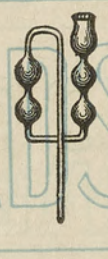

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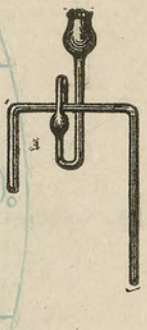


974



975

No.

960. **Funnels, Separatory, Low's,** with 3 way patent stopcock.
The advantages are that the layer of immiscible solvents can be drawn off from the bottom of the funnel through a separate tube; capacity, 350 to 400 cc. **$3.00**

961 — **Separatory, Drechsel's.**

Capacity of each bulb.	8	16	32 oz.
Glass part with rubber connections,	**$5.00**	**6.00**	**7.00**

962. — **Hot Water,** for hot filterations, dia. 6½ in **3.00**
963. — **Hot Water,** on legs **4.00**
964. — **Hot Water,** of copper, with ring burner and support; 6 in. glass funnel, complete **6.00**
965. — **Hot Air,** after **Lothar Meyer,** with support and ring burner, complete **8.00**
966. — **Steam or Hot Water,** with glass funnel, complete **2.50**
Heaters for above see: Water Heaters.

967. **Funnel Tubes,** thistle top.

Length	10	12	15	20	25	30 in.
Each	**.10**	**.12**	**.15**	**.20**	**.25**	**.30**

968. — Conical top.

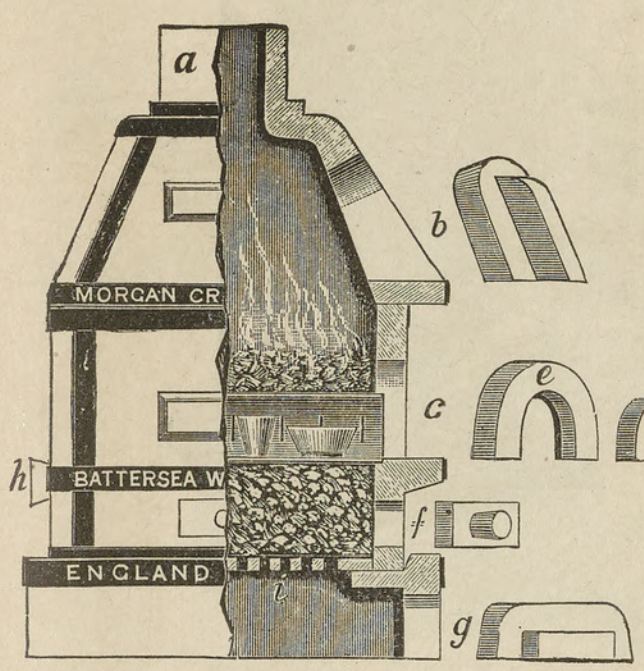
Length	10	12	15	20	25	30 in.
Each	**.12**	**.15**	**.20**	**.25**	**.30**	**.35**

969. **Funnel or Safety Tube,** bent; Thistle top ..... **.20**
970. — Bent; Conical top ..... **.20**
971. — With bulbs, thistle top.

With	1	2	3	4 bulbs.
Each	**.25**	**.30**	**.35**	**.40**

972. — **Babo's,** ..... **.75**
973. — **Vogel's,** ..... **.30**
974. — **Welter's,** ..... **.50**
975. — **Welter's,** with 2 valves, ... **.50**

New York. Chicago RICHARDS & CO. LTD. Berlin. Hamburg.



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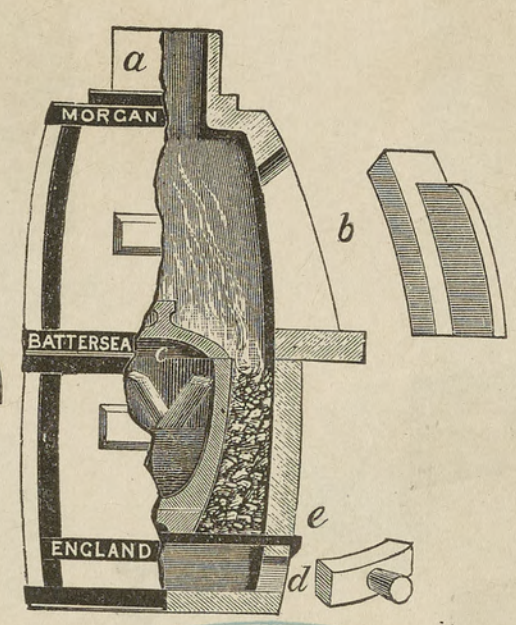

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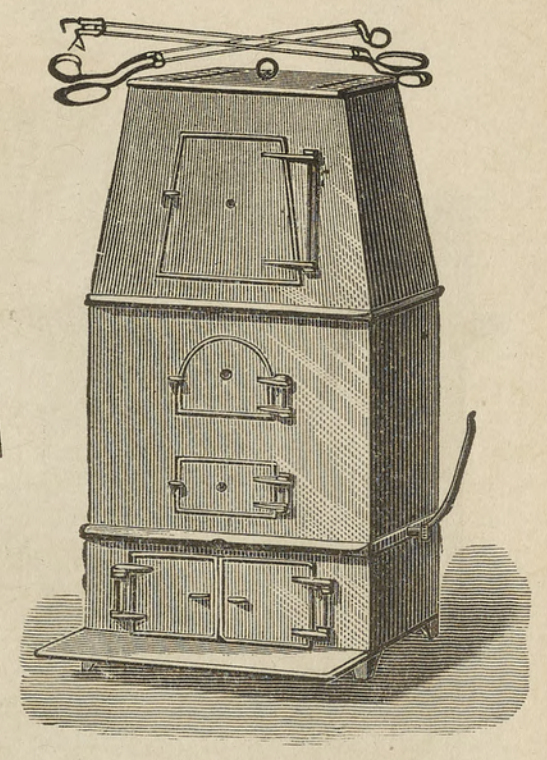


978

FURNACES.

A FOR COAL, COKE OR CHARCOAL.

No.

976. **Furnaces, Assay, Battersea,** in three sections.

The strongest and best clay furnace ever made. Never breaks in transportation, and will stand constant use for years. Hundreds of them are in use throughout the country, and are giving complete satisfaction.

a, Socket on which to fix iron chimney. *b*, Door for fuel. *c*, Muffle. *d*, Door of muffle. *e*, Muffle arch. *f*, Door for stirring fire. *g*, Doors for regulating draft. *h*, Support for muffle. *i*, Iron grate.

No.	Exterior Dimensions. Width and depth front to back.	Interior Dimensions. Width and depth front to back.	For Battersea Muffles.	Price.
A	12½ in.	9¼ in.	A B C D	$17.00
B	13¼ "	10 "	B C D E	19.00
C	14½ "	11 "	C D E F H	24.00
D	15½ "	12 "	D E F G H	26.00
E	16¼ "	12¾ "	E F G H	29.00
F	17½ "	13¾ "	F G H J	33.00
K	23 "	19 "	K L	67.00

977. — for **melting** gold, silver, copper, etc., **Battersea;** of clay, ironbound.

a, Socket on which to fix iron chimney. *b*, Door for putting in crucibles and for coking. *c*, Crucible. *d*, Door for regulating draft. *e*, Door for stoking. *f*, Iron grate.

No.	Diameter.	Height.	For Battersea Crucibles Round and Triangle.		Price.
A	9¼ in.	17½ in.	D	V	$ 8.50
B	9¾ "	20 "	E	S	10.50
C	11 "	22 "	H		12.50
D	13¾ "	26 "	J		15.00
E	14½ "	28 "	K		17.50
F	18 "	32 "	M		27.00

978. — **Assay, Judson's. Sectional No. 1.** Bottom section cast iron; middle and top sections steel, **revolving grate,** with set of concentric rings for the top to use with sand baths.

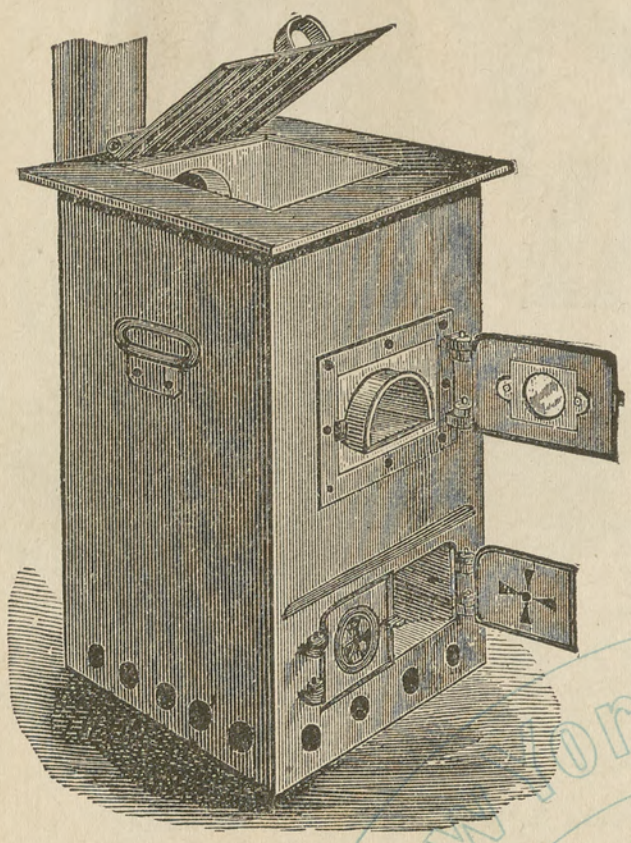
Height	Width	Depth	Size of Muffle
36	18	13	12x6x4 in.

Weight packed ready for shipment 450 lbs..... 40.00

979. — **Assay, Judson's. Sectional No. 2.** Same as No. I. but without concentric rings, muffle door double.

Height	Width	Depth	Size of muffle
42	22	16	15x9x16 in.

Weight, packed ready for shipment 650 lbs..... 50.00



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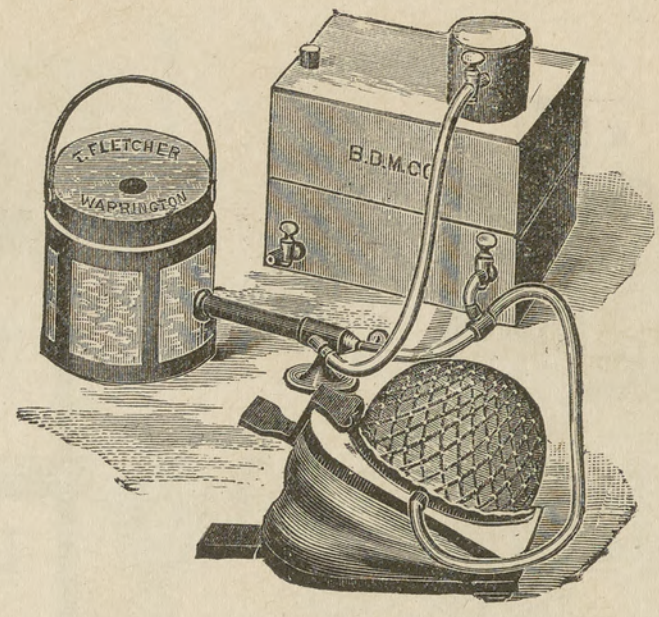

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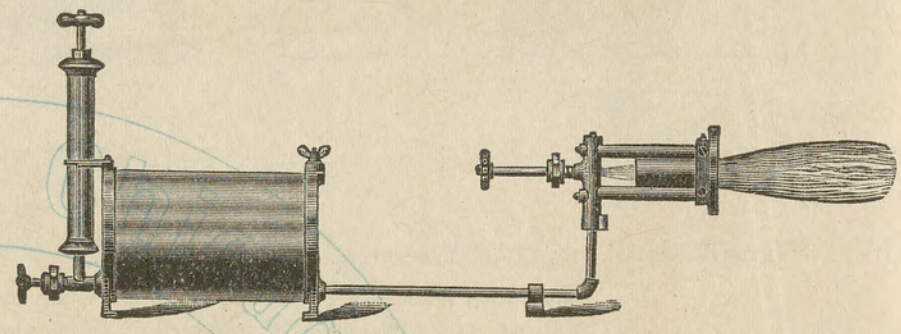


982

No.

980. **Furnace Assay, Brown's,** no complicated parts to get out of order. It can be used both for muffle work, and for crucible operations. There is no other furnace manufactured of similar dimensions and weight, which can accommodate so large muffles, and consequently produce so much work and so rapidly. Being made of heavy sheet-iron, it cannot be broken by handling, nor injured by heating. This furnace, packed for shipment, weighs 125 lbs..... **$20.00**

b, FOR GASOLINE.

981. **Furnace, Fletcher's, for gasoline,** simple and safe arrangement for burning the vapor of gasoline, giving a power and efficiency full equal to that which can be obtained by a large gas supply. The arrangement is in every way as simple as when gas is used, requiring no more trouble or attention.

981a.t. —— **for No. 1. Black Lead Crucible,** Blower, Generator and Tubing complete, for use with either gasoline or coal gas..... **25.50**

981b.t. —— **for No. 3. Black Lead Crucible,** Blower, Tubing and Generator complete..... **30.00**

982t. **Furnace, Hoskin's patent hydrocarbon blow-pipe and furnaces using 74 degrees gasoline. For assayers, chemists, jewelers, etc.**

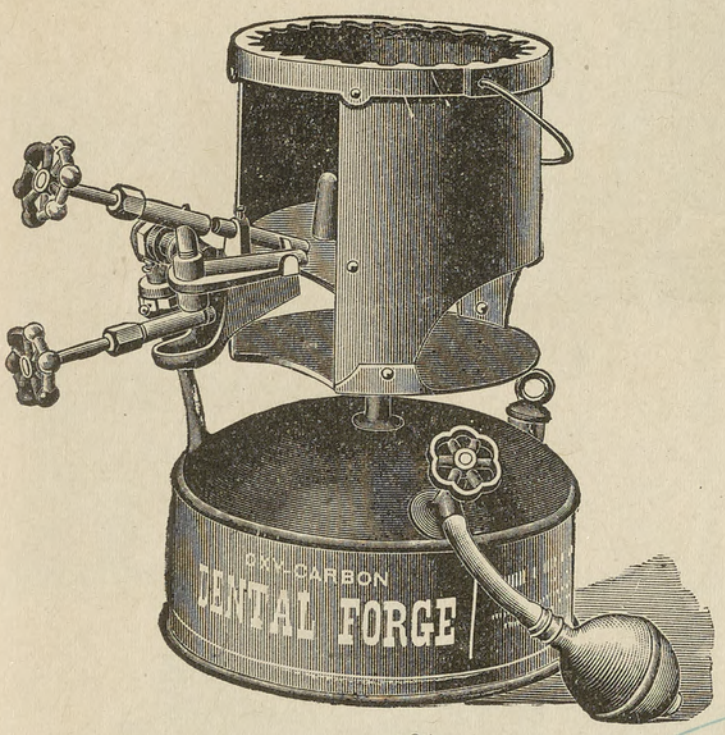
A most convenient and safe apparatus for all furnace work, such as smelting, scorifying, cupelling, fusing in platinum crucibles, testing of smelting charges, roasting, enameling, etc. Its action can be controlled from the heat of an ordinary Bunsen burner to that required to melt cast iron. The maximum effect can be produced in about five minutes from the start. The expense of running is about five cents per hour, and in most of our large cities will not exceed three cents per hour.

982a.t. **Furnace Blow-Pipe, No. 2, Hoskin's, for Gasoline,** with half gal. tank, made entirely of brass, very strong, will not rust..... **23.00**

983t. **Furnace Blow-Pipe, No. 3, Hoskin's for Gasoline,** with one gallon tank, otherwise same as No. 2. **26.00**

Extra burners..... **6.00**

NOTE: Either of these blow-pipes may be used with any of the crucible or muffle furnaces.



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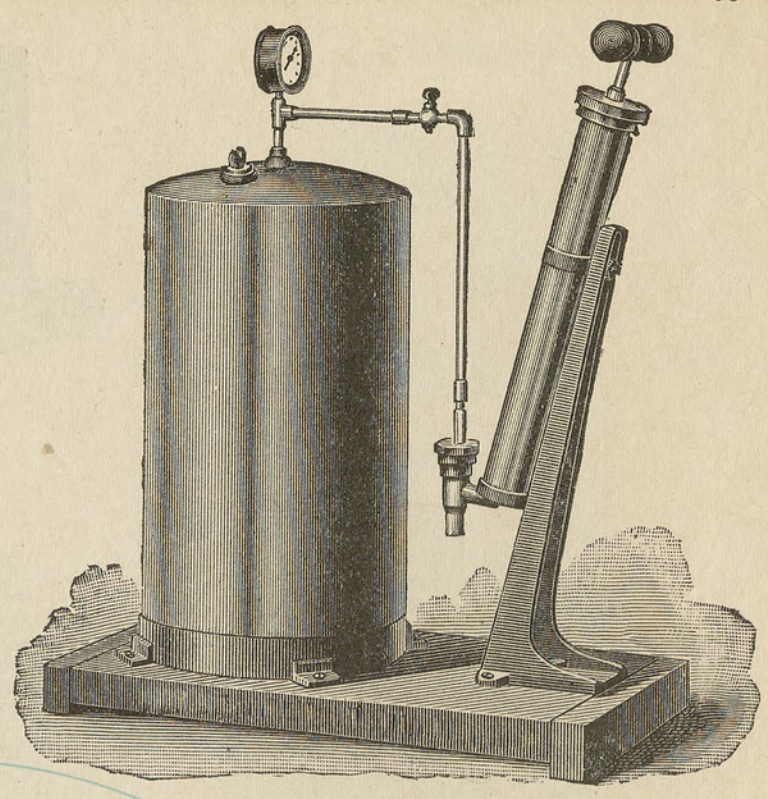

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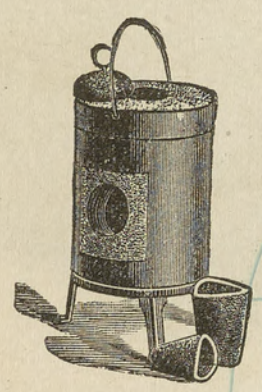

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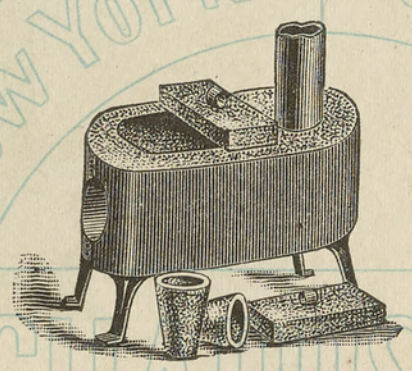

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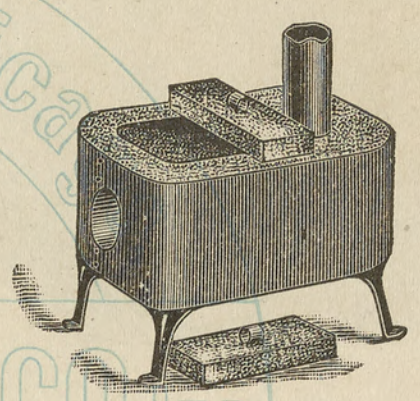


989

No.

984t. **Furnace, Fletcher's Oxycarbon,** for gasoline. For melting metals, soldering, heating water, etc. This furnace will be recognized as an improved form of the well-known plumbers' furnace, which is in universal use among that class of artisans. As will be seen by reference to the engraving, the furnace has two burners; the lower one discharges its vapor into a cast-iron casing; from whence it issues as a broad, flat flame. The heat for vaporizing the gasoline is derived from this burner. The flame from the upper burner issues from a small, round tube, and has the form and properties of a **blow-pipe flame**. Both burners may be used together, or the lower one alone, or it may be turned down to a small flame, and the upper one used as a blow-pipe. The flames can be turned in any direction.
Dimensions; dia. of reservoir 9 in.; height with casing in place, as shown in cut, 12 in..... **$10.00**

985t. **Furnace Blow-Pipe, No 4, Hoskin's, for Gasoline,** with six gal. tank, made of heavy copper, with suitable pump, pressure gauge, ten feet of pipe, elbows, etc., with two burners, complete..... **50.00**

NOTE: This tank is of very best workmanship and is specially designed for use with No. 4 Muffle furnace, but will be found very convenient when large quantities of continuous work is required with any of the furnaces quoted.

986t. **Furnace Crucible No. 1, Hoskin's,** taking Battersea U or Colorado B Crucible, or equivalent sizes, 4 in. dia., 5½ in. deep inside..... **4.00**

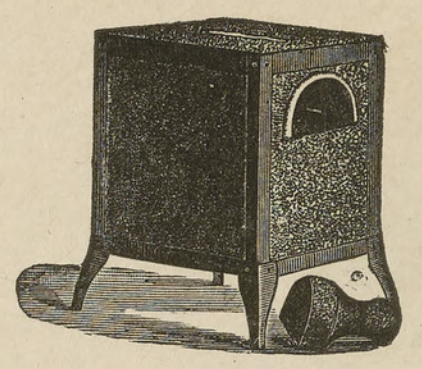
987t. **Furnace Crucible, No. 2, Hoskin's,** taking Battersea K round Crucibles, or equivalent sizes, 5 in. dia. 6½ in. deep inside..... **5.00**

988t. **Furnace Crucible, No. 3, Hoskin's,** long form, taking two Colorado B Crucibles, Battersea, or equivalent sizes, a very effective furnace..... **7.00**

989t. **Furnace Crucible, No. 4, Hoskin's,** taking four No. 9 Battersea Fluxing Crucibles, or equivalent sizes. This is a very efficient furnace for large quantities of work..... **12.00**

990t. **Furnace Crucible, No. 5, Hoskin's,** for large crucibles taking Battersea Q Crucible, 12 in. high, 8⅜ in. wide, or equivalent sizes, and requires two No. 3 Blow-pipes or one No. 4, Blow-pipe..... **25.00**

New York. Chicago. Hamburg. RICHARDS & CO. LTD.



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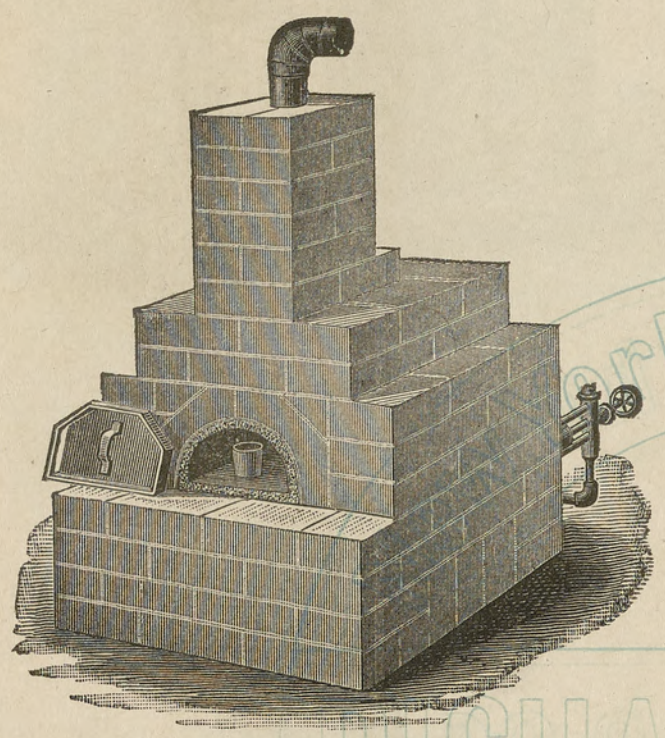
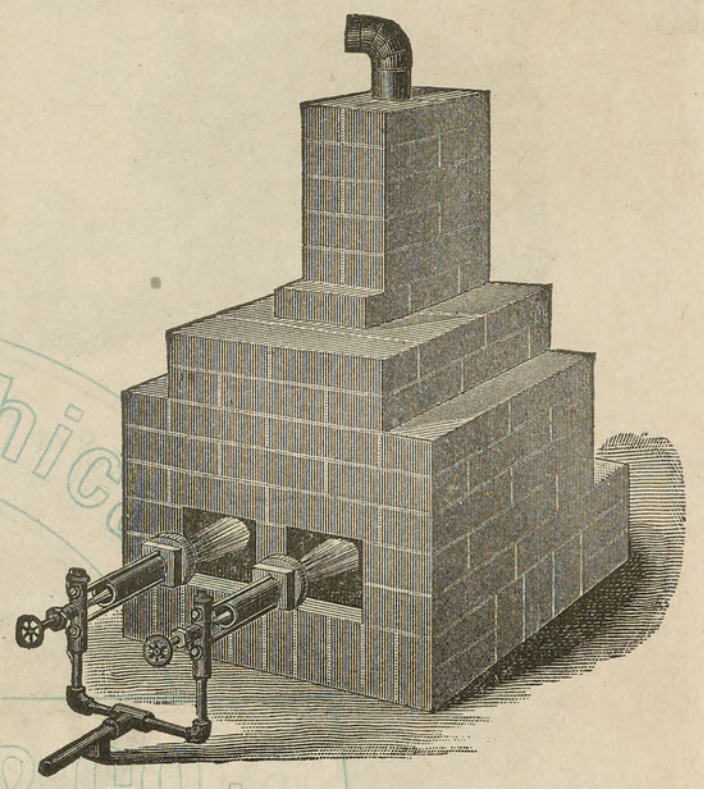


993 (Front View.)



993 (Back View.

No.

991t. **Furnace, Muffle, No. 2, Hoskin's,** taking C Battersea Muffle, 8x4¾x3 in..... **$10.00**

992t. **Furnace, Muffle, No. 3, Hoskin's,** taking F Battersea Muffle, 10x6x4 in..... **15.00**

NOTE: Either of these Muffle Furnaces may be raised to a *good heat for scorification in less* than 15 minutes.

993t. **Furnace, Muffle, No. 4, Hoskin's,** taking L Battersea muffle 15, in. long, 9 in. wide, and 6 in. high, which requires two No. 3 blow-pipes, or one No. 4 blow-pipe. All special interior fire bricks, with full directions for setting and bricking up with common brick, including one muffle..... **25.00**

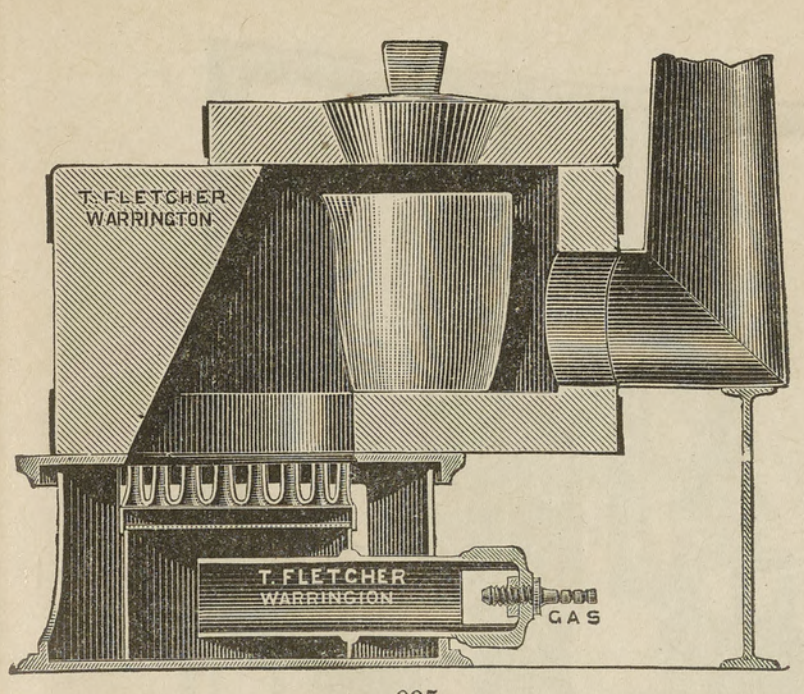
NOTE: This Furnace can be raised to a *good heat* for scorifying or *crucible work in the muffle* in 30 minutes.

C, FOR GAS, DIRECT DRAFT.

994t. **Furnace, Fletcher's Crucible.** This will take crucibles up to 4x3½ in., holding about six pounds when full, and with ½ in. gas pipe and a pressure of gas equal to 2 in. of water, supplying about 50 feet per hour, will melt a crucible full of gold, silver or brass in about 30 minutes, and the same quantity of cast iron in about 60 minutes from the time the gas is first lighted. It is made in a very substantial manner, and is recommended as a first-rate furnace for manufacturing jewelers, reducing photo waste, etc. The lid never gets very hot, and can be lifted away by a handle provided for the purpose. Furnace, six feet of pipe, crucible and tongs, complete. (Cut page 95.) **16.00**

Price of separate parts.

Plumbago Crucibles, No. 3,	each	.30
Plumbago Cylinders		1.00
Fire-clay Casing		3.00
Lid		1.00
Grate		1.00
Burner		8.00
Burner Tubes, all sizes	each	.25
Wire Gauze Rings	"	.25



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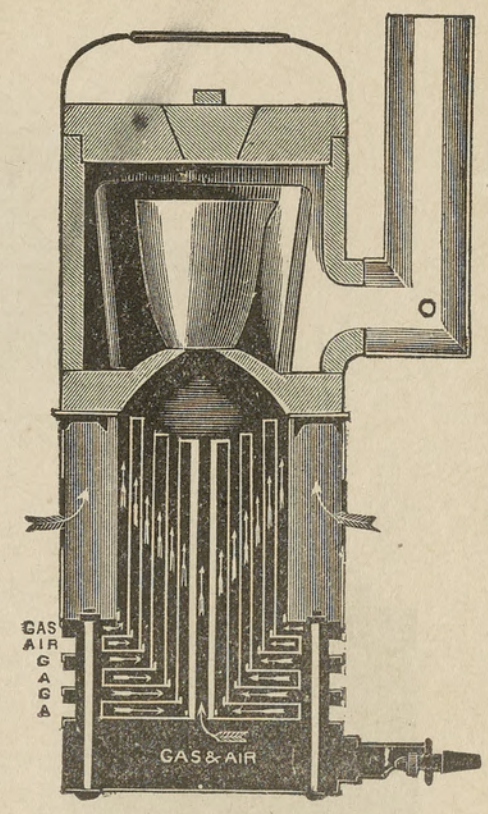

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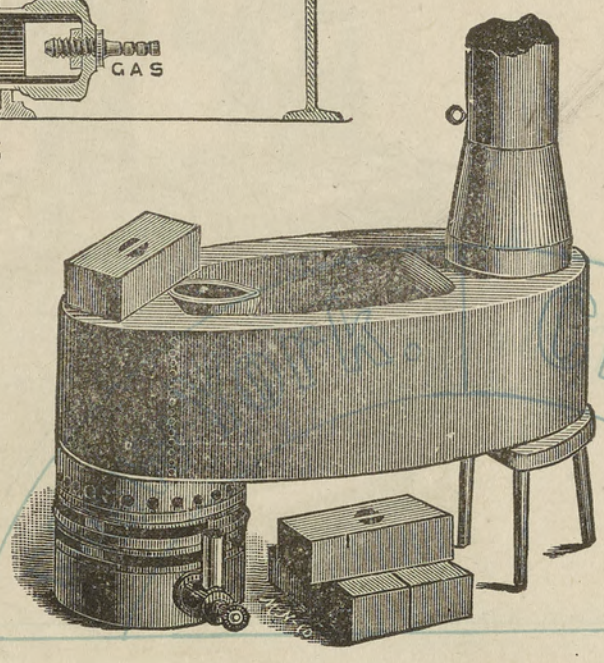


996

No.

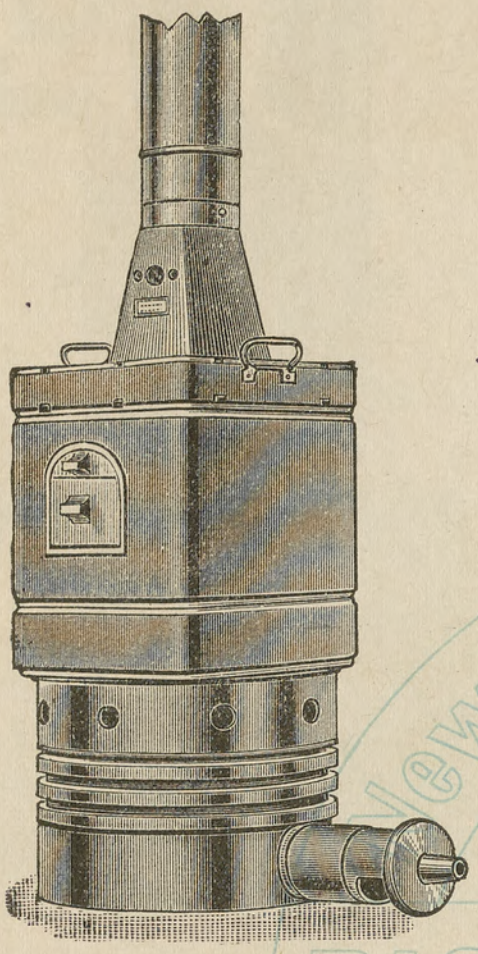
995t. **Furnace, Crucible, Fletcher's,** direct draft for gas, this form of furnace is powerful enough to melt gold, silver, brass and copper, but is not recommended for cast-iron. It can be used for scorifying and cupelling. The lid can be pushed sideways sufficiently to give access to the interior of the furnace. Prices include one length of pipe, damper, crucible and tongs.

No. 1 for No. 1 Black Lead Crucibles	$12.00
" 2 " 3 " "	14.00
" 3 " 16 " "	45.00

996t. **Furnace, the Monitor, Fletcher's** new form of Gas Assaying Furnace, suggested by Walter Lee Brown, Chicago, Ill.—In this furnace the flame rises from the burner, shown at the left of the engraving and passes horizontally through the body of the furnace to the chimney. Its form and mode of operation are somewhat similar to that of a reverberatory furnace, the movable bricks when in place forming the roof. The exterior dimensions are 20 in. long, 7 in. wide, and 5½ in. deep. It will accommodate four 2¾ in. scorifiers, or eight to ten cupels at once. The size of the floor is 10x3⅞ in. and the cavity is 3⅝ in. deep, accommodating a No. 1 plumbago crucible. As there is no direct heat *under* the floor of the furnace, a platform is furnished on which scorifiers or cupels are placed. The heat passing under as well as over the platform, the articles placed thereon are heated quickly and evenly. The gas supply should come through a ½ in. pipe from a tap at least ⅜ in. clear bore, so that the gas will be delivered at full pressure. Proper connection should be made by means of small stove-pipe from the furnace to a chimney. One length of chimney pipe with damper, crucible and tongs, are included in price of furnace 18.00

Price of separate parts.

Fire-clay Slabs for covers ..... each	.50
Body of Furnace	8.50
Platform	.15
Supports for Platform ..... each	.05
Tripod	.50
Burner	6.00
Chimney Pipe, per length	.35



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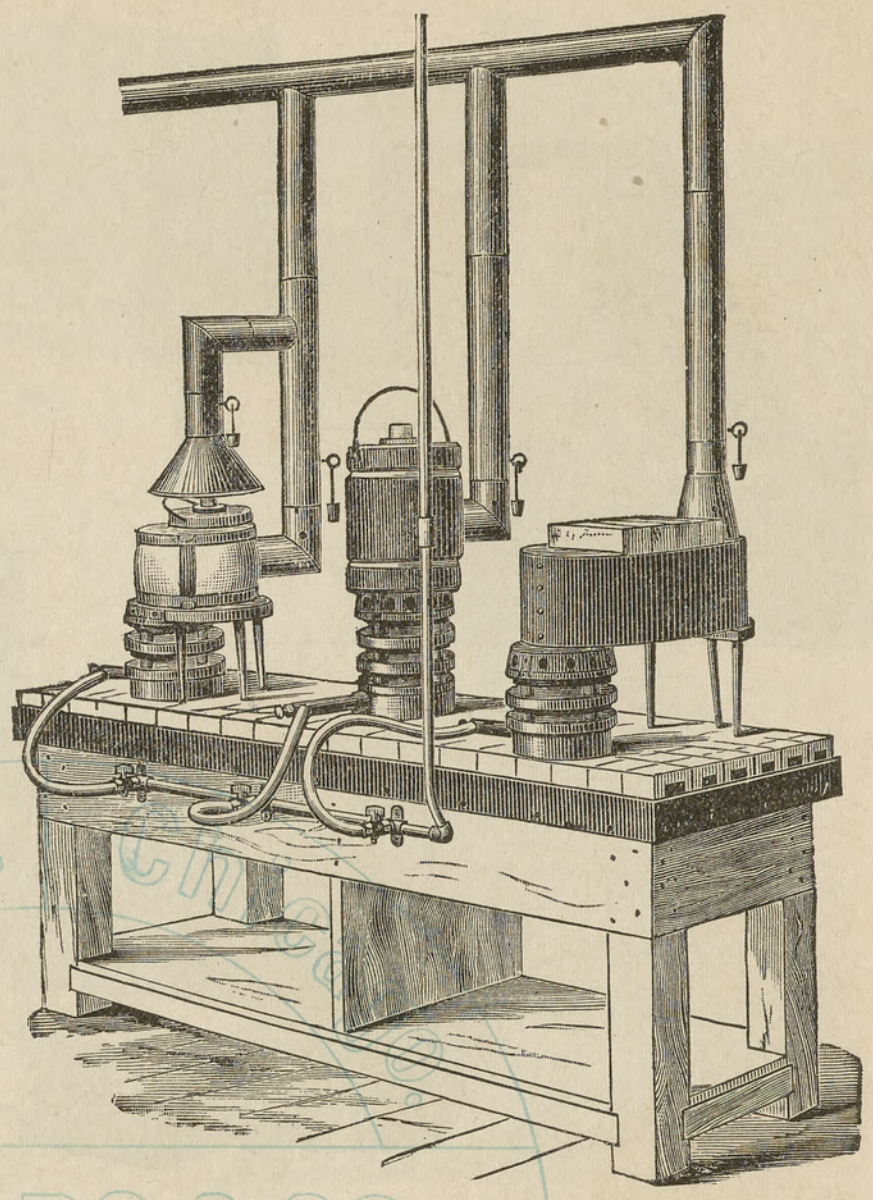


1001

No.

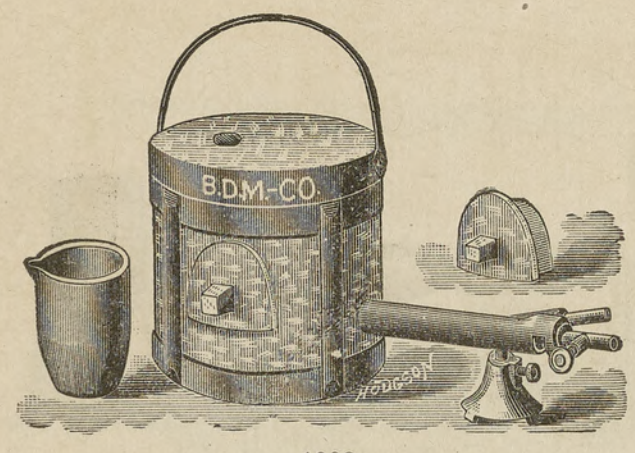
997t. **Furnace, Muffle, Fletcher's,** for assaying, enameling, and all purposes where exact temperatures are required, not exceeding the fusing point of copper.

997a.t.	—	**Size No. 3.** Inside muffle space 3x4x2½ in. high. Requires ½ in. bore gas pipe	$17.00
		Extra Plumbago	1.00
		Extra Plumbago Domes	1.00
		Extra Chimney Pipe, per length	.35
998t.	—	**Size No. 4.** Inside muffle space 3⅞x5x3 in. high. Requires ¾ in. clearboar gas pipe and tap	20.00
		Extra Plumbago Muffles	1.25
		Extra Plumbago Domes	1.25
		Extra Chimney Pipe, per length	.40
999t.	—	**Size No. 5.** Inside muffle space 4½x7x3¾ in. high. Gas supply as above	30.00
		Extra Plumbago Muffles	1.50
		Extra Plumbago Domes	1.50
		Extra Chimney Pipe, per length	.45
1000t.	—	**Size No. 6.** Inside muffle space 5¼x8x4¼ in. high. Requires 1 in. clear boregas pipe and tap.	45.00
		Extra Plumbago Muffles	2.50
		Extra Plumbago Domes	2.50
		Extra Chimney Pipe, per length	.60

Chimney 6 feet high are included in the above prices.

1001t. **Furnace, Fletcher's, Assayer's Plant** of **Gas Furnace** direct draft, arranged by Walter Lee Brown for use in his laboratory. A full description of the plant appears in the fourth edition of his "Manual of Assaying: Gold, Silver, Copper and Lead Ores." The furnace at the left is for roasting sulphurets, etc., the center one is for crucible fusions, it taking an "S" Battersea crucible (5 in. deep by 4½ in. across), and the one at the right is the "Monitor" furnace for scorification and cupellation. The price given includes the three furnaces, chimney pipe, the horizontal gas pipe and three ⅜ taps, as illustrated. The vertical gas pipe, rubber tubing for connection and bench are not furnished except as extras 50.00

RICHARDS & CO. LTD. New York. Chicago. London. Hamburg.



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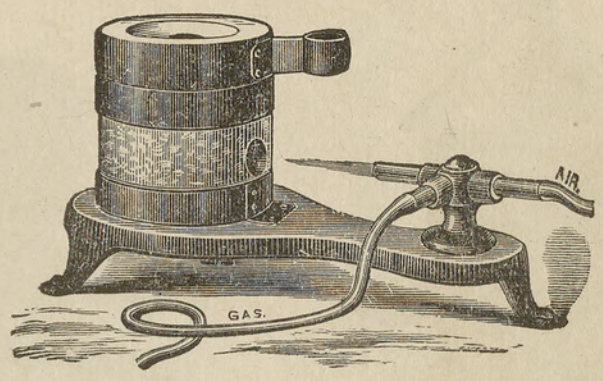

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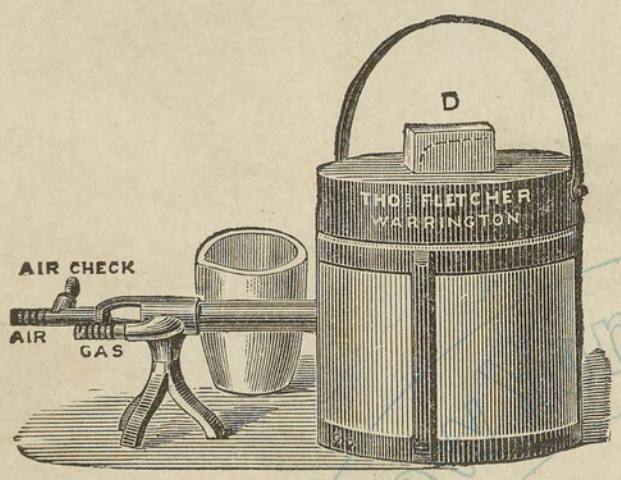

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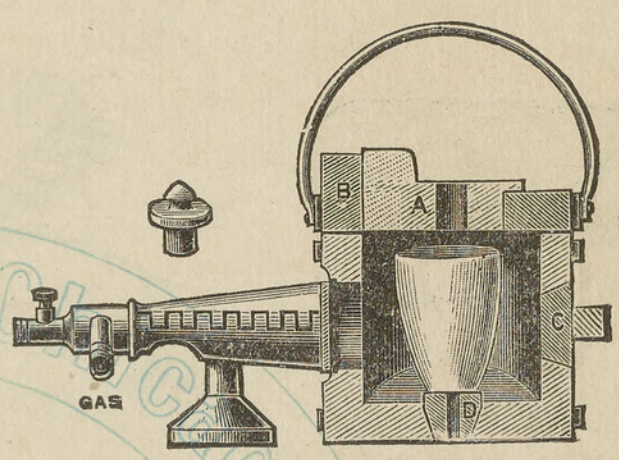


1005

No. D, FOR AIR BLAST.

1002t. **Furnace. combined Crucible and Muffle, Fletcher's.** For gas with Air Blast. This is supplied with muffle fittings and can be used either as a crucible or muffle furnace. The body of the furnace is large enough to receive a No. 6 Black Lead Crucible, holding twelve pounds of metal. The cover has a projection on one side, which will reduce the height of the cavity of the furnace some two in., or to the proper size to receive the muffle or a No. 3 Crucible. By reversing the cover, a No. 6 Crucible may be used. Use the No. 9 B or 10 B Foot Blower with this furnace. The gas supply should be from a ½ in., or still better, a ¾ in. pipe.

1002a.t. Combined Crucible and Muffle Furnace, for gas, without foot blower **$11.00**

1002b.t. " " " " as above, for **gasoline,** including generator and tubing, **27.00**

1003t. — **Fletcher's Crucible** with improved gasburner for Air Blast. The casing holds the heat so perfectly that the most refractory substances can be fused with ease, using a Fletcher foot blower. Half a pound of cast iron requires from seven to twelve minutes for perfect fusion; the time depending on the gas supply and pressure of air from the foot blower. The crucible will hold about ten ounces of gold. The power which can be obtained is far beyond what is required for most purposes, and is limited only by the fusibility of the crucible and casing. Gas from a ⅜ in. supply pipe will work it efficiently. About ten cubic feet of gas per hour is sufficient for most purposes. Crucibles must not exceed 2½ by 2 in. The No. 9 A or No. 10 A Foot Blower will operate the furnace satisfactorily, except for very high temperatures (fusion of steel, etc.), which require a heavy pressure of air. Without Foot Blower **3.00**

Extra Furnace Body ..... **.75**

Extra Furnace Body and Cover **1.10**

Burner only **1.50**

Stand, less burner ..... **.90**

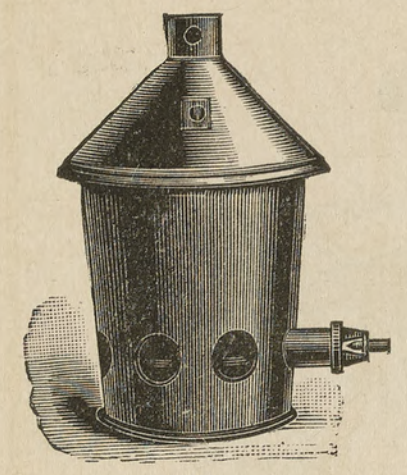
Plumbago Crucibles, No. 00 ..... each **.20**

1004t. — **Fletcher's Perfected Injector Gas Furnace.** For metallurgists, jewelers, chemists manufacturers of artificial gems, iron and brass castings, and other purposes where an ordinary furnace is useless or unreliable.

1004a.t. Taking No. 1. Black Lead Crucible, price, without blower **4.50**

1004b.t. Taking No. 3 Black Lead Crucible, price, without blower **7.00**

1005t. — **Fletcher's Lecture and Experimental.** Working with the same burner as a draught or blast furnace at any temperature up to the fusion of the furnace casing, and adapted for crucibles, muffles, tubes, cupels, distillation by descension, treatment of refractory substances with gases at high temperatures, small forgings, roasting ores, etc. This furnace is specially designed for the lecture table, and has, we believe, power and capabilities equal to any demands which may be made on it. It must be remembered that, although the power of the burner is almost without limit, it is not possible at present to supply any furnace casing which will stand excessively high temperatures, or the contact of fluxes, without damage **18.00**



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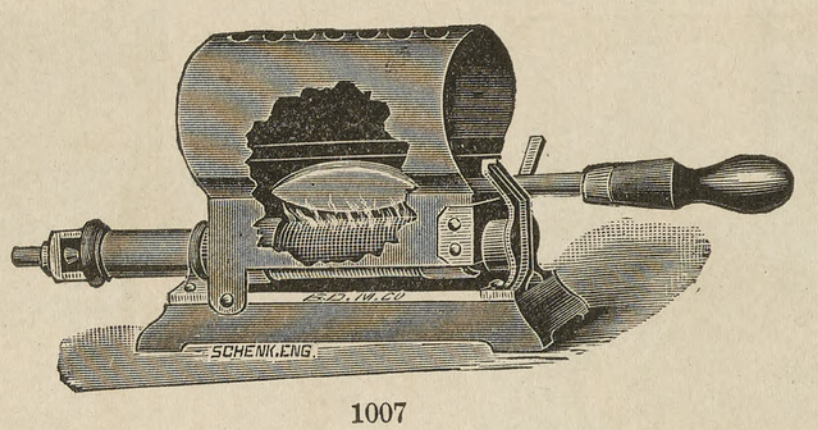

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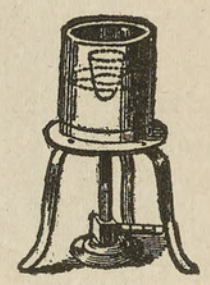

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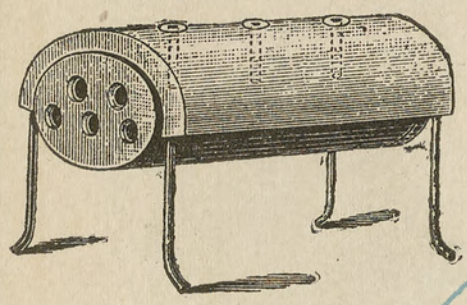

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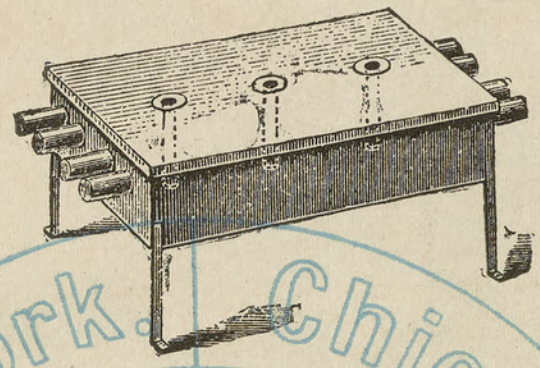

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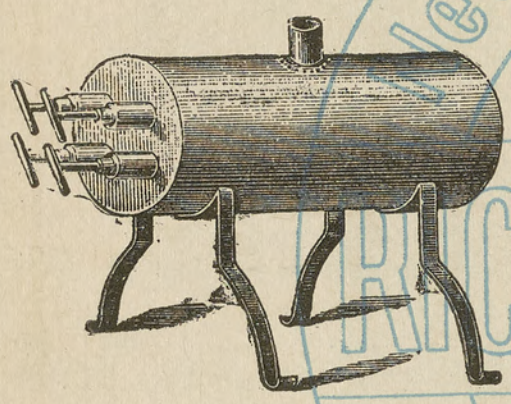

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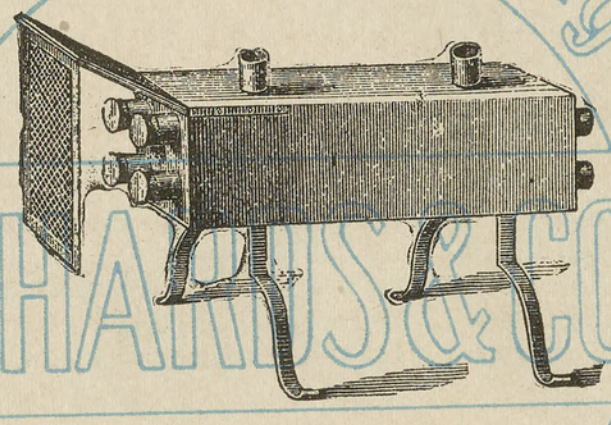

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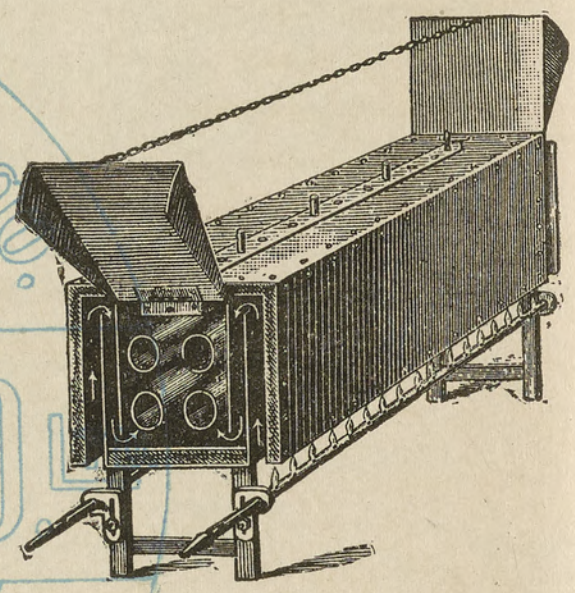


1013

No.

1006t. **Furnace, Fletcher's Ladle Furnace** with Fletcher's Solid Flame Heating burner, for melting lead tin, zinc, and their alloys. This is a better ladle furnace in every respect than any other made. The burner is simple, safe, and works equally well with any gas supply available, giving proportionate speed of working. It can be removed from the casing and used for other purposes if desired. The worst possible accident to the burner can be remedied in a minute at the cost of a few cents. Capacity of burner, 35 ft. per hour. Supply pipe, $\frac{3}{8}$ in. (Ladles extra)..... **$3.50**

1007t. — **Fletcher's Gas Furnace.** For heating soldering bits and general use in metal pattern work, electrotyping, etc. This furnace has been carefully devised and is believed to meet all the requirements of those who have occasion to use tinner's solder. Two flames issue horizontally from narrow slits, and meet under the soldering iron, which is enveloped by them as they rise.. **1.75**

1008. — **Erdmann's** for gas, complete, with burner..... **1.25**

E, Furnaces, for Heating Substances in Sealed Tubes.

1009. **Furnace, Carius,** for 5 tubes up to 1 in. dia..... **15.00**

1010. — **Erlenmeyer's**

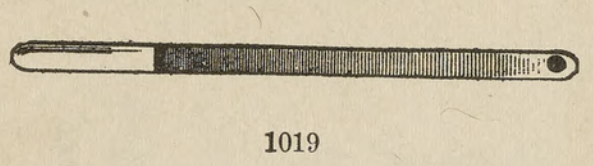
	For	2	4 tubes.
	Each	**$7.00**	**9.00**

1011. — **Habermann's** of wrought iron, brazed, can also be used as oil bath ; for 4 tubes, with protecting wire gauze..... **24.00**

1012. — **Habermann's** of wrought iron ; cylindrical ; the tubes are closed by screws **26.00**

1013. — **Lothar Meyer's** of iron, with adjustable gasburners and iron shutters, length of tubes, 25 in., dia., $1\frac{1}{4}$ inch.

	With	4	8 tubes.
	Each	**$35.00**	**40.00**



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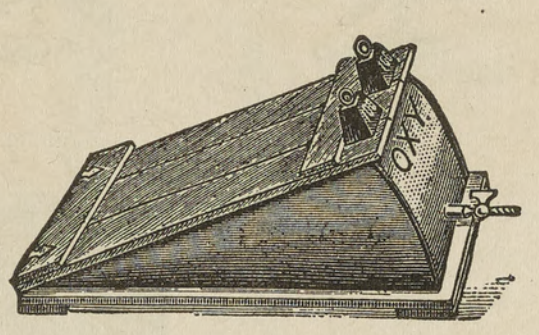

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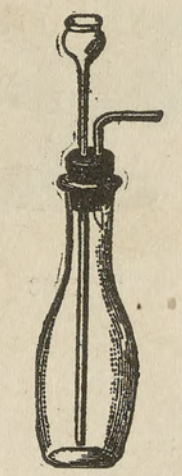

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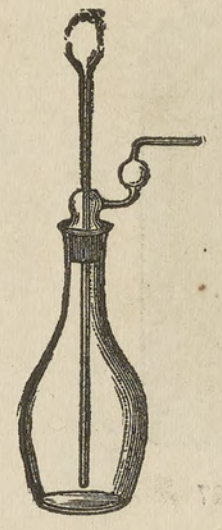

1025

GASES.

No.

1014. **Ammonia Gas,** anhydrous, liquefied; in cylinders of about 10 pounds.....per lb. $ .75

1014a. —— **Same,** in cylinders, of about 100 pounds..... " .65

1015. **Carbonic Acid Gas,** liquefied; in cylinders of about 10 pounds..... " .50

1015a. —— **Same,** in cylinders of about 20 pounds..... " .40

1016. **Hydrogen Gas,** compressed, under 225 pounds pressure, in steel cylinders of 20, 25 and 50 cubic feet; per cubic foot..... .05

1017. **Nitrous Oxide,** gas, liquefied, in cylinders, giving about 100 gallons of gas.....per gal. .05

1017a. —— **Same,** in cylinders, giving about 450 gallons of gas..... " .04

1018. **Oxygen Gas,** compressed, under 225 pounds pressure, in steel cylinders of 20, 25 and 50 cubic feet; per cubic foot..... .20

1019. **Carbonic Acid in sealed glass tubes,** tube containing so small a quantity of liquid carbonic acid as to be invisible at ordinary temperature. The liquid appears on cooling the tube..... 8.00

1019a. —— Tube containing enough of carbonic acid to give about 2—5 ccm. liquid at ordinary temperature, and which disappears on warming the tube in the hand..... 8.00

1019b. —— Tube half filled with carbonic acid to show the fluidity..... 8.00

1019c. —— Tube containing enough carbonic acid gas to fill the entire tube when heated to 25° C..... 8.00

1020. **Gas Bags,** of best rubber, oval.

Capacity	1	2	3	4	5	6	8	10 gal.
Each	$1.25	1.75	2.00	2.50	2.75	3.00	4.00	5.50

1920a. Stopcocks for same, each, additional..... 1.00

1021. **Gas Bags,** of best rubber, square, without stopcocks.

Size	18x24	20x30	24x30	30x40 in.
Capacity	15	25	35	55 g
Each	$7.25	9.25	11.25	14.00

1021a. Socket and stopcock for same, additional..... 1.50

1022. **Gas Bag Pressure Boards,**.....per pair. 7.00

1023. **Gas Bottles,** Bohemian, with ring neck.

Capacity	4	8	16	32 oz.
Each	.15	.20	.25	.35

1024. —— Filled with rubber stopper, funnel and delivery tube.

Capacity	4	8	16	32 oz.
Each	.50	.60	.70	.80

1025. —— Funnel and delivery tube in one piece, ground into the neck.

Capacity	½ pt.	1 pt.	1 qt.
Each	$1.00	1.25	1.50

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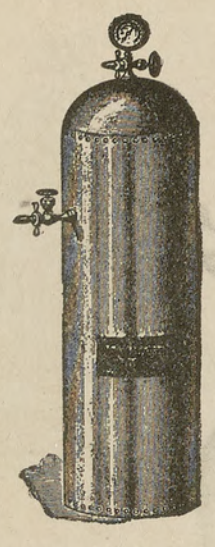

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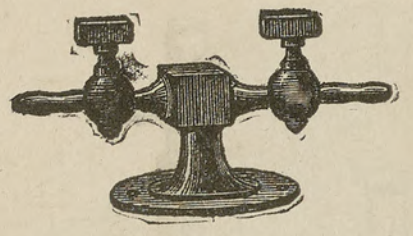

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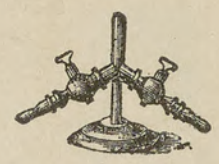

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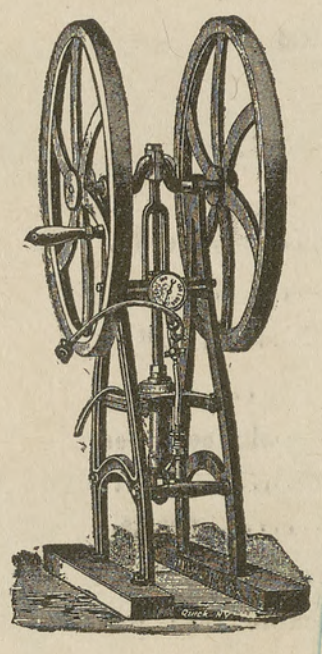

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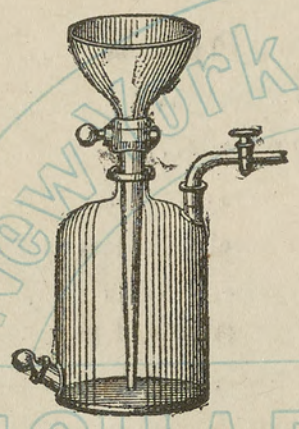

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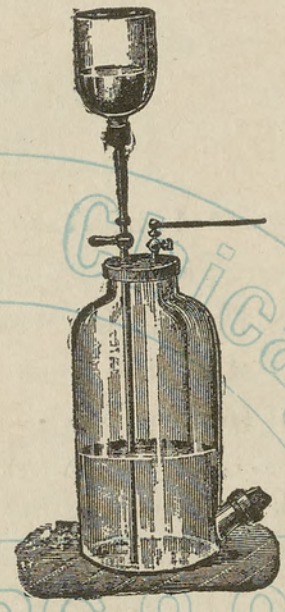

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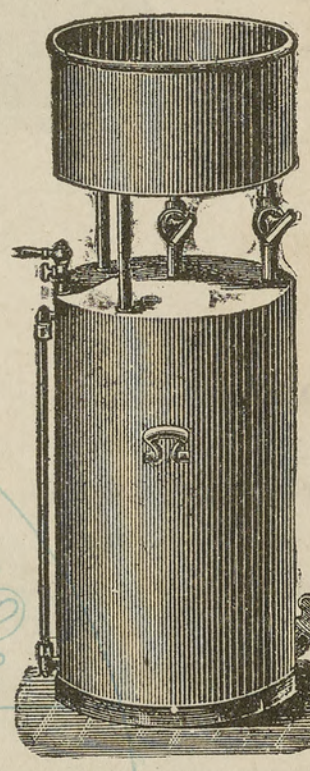

1031

No.

1026. **Gas Compressor,** No. 12.

This pump is widely known as the cheapest, most durable and effective pump for compressing gases or air into cylinders of all sizes. Owing to long experience of the manufacturer, this pump possesses all the modern improvements necessary for obtaining high pressure (300 lbs. to the square inch) even by hand power. The piston is so arranged, that the packing may be spread out until nearly worn away. The combination of the valves being perfect, this pump may be used for years with comparatively little attention. Height of pump from floor to top of wheel, 51 in.; floor space, 27x15 in.; dia. of wheels, 27 in.; dia. of chamber, 2¼x6½ in. stroke. Weight 250 lbs... **$110.00**

NOTE.—Adapted for use with electric motor.

1027. **Gas Cylinder,** of tinned steel, japanned with gauge registering from 1 to 100 lbs. pressure and latest improved high pressure valves, warranted not to leak. Also provided with couplings for attaching the necessary rubber tubing. Size 10 in. dia. by 32 in. high **24.00**

1028. —— of copper, highly finished and plated, with gauge, registering from 1 to 100 lbs. pressure; two accurately fitted air-cocks and couplings for attaching the necessary rubber tubing. Size 9 in. dia. by 16 in. high **20.00**

1029. **Gas Holder,** after **Berzelius,** entirely of glass; capacity 1 gal **9.00**

1030. —— after **Mitscherlich,** of glass with brass fittings; capacity 3 gal **20.00**

1031. —— after **Berzelius** and **Pepy,** with glass gauge.

		Capacity	5	10 gal.
1031a.	—— of japanned zinc,	Each	**$15.00**	**17.50**
1031b.	—— of copper	"	**20.00**	**25.00**

1032. **Gas Holder,** of glass, with brass fittings, capacity 4 gal **24.00**

1033. **Gas Distributor,** with two distributing connectors; on base **2.50**

1034. —— with three distributing connectors; on base **3.00**

1035. —— to supply two burners **1.50**

1035a. —— " " " " with two stopcocks **3.00**

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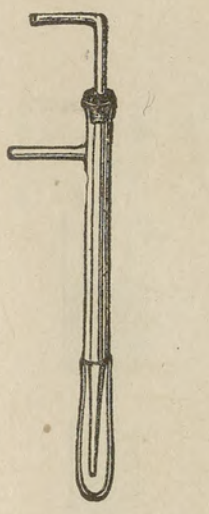

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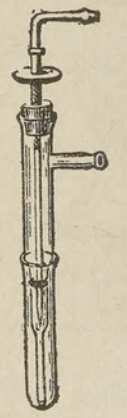

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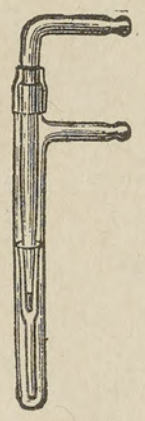

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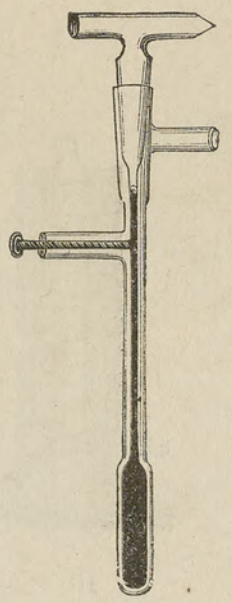

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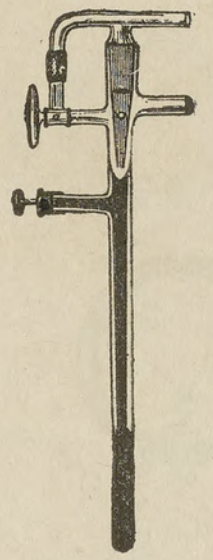

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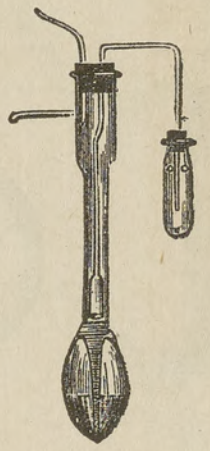

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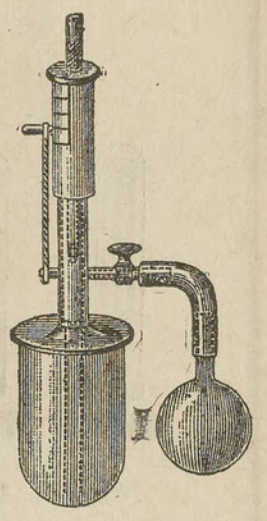

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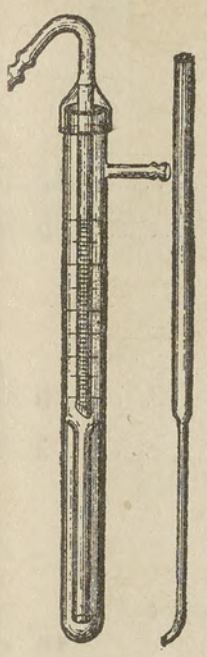

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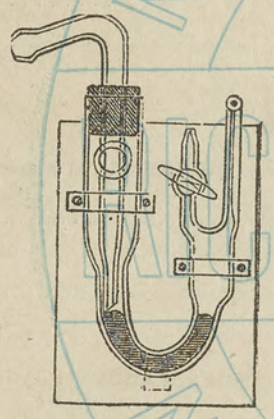

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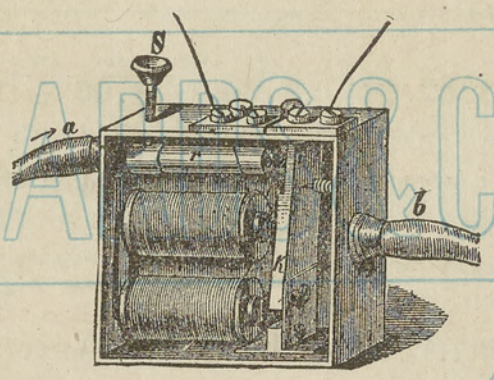

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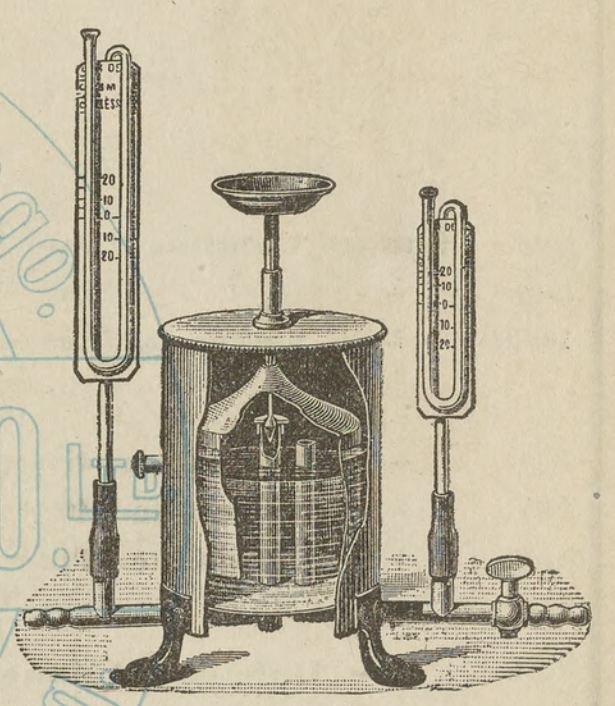


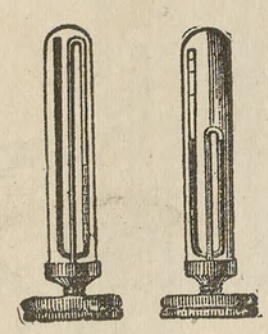
1047

GAS REGULATORS OR THERMOSTATS.

No.			
1036.	**Gas Regulator, Bunsen's,** all glass		$1.25
1037.	——	**Kemp-Bunsen's,** in metal frame	3.50
1038.	——	**Muencke's,** with adjustable metal gas tube, for temperatures above 100°C.	4.25
1039.	——	**Muencke's** all glass, with rubber connections, for temperatures above 100°C.	

Size	Sml.	Med.	Lge.
Each	$1.25	1.75	2.00

1040.	——	**Reichert's,** with micrometer screws	3.00
1041.	——	**Reichert's,** with micrometer screw and stopcock	4.00
1042.	——	**Soxhlets,** all glass with enlarged bulb, for low temperatures	2.00
1043.	——	**Kemp-Bunsen's,** for low temperatures	6.00
1044.	——	**Lothar Mayer's,** with filling tube and millimeter graduation, for temperatures under 100°C.	2.50
1045.	——	**Ruegheimer,** on polished wood support (Berichte d. Deutsch. Chem. Ges. 1887, p. 1281)	6.00
1046.	——	**Electrical, Scheibler's;** without thermometer and batteries (Fres. Zeits. 1873, p. 89)	18.00
1047.	——	**Pressure, Moitessier,** for glycerine, heavy, polished brass, 5 in. dia. with 2 gauges, stopcock and levelling set screws	18.00



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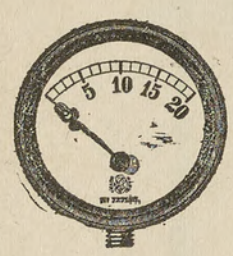

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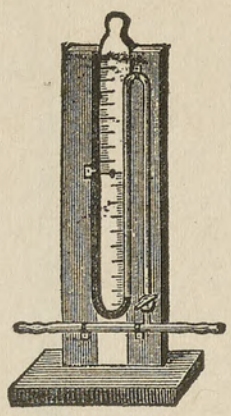

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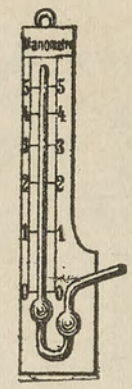

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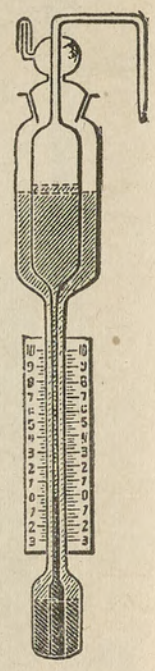

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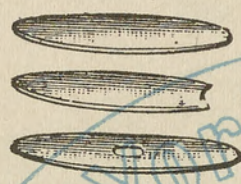

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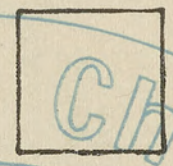


1060

No.

1048. **Gauges, Vacuum,** of glass (Manometer), in glass case, with metal fittings $5.00

1049. —— " of glass, syphon form ; in glass case, with metal fittings 5.00

1050t. —— **Spring,** for Vacuum or Pressure.

Dia.	3	4	5	6 in.
Each	$5.00	6.00	8.00	10.00

1051. —— **Manometer,** with movable scale, glass stopcock, filled with mercury, mounted on support 5.00

1052. —— **Manometer,** fitted with mercury and scales, mounted on wood frame 1.50

1053. —— **Manometer Tube,** plain.

Length	4	8	16 in.
Each	.30	.40	.75

1054. —— **Differential Manometer,** after **A. Koenig,** with concentric arranged tubes, adjustable scale, on support 12.00

Gauges, for Wire, see Wire Gauges.

1055. **Glass Balls,** of thin glass, with hook to support anatomical preparations in liquids.

Dia.	1	1½	2	2¾ in.
Doz.	.60	$1.00	1.25	1.75

1056. **Glass Beads,** for surface extending medium in absorptions ..... per lb. 1.20

1057. **Glass Knives,** for cutting tubing, of finest steel ..... .75

1058. **Glass Plates, round,** light, ground on one side.

Dia.	2	3	4	5	6	7	8	9	10 in.
Each	.05	.06	.08	.10	.15	.20	.25	.30	.35

1059. —— **perforated** in centre or on side for Stirrers, etc.;

Size	3	4	5	6 in.
Each	.30	.35	.40	.45

1060. —— **square,** light, ground on one side.

Size	2	3	4	5	6	7	8	9	10	12 sq. in.
Each	.03	.04	.05	.07	.10	.15	.20	.25	.30	.35

1061. —— **square,** heavy, plate glass, one side and edges ground.

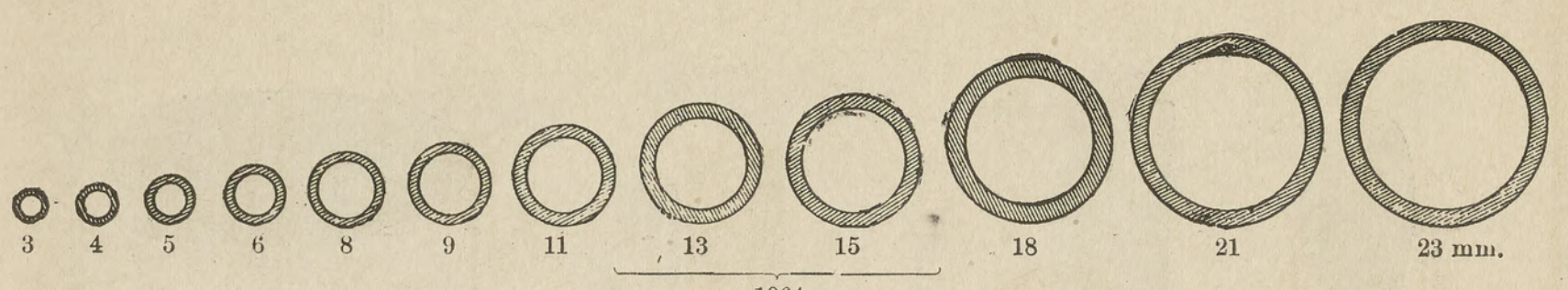
Size	3	4	5	6	7	8	9	10	12	15	20 sq. in.
Each	.20	.25	.30	.35	.45	.60	.75	$1.00	1.20	1.85	2.50

1062. —— **square.** of **blue** colored glass.

Size	2x2	3x3	4x4	5x5	6x6 in.
Each	.06	.08	.10	.15	.20

1063. **Glass Rods,** German glass, free of lead, in 5 feet length ..... per lb. .50

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



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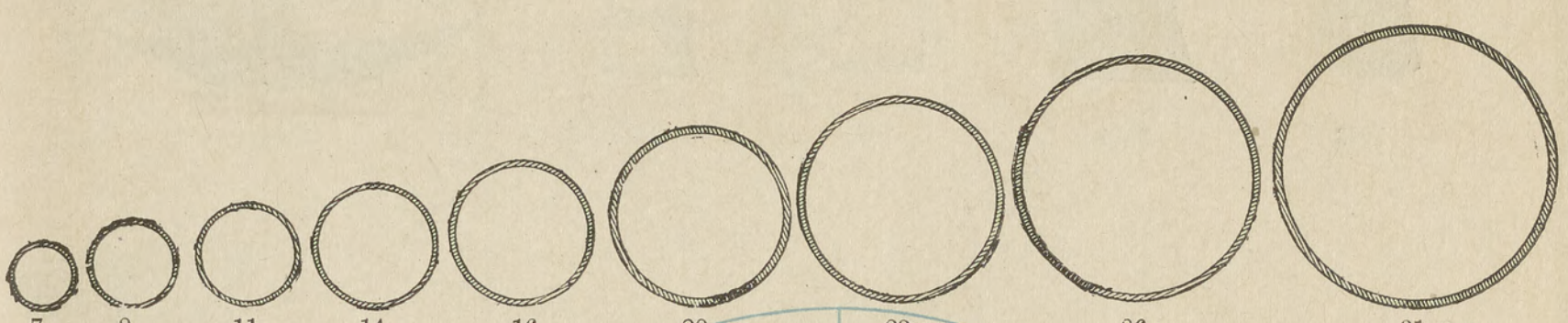

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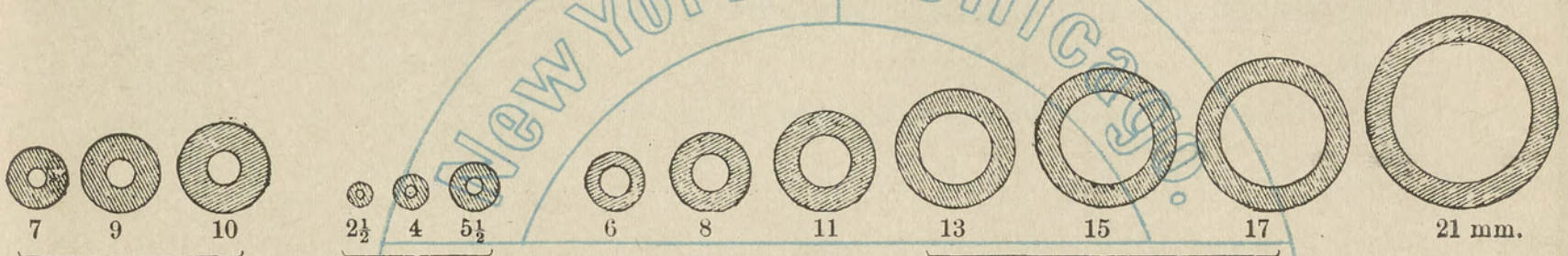

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New York. Chicago. RICHARDS & CO LTD. Newark. Hamburg.

GLASS TUBINGS.

No.

1064. **Glass Tubing,** medium wall, **best German, lead free, made expressively for chemical use;** the only suitable tubing for glass blowing and fitting up chemical apparatus; in lengths of 1½ metres.

1064a.	——	Size from 3 to 25 millim. extern. dia	per lb.	$.50
1064b.	——	" " 26 to 50 " " "	"	.60
1064c.	——	" " 51 to 65 " " "	"	.75
1065.	——	light wall, same price as above.		
1066.	——	**Barometer Tubing,** from 7 to 10 millim. extern. dia	"	.75
1067.	——	**Capillary Tubing,** from 2,5 to 5 millim. extern. dia	"	1.00
1068.	——	**Combustion,** hard Bohemian glass	"	.75
1068a.	——	same as above, small sizes for blowpiping	"	1.00
1069.	——	**Gauge Tubing,** for Mercury or Water Gauges, well annealed, from 6 to 21 millim. extern. dia	"	.75
1069a.	——	as above, cut in any length to order	"	1.00
1070.	——	**Test Tube Tubing,** sizes 12, 16, 20, 23, 25 millim	"	.50
1071.	——	**Thermometer Tubing**	"	.90
1071a.	——	same as above, white back	"	1.20
1072.	**Glass Wool,** finest	oz. $1.00	"	10.00

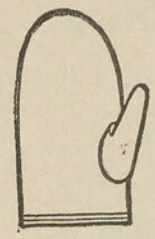
NOTE.— When ordering please give exact outside and inside measurements in millimeters, or send samples.



1073



1074



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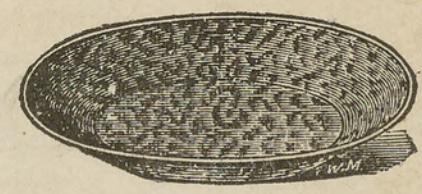

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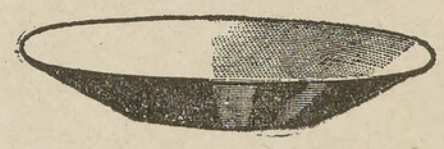

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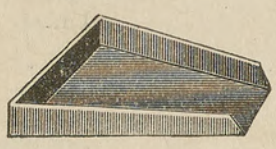

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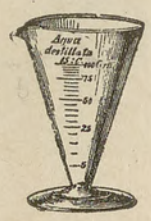

1083

No.

1073. **Gloves, Asbestos Mittens**.....per pair **$3.00**

1074. —— **Assayers' Buckskin,** gauntlets..... " **2.00**

1075. —— **Rubber,** short, fine..... " **1.50**

1076. —— " half-long, fine..... " **1.75**

1077. **Gold Washing Pans, Miners',** 16 in. dia.

	Plain Iron.	Polished Iron.	Russian Iron.	Agate Ware.
Each	.75	$1.00	1.25	1.50

1078. **Goldbeater's Skins**.....per doz. .50

1079. **Golddust Blower,** of polished brass.

Size	4½x6	6½x9	9x10	10½x11	11x13 in.
Each	.75	$1.00	1.25	1.75	2.50

1080. **Gold Washing Horns,** Miner's, of horn.....Each .75

1081. —— " of rubber..... " 1.25

1082. **Goggles,** for protecting the eyes, colored glass.....per pair .25

1083. **Graduates, Glass, Cone Shape,** guaranteed accurate.

Capacity	1 dram or 60 minims.	2 drams or 120 minims.
Each	.25	.30

1084. —— Glass, divided in **ounces,**

Capacity,	½	1	2	4	8	12	16	32 oz.
Each	.25	.25	.30	.45	.65	.85	$1.00	1.75

1085. —— Glass, divided in **grammes,**

Capacity	30	50	100	200	250	500	1000 grms.
Each	.30	.35	.45	.75	.85	$1.40	2.25

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1089



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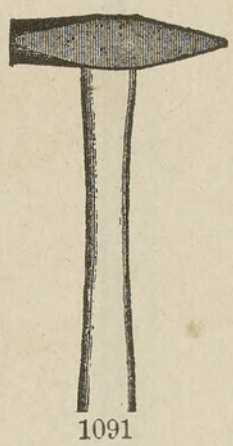

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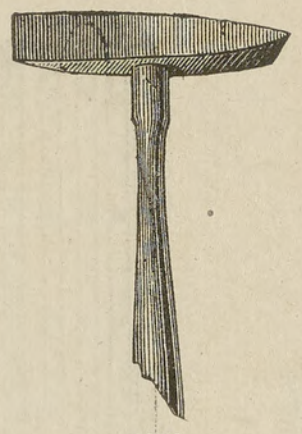

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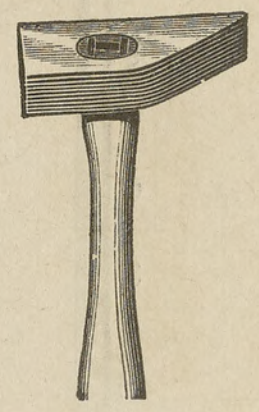

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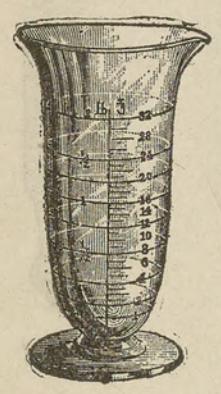

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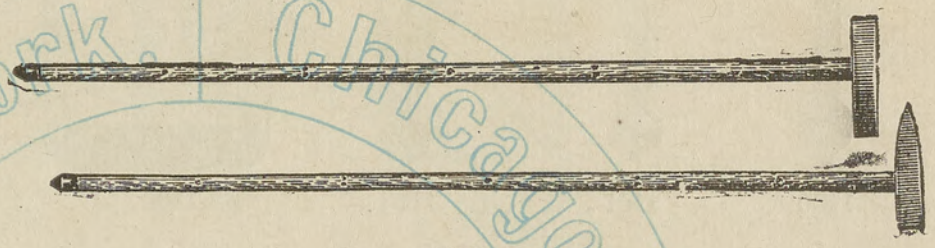

1095

No.

1086. **Graduates,** Glass, **double graduation,** in **grammes** and **ounces,**

Capacity	1	2	4	8	16	32 oz.
"	30	60	125	250	500	1000 grms.
Each	.30	.45	.80	$1.05	1.75	2.75

1087. — **In minims** to 120 minims, **and in drachms** up to 1 ounce..... $ .75

088. — **Porcelain,** with handles, graduated in ounces,

Capacity	4	8	16	32 oz.
Each	.40	.60	$1.00	1.50

1089. **Hammers,** blow-pipe, **Plattner's** with wooden handle..... .60

1090. — blow-pipe, **Colton's** with wire handle..... .75

1091. — **wedge shape** and for breaking ores, slagging, etc.

No.	1	2	3	4	5	6
Weight	6	8	12	16	24	50 oz.
Each	.35	.40	.45	.50	.75	$1.25

1092. — **Mineralogical,** sharpened at both ends.

Weight	11 oz.	$1\frac{1}{4}$ lb.
Each	$1.20	1.50

1093. — According to **Dana,** square face.

Weight	$\frac{3}{4}$	1	$1\frac{1}{2}$	2 lbs.
Face	$\frac{3}{4}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$ in.
Each	$1.25	1.50	2.00	2.50

1094. — According to **Maynard,**

Weight	$1\frac{1}{4}$	$2\frac{1}{4}$ lbs.
Each	$1.75	2.65

1095. — **Prospectors'** combined hammer, with chisel edge, 3 foot handle with spike at end to assist in climbing. Weight, 2 lbs..... 2.50

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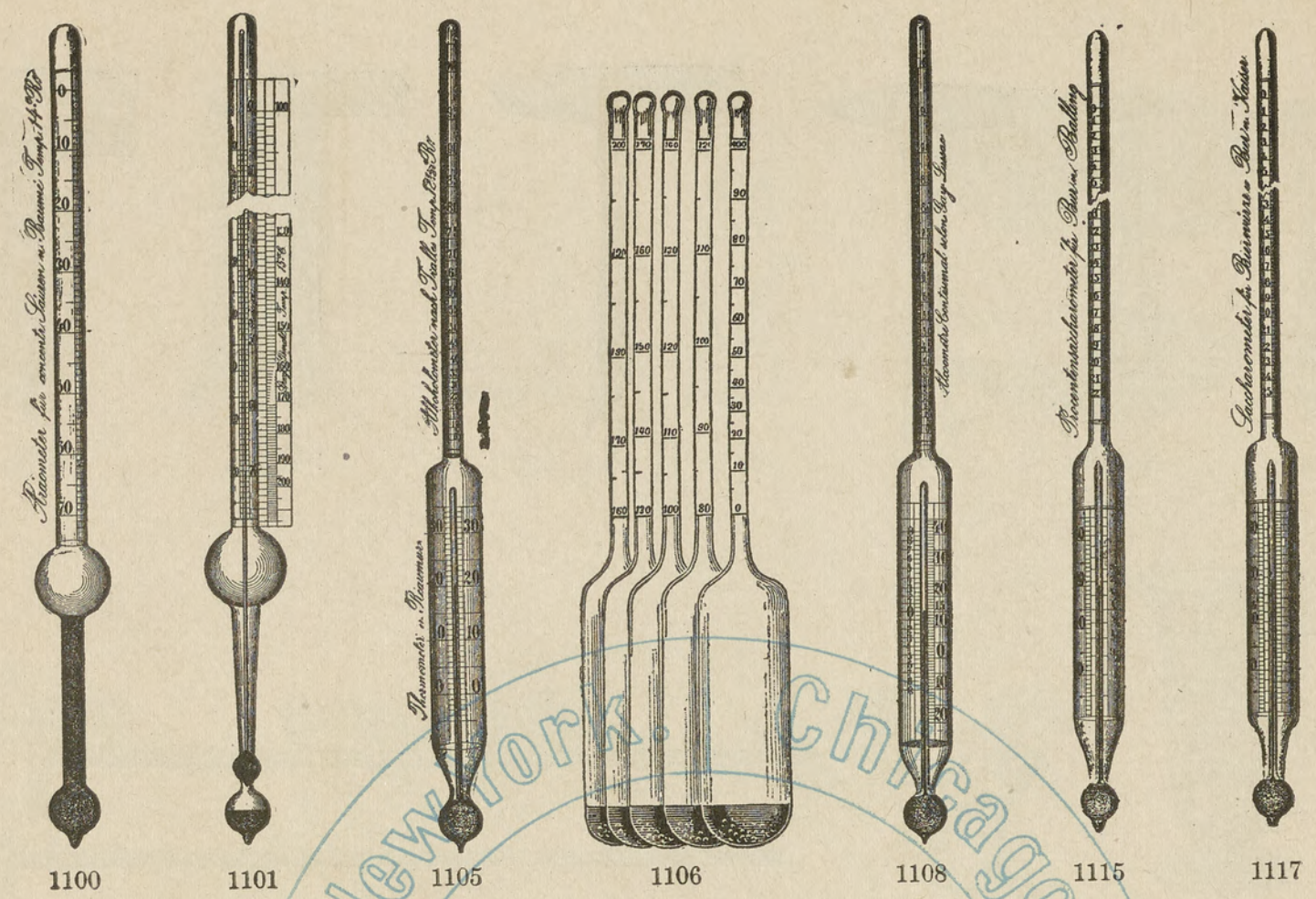


1100 1101 1105 1106 1108 1115 1117

HYDROMETERS.*

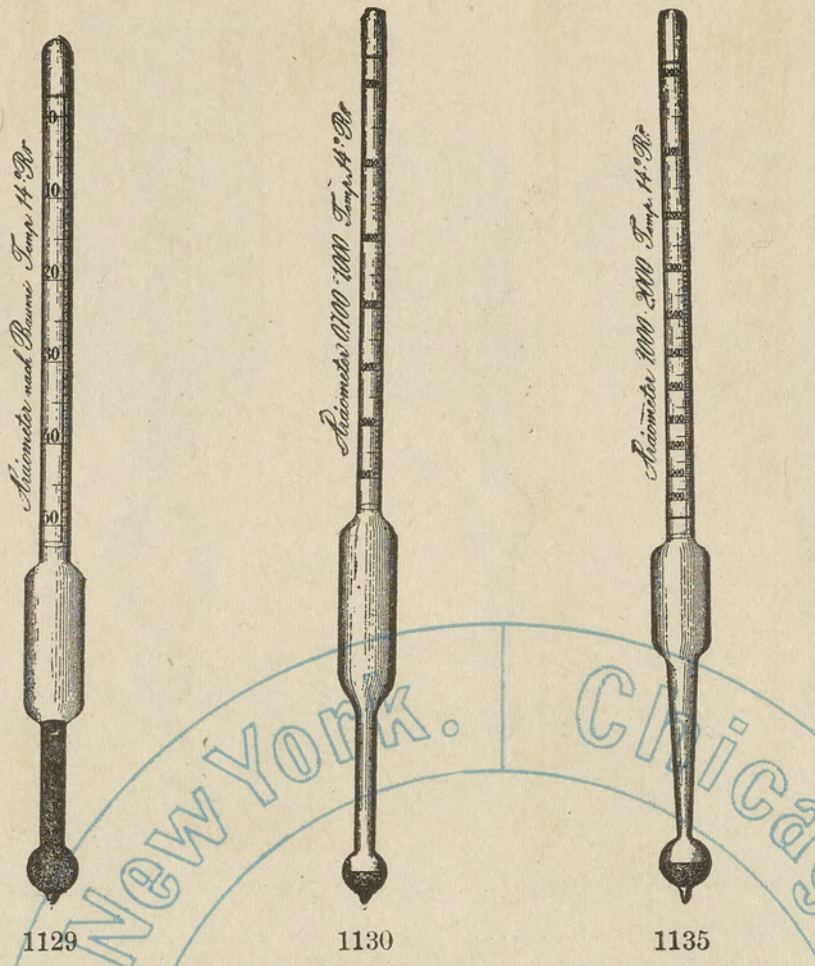
Our Hydrometers are favorably known for their excellent quality.

No.			
1100t.		**Hydrometer for Acid, Beaume** scale 0-50 or 0-70 in $\frac{1}{10}$	$ .50
1101t.	——	**Acid,** Beaumé and Specific gravity scale	.75
1102t.	——	**Acid,** same as above, with thermometer	1.05
1103t.	——	**Alcohol,** Beaumé scale	.50
1104t.	——	**Alcohol,** Proof and Tralle scale	.75
1105t.	——	**Alcohol,** Proof and Tralle scale, with thermometer, U. S. Custom House standard	1.75
1106t.	——	**Alcohol,** set of five stems, according to standard adopted by U. S. Internal Revenue Department ..Set	9.00
1107t.	——	**Alcohol,** set of five stems, as above, complete with copper can and thermometer in Walnut case ..Set	24.00
1108t.	——	**Alcohol,** Gay Lussac scale	.75
1109t.	——	**Alkali,** Beaumé scale	.50
1110t.	——	**Ammonia,** Beaumé scale	.50
1111t.	——	**Bark,** Specific Gravity scale	.50
1112t.	——	**Battery,** Beaumé scale, 4 in. long	.75
1113t.	——	**Battery Diffusion,** in sets of 20, in $\frac{1}{20}$° standard quality, 0° to 5°, 5° to 10°, etc., ranging from 5 to 5° ..Each	1.75
1114t.	——	**Beer,** Balling scale	.50
1115t.	——	**Beer,** Balling scale, with thermometer	1.75
1116t.	——	**Beer,** Kaiser scale	.50
1117t.	——	**Beer,** Kaiser scale with thermometer	1.75
1118t.	——	**Benzine,** Beaumé scale	.75
1119t.	——	**Chlorine,** Beaumé scale	.50

*NOTE: The Specific Gravities of all liquids are referred to distilled water as a standard, the unit of comparison being 1,000 grains of distilled water at a temperature of 60 Fahrenheit. The inconvenience of measuring and weighing like bulks of liquids led to the construction of the Hydrometer, its principle of operation being that of the law of floating bodies, i. e., that when a body floats the weight of the bulk of liquid displaced is equal to the weight of the body floated.

(OVER)

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



1129 1130 1135

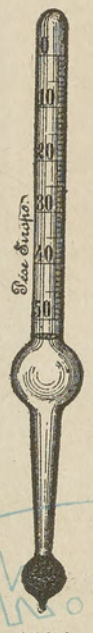
New York. Chicago. Newark. Hamburg. RICHARDS & CO. LTD.

No.			
1120t.	**Hydrometer, for Cider,** Beaumé scale		$ .50
1121t.	——	**Coal Oil,** Beaumé scale	.50
1122t.	——	**Coal Oil,** Beaumé and Specific Gravity scale	1.25
1123t.	——	**Coal Oil,** Beaumé and Specific Gravity scale, with thermometer	1.75
1124t.	——	**Coal Oil,** Standard, Beaumé scale as adopted by the U. S. Petroleum Association, graduated 10° to 20° divided in $\frac{1}{2}$° or $\frac{1}{4}$°	3.50
1125t.	——	**Coal Oil,** Standard, Beaumé scale as adopted by the U. S. Petroleum Association, graduated 10° to 20°, divided in $\frac{1}{2}$° or $\frac{1}{4}$°, with thermometer	4.00
1126t.	——	**Ether,** Beaumé scale	.75
1127t.	——	**Glucose,** 0° to 5° in $\frac{1}{10}$°, 5° to 10° in $\frac{1}{10}$°, 10° to 20° in $\frac{1}{5}$° Each	1.00
1128t.	——	**Glycerin,** Beaumé scale, 20° to 40°	1.25
1129t.	——	**Light Liquids,** Beaumé scale	.50
1130t.	——	**Light Liquids,** Beaumé and Specific gravity scale 0,700 to 1,000	1.00
1131t.	——	**Light Liquids,** as above, with thermometer	1.75
1132t.	——	**Light Liquids**, Standard, 0,700 to 0,800; 0,800 to 0,900; 0,900 to 1,000 Each	1.00
1133t.	——	**Light and Heavy Liquids,** Universal, 0,700 to 2,000	1.75
1134t.	——	**Heavy Liquids,** Beaumé scale	.50
1135n.	——	**Heavy Liquids,** Specific gravity scale, 1,000 to 2,000	1.00
1136t.	——	**Heavy Liquids,** same as above, with thermometer	1.75
1137n.	——	**Heavy Liquids,** Standard, 1,000 to 1,200; 1,200 to 1,400; 1,400 to 1,600; 1,600 to 1,800; 1,800 to 2,000 Each	1.00
1138t.	——	**Heavy Liquids,** Standard, 1000 to 1,400	1.00
1139n.	——	**Heavy Liquids,** Standard, 1,400 to 2,000	1.00
1140t.	——	**Light and Heavy Liquids,** complete set consisting of 3 for light and 5 for heavy liquids	7.50
1141t.	——	**Light and Heavy Liquids,** complete set of 19, giving the specific gravity to the 3rd decimal place; with thermometer in wooden case	20.00

Of the scales for general use, Twaddle's and Beaume's are the most conspicuous; of the latter there are two kinds, one graduated from 0 to 70° for liquids heavier than water, and the other from 10 to 100° for liquids lighter than water. These scales, now more generally in use among manufacturers than any other, were first published by Beaume. He constructed his Hydrometer for liquids heavier than water by preparing a solution of salt containing 15 parts of salt and 85 parts of water by weight, making the scale at the point to which it sank in pure water 0, and in the 15° salt solution 15, dividing the space between 0 and 15 into equal parts and continuing the scale above 15 in the



1144



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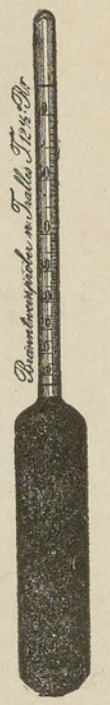

1165

No.

1142t. **Hydrometer for Lime,** Beaumé scale ..... $ .50

1143t. —— **Lye,** Beaumé scale ..... .50

1144t. —— **Milk,** N. Y. Board of Health scale, 0–120° ..... .75

1145t. —— **Milk,** N. Y. Board of Health scale, 0–120° with thermometer 2.00

1146t. —— **Naptha,** Beaumé scale, 40° to 100° ..... .75

1147t. —— **Salt,** 0° to 50°, Beaumé scale ..... .50

1148n. —— **Sucrose Standard,** as made for Drs. Wiley and Spencer. Arranged in sets of 9, up to 90°, standard quality in 1-10°, 0° to 10°, 10° to 20°, 20° to 30°, etc ..... Set 10.00

Specific gravity, see for light and heavy liquids.

1149t. —— **Syrup,** Brix scale, set of three, in ½°; 0° to 30°; 30° to 60°; 60° to 90° ..... Set 3.00

1150t. —— **Syrup,** as above with thermometers ..... " 7.50

1151t. —— **Syrup,** Brix' scale set of 3° in ⅕°; 5° to 30°; 25° to 60°; 55° to 85° ..... " 4.00

1152t. —— **Syrup,** as above with thermometer ..... " 9.00

1153t. —— **Syrup,** Balling's Saccharometer with thermometer 5° to 10° in $\frac{1}{10}$ 1.75

1154t. —— **Syrup,** Beaumé scale ..... .50

1155t. —— **Syrup, Maple,** Beaumé scale, marked to show depth hydrometer will sink in syrup containing 11 lbs. of sugar to the gallon ..... .50

1156t. —— **Twaddle's No. 1;** 0 to 24—1000 to 1120 S. G ..... .60

1157t. —— " **No. 2;** 24 to 48—1120 to 1240 S. G ..... .60

1158t. —— " **No. 3;** 48 to 72—1240 to 1360 S. G ..... .60

1159t. —— " **No. 4;** 72 to 100—1360 to 1500 S. G ..... .60

1160t. —— " **No. 5;** 100 to 134—1500 to 1670 S. G ..... .60

1161t. —— " **No. 6;** 134 to 180—1670 to 1900 S. G ..... .60

1162t. —— **Vinegar,** Beaumé scale ..... .50

1163t. —— **Vinegar,** P. P. scale, each degree representing one grain of acid ..... .75

1164t. —— **Wine and Must,** Oechsle scale ..... .75

1165t. —— **Wine,** Tralle scale 1.00

same manner. For his Hydrometer for liquids lighter than water he used a 10° solution of salt prepared in the same way, fixing 0 as the point to which this Hydrometer sank and making distilled water the 10 point, and obtained a scale as in the other instrument, but running in the opposite direction.

Twaddle's scale is converted to Specific Gravity by multiplying its degrees by 5 and adding 1000 (water) e. g. 24° Twaddle's—1120 S. G.

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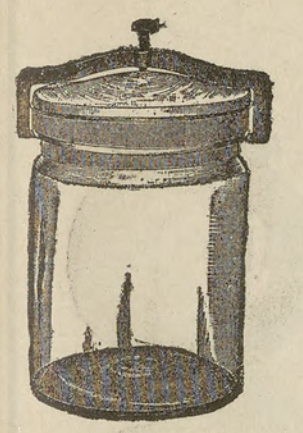

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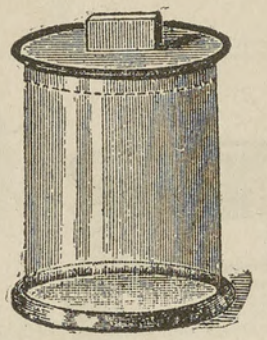

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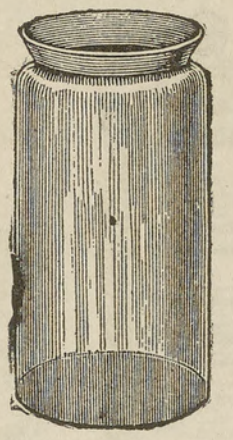

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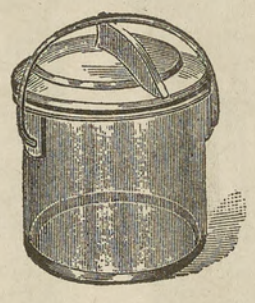

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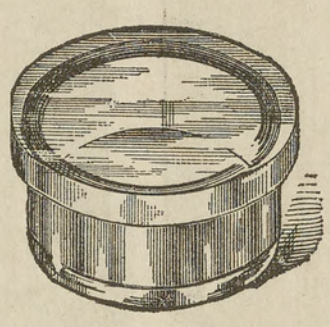


1170



1171

JARS.

No.

1166t. **Jars, Anatomical,** glass, with a thin rubber medium under lid to make the jar air-tight; the lid is securely fastened down with a metallic clamp. To the inner surface of the glass lid is attached a glass ring, for the convenient securing of specimens.

Capacity	½	1	2	3½ pts.	½ gall.	2	3 pts.	½	1 gal.
Height	4	7	10	18	20	6	8½	11½	8 in.
Dia.	3	8	3	3	3	4½	4½	4½	6 "
Each	.45	.50	.55	.75	.80	.75	.85	.95	$1.35

Capacity	1½	1¾	2	2	2½	3¼	3½	5	7 gal.
Height	12	15	18	8	12	15	18	23	36 in.
Dia.	6	6	6	9	9	9	9	9	9
Each	$1.50	1.65	1.80	2.50	3.00	3.25	3.50	4.00	7.00

1167. —— **Anatomical, Bohemian glass,** with air-tight ground stoppers, as wide as the body of the jar.

Height	5	6	7	8	10	12 in.
Dia.	4	4	5	6	7	8 "
Each	$1.20	1.40	1.80	2.00	3.60	6.50

1168t. —— **Anatomical :** "Tie Over."

Capacity	1 pt.	1 qt.	½	1	1½	2 gal.
Each	.25	.35	.60	.85	$1.25	1.60

1169n. —— **Museum, airtight;** these jars are especially adapted for the laboratory and general microscopical uses. As they are airtight, volatile liquids can be kept in them for any length of time, and specimens in alcohol can be preserved perfectly. They have no necks, and therefore can be readily cleaned, and delicate specimens can be removed from them without danger of injury.

Capacity	6	10	6½ oz.
Height	3	4	6½ in.
Dia.	3	3	3 "
Doz.	$1.00	1.25	1.50

1170n. —— **Preparation,** these jars have no lip or contraction at the top; the cover being grooved and ground makes them airtight; they are especially adapted for holding delicate tissues.

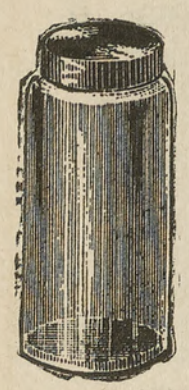
Size	A	B	C
Height inside	3⅛	1	¾ in.
Dia. inside	2⅛	2¼	1¾ "
Doz.	$2.40	2.15	2.00
Each	.22	.20	.18

1171. —— **Storage,** green glass, with screw cap, well suited for storing of deliquescent salts, etc.

Capacity	1 pt.	1 qt.	½ gal.
Doz.	$1.25	1.50	1.75

1172. —— **Storage,** flint glass, with screw cap, cork lined.

Size	4	8	16 in.
Doz.	$1.50	2.00	3.00



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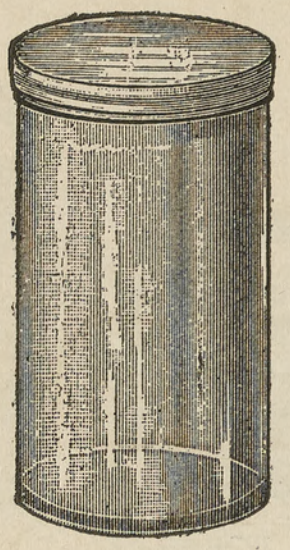

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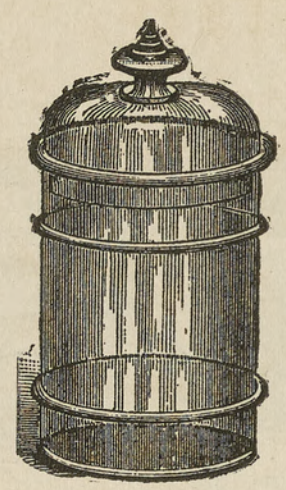

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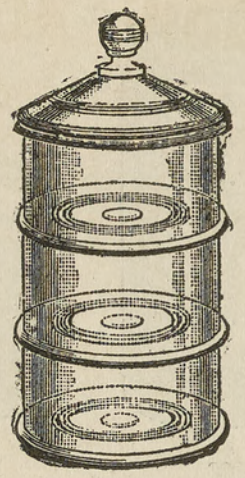

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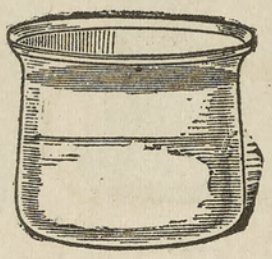

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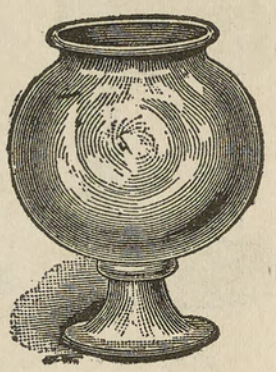

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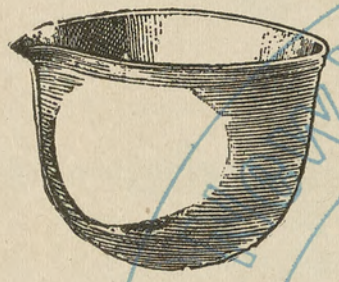
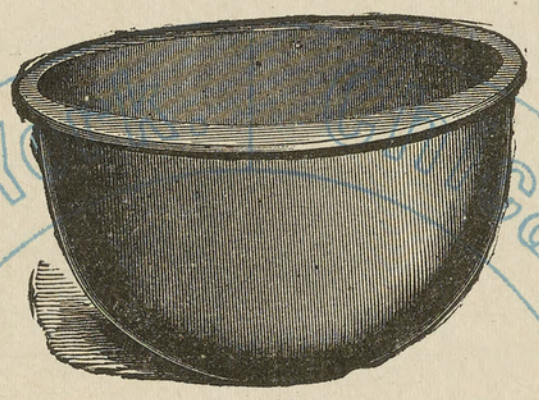


1179



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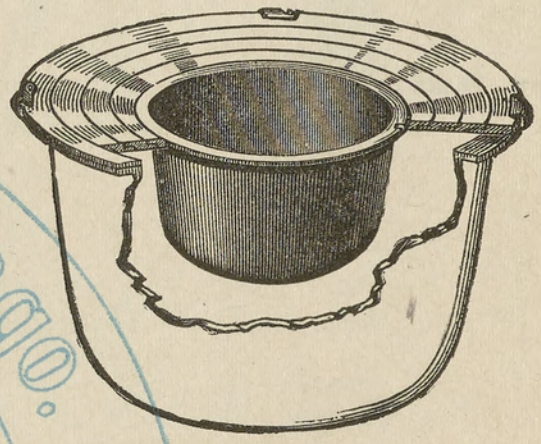


1182

No.

1173. **Jars, Specie** with lacquered lids.

Capacity	1 pt.	1 qt.	½	1 gal.
Each	.20	.25	.30	.50

1174. —— **Specimen,** with glass lids ground in; without shoulders, rim inside the lid from which specimens may be suspended.

Size	5¼x8	5¼x12	5¼x15	5¼x18 in.
Each	$1.40	1.50	1.80	2.10

1175. —— **Show Jar,** with glass cover

Capacity	½	1 pt.	1 qt.	½	1	1½	2 gal.
Each	.50	.70	.85	$1.10	1.85	2.00	2.60

1176. —— **Section Jars,** each consisting of three sections.

Size	6½x14½	5½x14½	4½x14½ in.
Each	$2.00	1.60	1.25

1177. —— **Aquaria,**

Capacity	½	1	2	3	5 qt.
Each	.75	$1.10	1.80	2.10	3.00

1178. —— **Aquaria,** on foot

Capacity	½	1	2	3 qt.
Each	$1.00	1.35	2.25	3.25

1179. **Kettles, Porcelain,** glazed inside.

Dia.	15	16	17	18	19 in.
Capacity	3	3¾	4½	5	6 gal.
Each	$6.00	8.00	10.00	12.00	15.00

1180. —— **Iron, Caldron.**

Capacity	7	10	15	20	30	60	90	120 gal.
Each	$2.25	2.75	4.00	5.00	6.00	12.00	16.00	24.00

1181. —— **Iron, White Enameled.**

Capacity	15	20	30	45	60 gal.
Each	$10.00	12.00	14.00	21.00	28.00

1182. —— **Chemists' with adjustable reducing rings;** one each 5, 10, 15, 20, 30 gal. kettle, including set of 4 rings..... $25.50

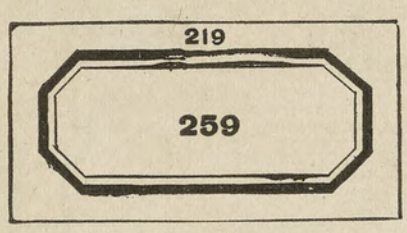
RICHARDS & CO. LTD.

$C_4H_6PbO_3$

PLUMBIC ACETATE

$Pb(C_2H_3O)_2\}O_2$

1184



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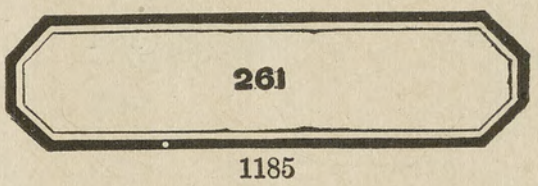

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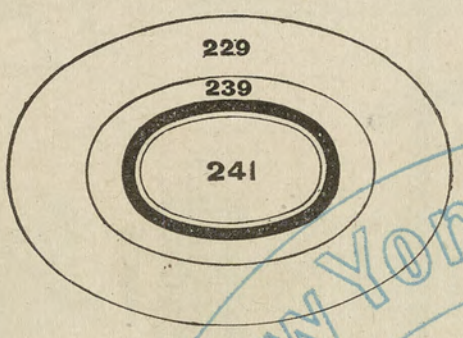

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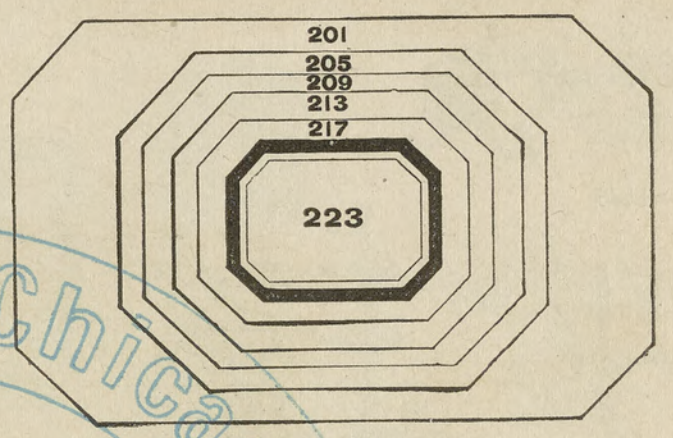

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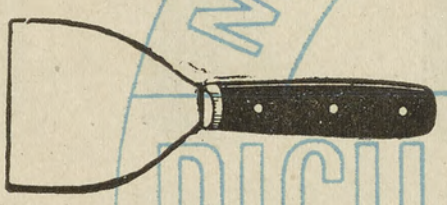

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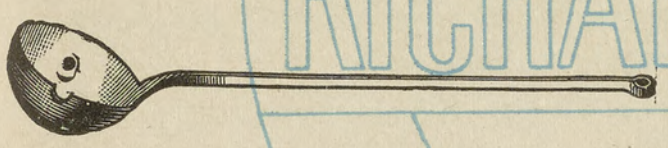

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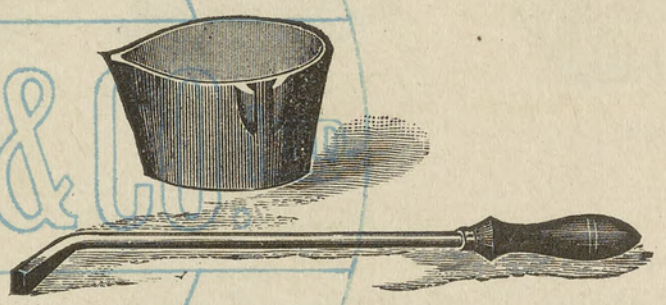


1188

New York. Chicago. RICHARDS & CO. Newark. Hamburg.

No.

1183. **Knives, Amalgam,** with handle, blade 3 in. wide, for cleaning amalgam plates..... $0.75

1184. **Label Books,** including the names of the most used chemicals and reagents strip form, gummed and perforated, with name and formula ; atomic weight, etc..... .40

1185. **Labels,** gummed paper, of any size.

No.	223	217	213	261	205	201	219	209	259	241	239	229
Box	.08	.09	.10	.10	.11	.12	.10	.10	.09	.08	.09	.11

1186. ——

No.	2004	2007	2002	2001	2006	2005	2003
Size	$2\frac{3}{4}$x1	$2\frac{7}{8}$x$1\frac{5}{8}$	$3\frac{7}{8}$x1	$3\frac{7}{8}$x$1\frac{1}{2}$	4x$1\frac{5}{8}$	4x$1\frac{7}{8}$	$4\frac{3}{4}$x2 in.
Box	.20	.25	.25	.30	.35	.40	.50

1187. **Ladles, Melting,** wrought iron, with lip.

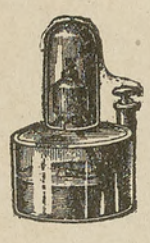
Dia.	$2\frac{1}{2}$	3	4	5	6 in.
Each	.25	.30	.35	.45	.50

1188t. —— cast iron, with detachable handle.

Size	$4\frac{1}{2}$x$2\frac{3}{4}$	$4\frac{3}{8}$x$2\frac{3}{4}$	4x$2\frac{3}{8}$ in.
Each	.65	.60	.50



1189



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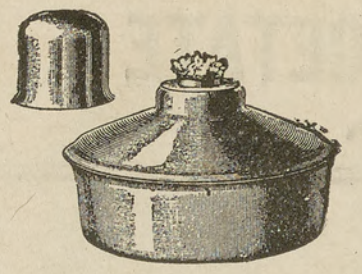

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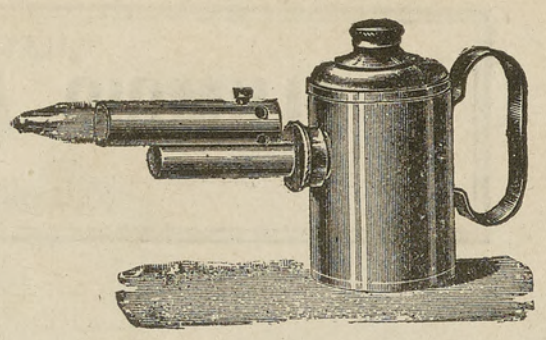

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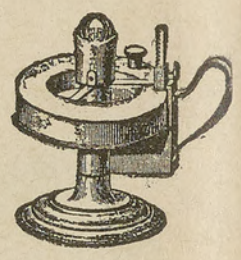

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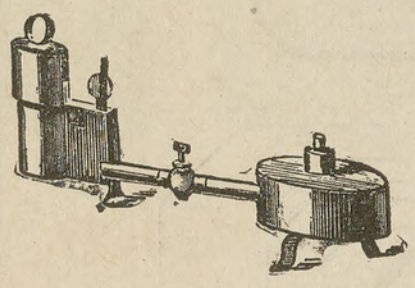

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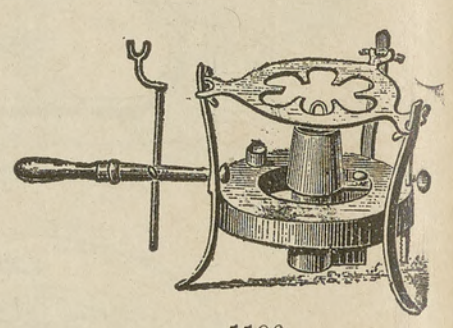

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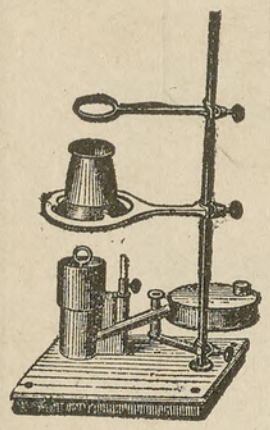

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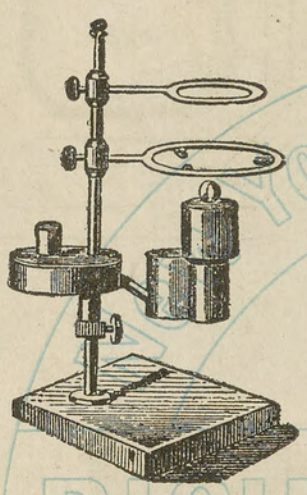

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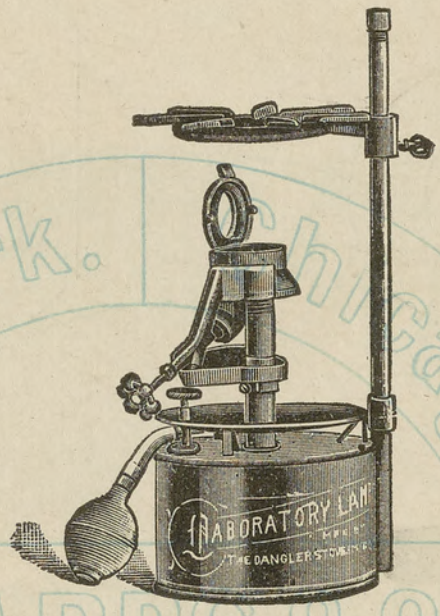

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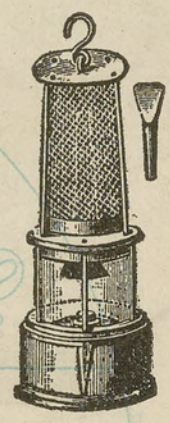

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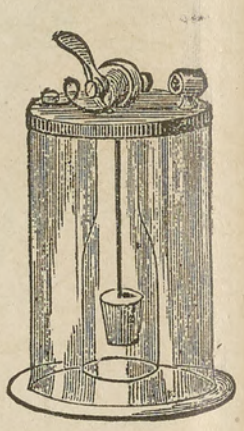


1201

LAMPS.

No.

1189. **Lamps, Alcohol,** glass, with ground on cap, wick and wickholder.

Capacity	2	4	8 oz.
Each	20	.30	.40

1190. — **Alcohol,** glass, with ground cap, wick and wickholder, side tubulature and stopper.

Capacity	2	4	6	8 oz.
Each	.45	.50	.60	.70

1191. — **Alcohol,** brass, with screw top.

Capacity	4	8 oz.
Each	.50	.60

1192. — **Lamp Wicks,** per bundle $0 10

1193t. — **for hard soldering, Barthel's,** for use with alcohol, giving a pointed flame of great intensity, 1300°C. It has been accepted by mechanics and electricians as the most practicable medium for above purpose now in use 4.50

1194. — **Berzelius,** of brass, with Argand burner, for alcohol or kerosene, with adjustable wick holder 4.00

1195. — **Fuchs',** low shape, on three legs, with stop cock to cut off alcohol supply 5.00

1196. — **Luhme's'** for general laboratory work 7.50

1197. — **Rose's,** of brass, with sliding rod, chimney, triangle and 2 brass rings, on mahogany base 6.00

1198. — **Rose's,** modified by Mueller 6.50

1199at. — **Dangler's,** for gasoline, an excellent substitute for gas, giving high or low flame 5.00

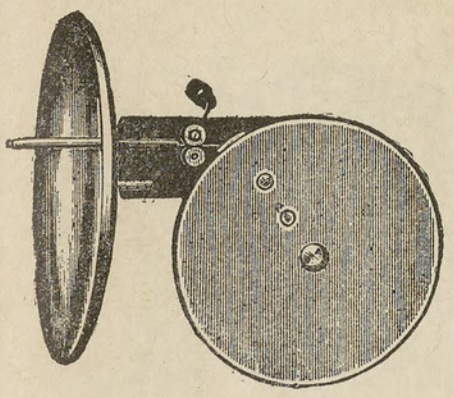
1199bt. — " for gasoline, with heavy copper reservoir 9.00

1200. — **Davy's Safety,** or Miner's 3.50

1201. — **Doebereiner's** Hydrogen 8.50

Extra Platina Sponge for same ..... .30

RICHARDS & CO. LTD. New York. Chicago. Newark. Hamburg.



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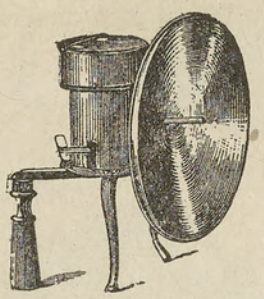

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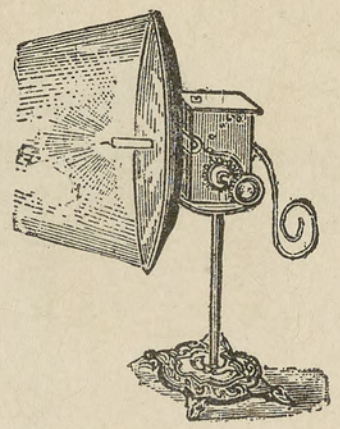

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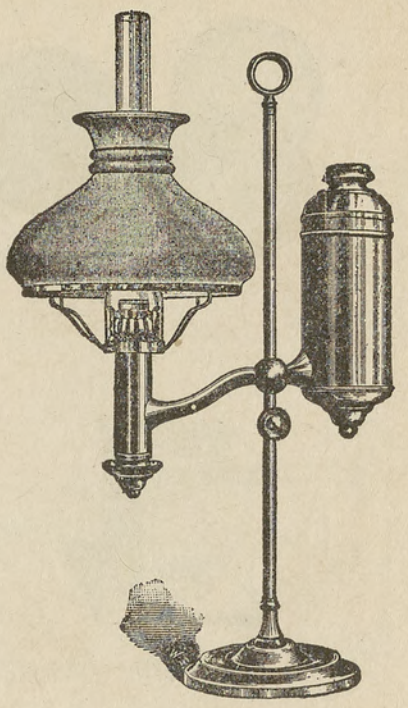

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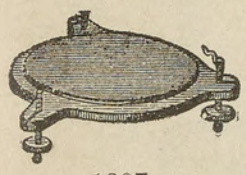

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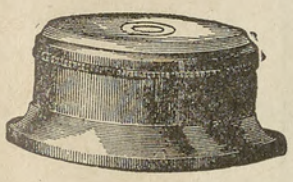
1208



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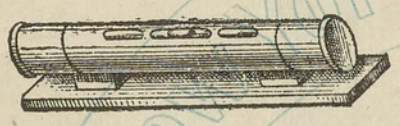

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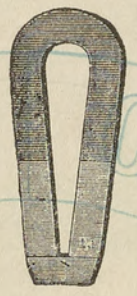

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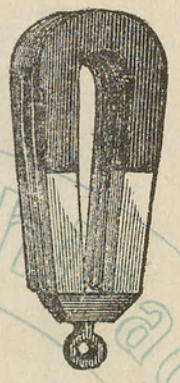

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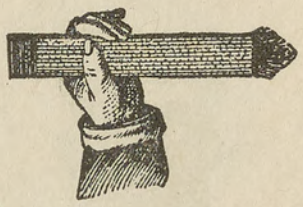


1212

No.

1202. **Lamps** **Magnesium,** operated by hand for burning magnesium ribbon $2.75

1203. —— " with clock movement 9.00

1204. —— " for flash light 7.00

1205. —— **Students,** nickel-plated, with shade 5.00

1206. **Leveling Screws,** brass, for balances, etc.

For	50	100	200	500	1000 gram. balance
Per Set	$1.20	1.40	1.60	2.00	2.30

1207. **Leveling Table,** of metal, for leveling cylinders, jars, etc 4.00

1208. **Levels, glass.**

Length	3	4	5	6 in.
Each	.15	.15	.20	.25

1209. —— **Pocket, mounted in brass.**

Length	3	4	5 in.
Each	.50	.60	.70

1210 —— **Mounted in iron,** japanned,

Length	3	4	5 in.
Each	.25	.30	.40

1211. —— **Round brass case,** one inch diameter 2.50

1212. **Magnet, Bar,** best quality.

Length	5	6	8	10 in.
Per pair	.60	.70	.80	$1.00

1213. —— **Horseshoe,** best English steel.

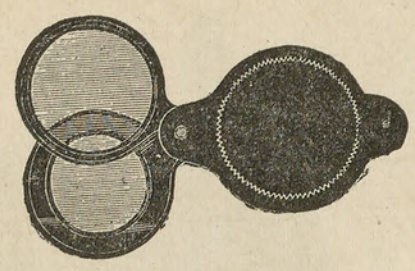
Length	2	3	4	5	6	8	10	12 in.
Each	.10	.15	.25	.40	.50	$1.10	1.80	2.50

1214. —— **Horseshoe Compound,** 4 bars.

Length	6	8	10 in.
	$4.00	6.00	10.00

Magnets, Electro, see Part II Electrical Apparatus.

New York. Chicago. Newark. Hamburg. RICHARDS & CO. LTD.



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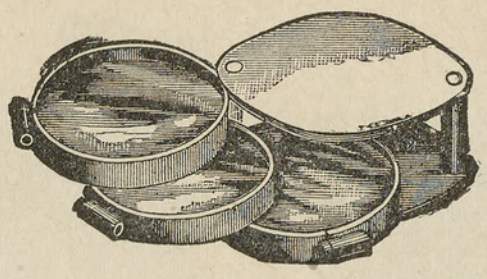

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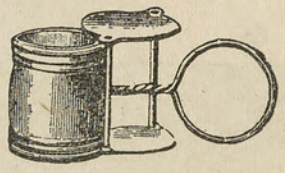

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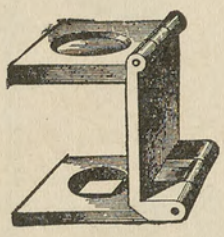

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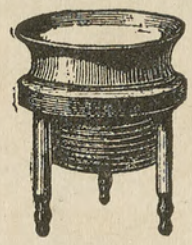

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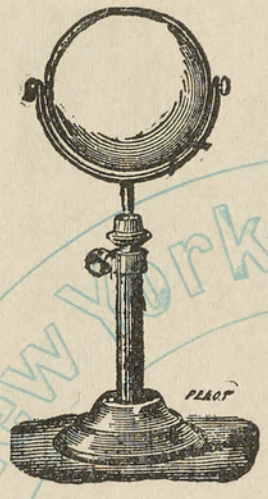

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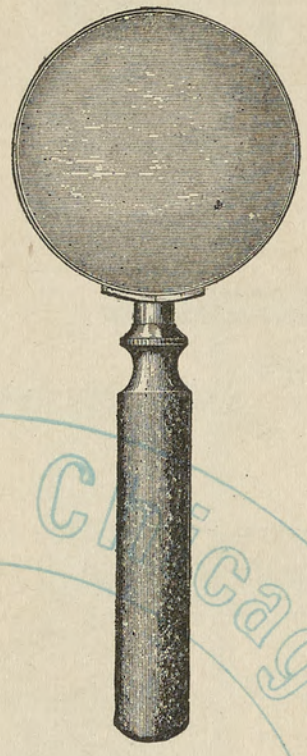

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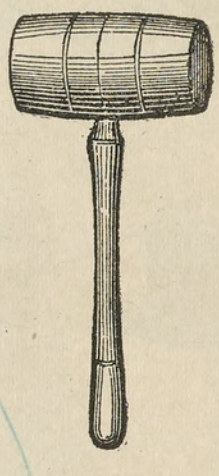


1223

No.

1215. **Magnifiers, in rubber case,** folding, best quality.

Glasses	1	2	3
Each	.50	.75	$1.00

1216. — **in metal case,** folding.

Glasses	1	2	3
Each	.75	$1.00	1.25

1217. — **Coddington,** in metal case, folding, very powerful.

Size	Sml.	Med.	Lge.
Each	$1.50	1.75	2.25

1218. — **Thread Counters,** in brass case.

Dia. open square	1	¼ and ½	¼ in.
Each	$1.50	.40	.40

1219. — **in brass case with 3 legs** $0.75

1220. — **lens of crownglass,** four and a half inches in dia., on brass stand 9.00

1221. — **Reading Glasses,** metal frame, polished wooden handles.

Dia. of lenses	2	2½	3	3½	4 in.
Each	.80	$1.00	1.50	2.00	2.50

1222. — **Achromatic Doublet,** giving large and flat field.

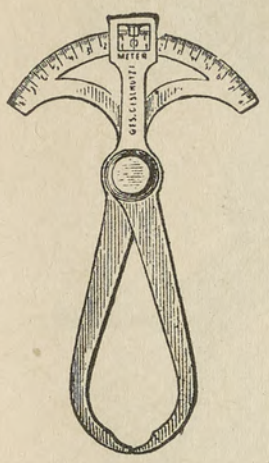
Dia.	20	12 mm.
Magnification	8	10 "
Each	$5.00	4.00

1223. **Mallets,** hardwood ..... .50

1224. — rawhide end 1.75

Manometers, see Gauges.

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



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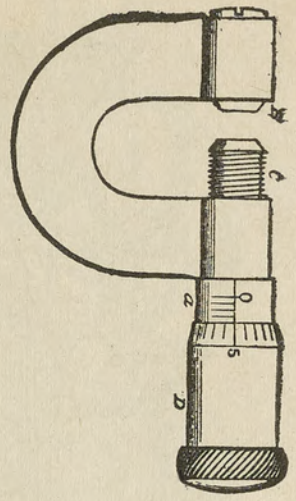

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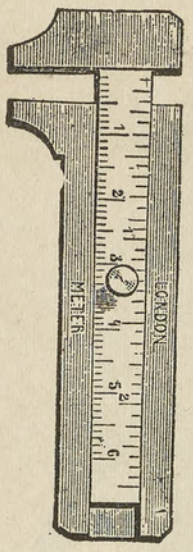

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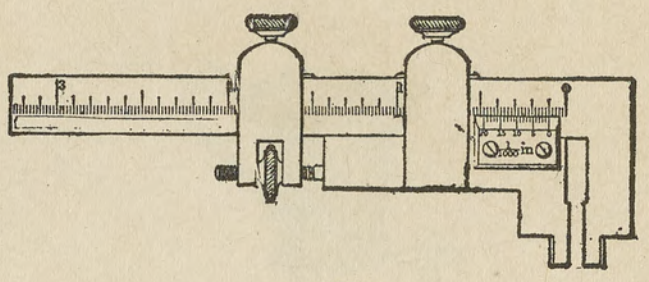

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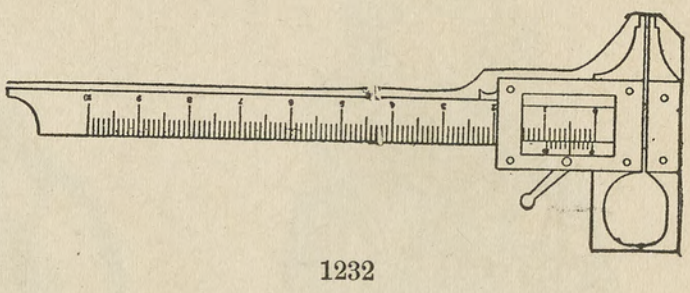

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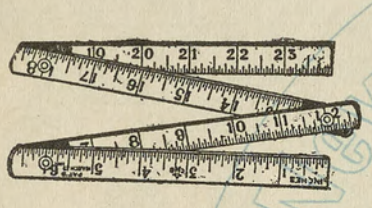

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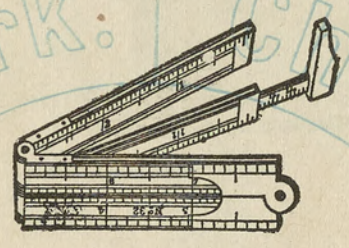

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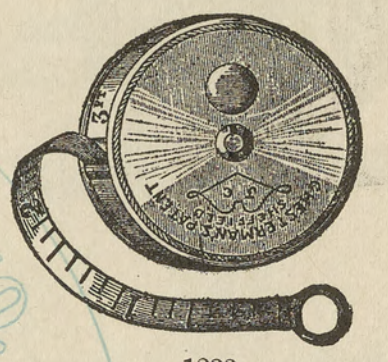


1233

No.

1225. **Measures, Calipers,** metric graduation, 80 mm. opening..... **$2.75**

1226n. —— **Caliper, Micrometer;** measures all sizes, less than an inch by thousandth of an inch One-half and one-quarter thousandth are readily estimated..... **5.00**

1227n. —— **Caliper, Micrometer;** graduated to read to hundredths of a millimeter..... **5.00**

1227a.n. —— Morocco case for 1226n. and 1227n..... **.75**

1228n. —— **Caliper, improved Pocket Vernier;** metric and English measure. Graduated on one side to read $\frac{1}{1000}$ of in., the other side graduated to read $\frac{1}{50}$ millimeter..... **10.00**

1228a.n. —— Morocco case for same..... **.50**

1229. **Measures, boxwood,** with four folds, 2 feet; inches on one side, millimeters on the other side..... **.40**

1230. —— **folding,** 1 foot, divided into inches on one side, centimeters and millimeters on the other, with caliper extension..... **.60**

1231. —— **Brass, with caliper,** graduated into millimeters..... **1.00**

1232. —— **German silver, with caliper** and vernier, so that $\frac{1}{10}$ mm. can be read..... **2.00**

1233. **Measure Tape,** of steel, in inches and centimeters, in German silver case.

Length	3	6	12 ft.
Each	**$1.50**	**2.25**	**3.50**

1234. —— of steel, inches only.

Length	25	50	100 ft.
Each	**$5.00**	**8.00**	**16.00**

1235. —— in pressed leather case, with folding handles.

Length	25	50	100 ft.
Each	**$1.00**	**1.50**	**2.50**

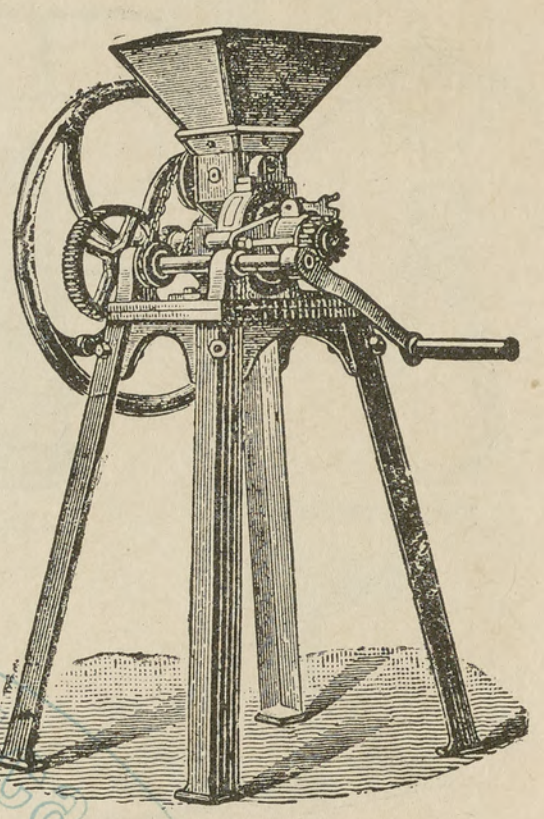
New York. Chicago. RICHARDS & CO. LTD. Newark Hamburg.



1236



1238



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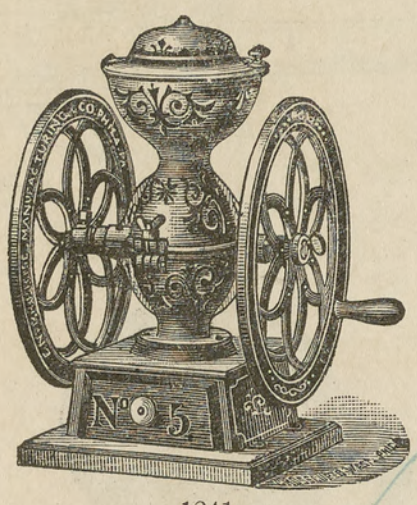

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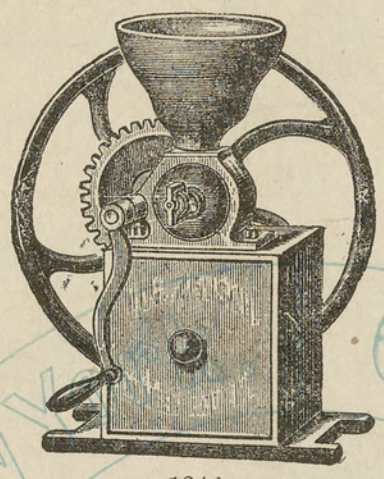


1242

No.

1236. **Measures,** for **Liquids,** of tin.

Capacity	½	1 pt.	1 qt.	½	1 gal.
Each	.20	.25	.30	.40	.50

1237. — **Agate Ware,** seamless.

Capacity	½	1 pt.	1 qt.	½	1 gal.
Each	.50	.65	.85	$1.00	1.50

1238. — **Copper.**

Capacity	½	1 pt.	1 qt.	½	1 gal.
Each	.55	.70	90	$1.25	1.75

1239n. **Mills, Laboratory,** for grinding soft ores, bones, grain, etc.; to be screwed to the wall; height, 11 in.; weight, 47½ lbs..... $6.50

1240n. — **Laboratory,** to be screwed to the table; height, 17 in.; weight 60 lbs..... 7.50

1241n. — **Laboratory,** for grinding roots, herbs, seeds, etc.

Nos.	2	3	5	7
Height	10½	15	17	20 in.
Weight	14	22½	36	62 lbs.
Each	$3.00	5.00	8.00	10.00

1242. — **Laboratory,** especially adapted for grinding all kinds of drugs, chemicals, minerals, grain, seeds, etc. Mounted on iron box with drawer. Dia. of plates, 80 mm. Weight, 65 lbs..... 25.00

Extra plates, per pair..... 4.00

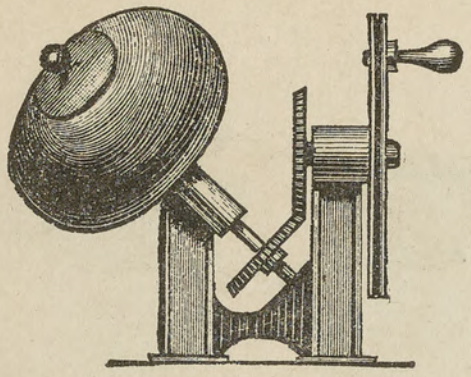
1243. — **Laboratory,** as above, for grinding and powdering, mounted on stand. Dia. of plates 120 mm. Weight, 135 lbs..... 60.00

Extra plates, per pair..... 6.00

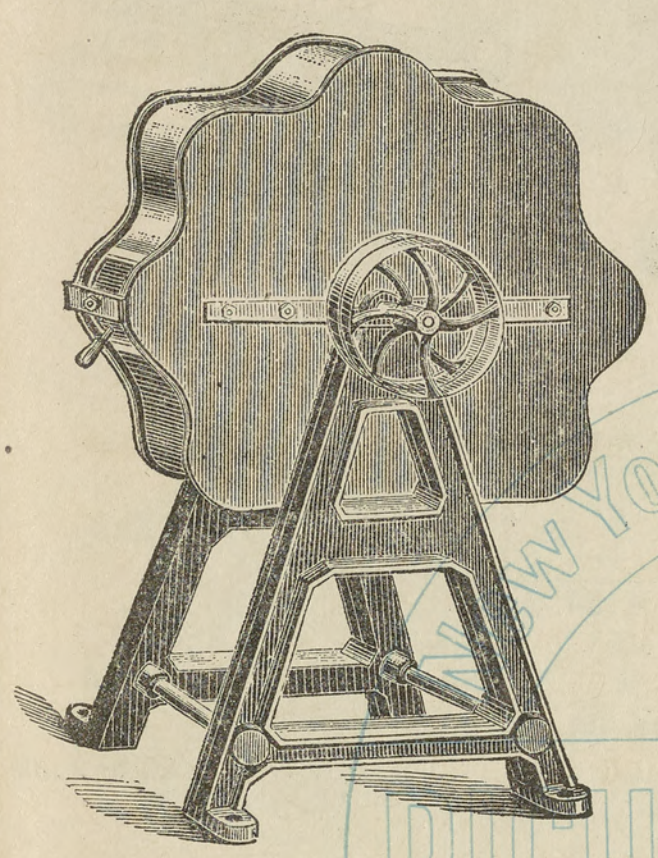
1244. — **Laboratory,** as above, for grinding and powdering, mounted on stand. Dia. of plates, 160 mm. Weight, 135 lbs..... 76.00

Extra plates, per pair..... 8.00

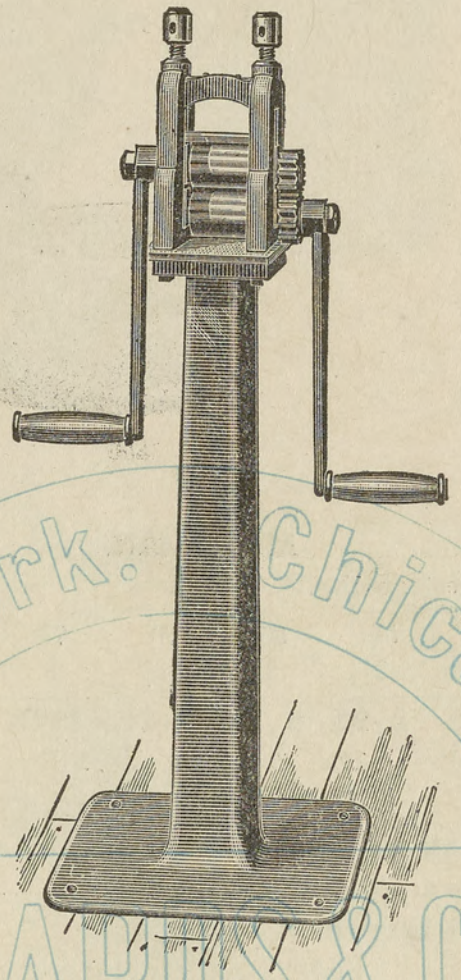
New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



1245



1246b



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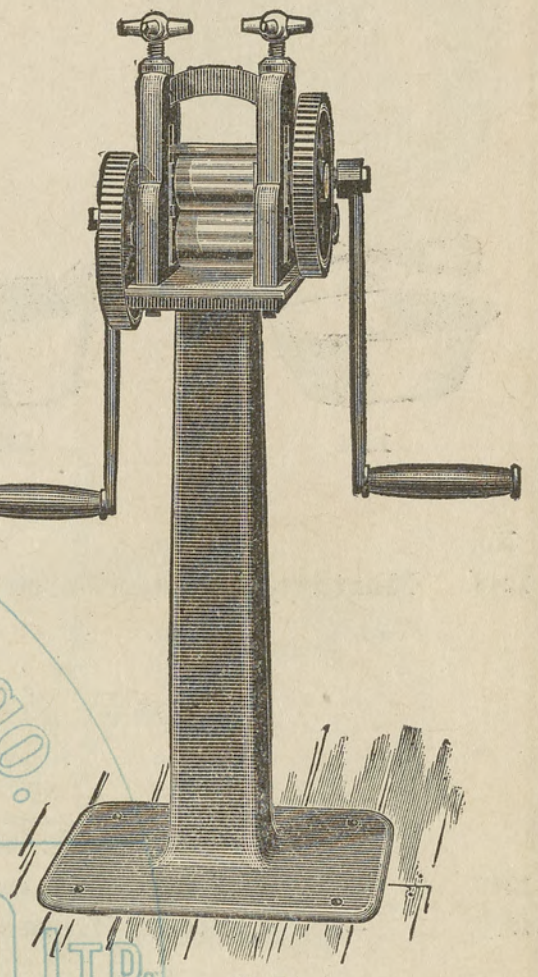


1247a

No.

1245. **Mills, Ball Mills, Cast Iron,** 12 in. dia. **with ball** **$85.00**

1246. —— " **Porcelain, cylindrical,** 9 in. dia., 10 in. long, with support **75.00**

1246a. Porcelain Balls for above mills, each **2.00**

1246b. —— **Ball Mill, Iron,** 30 in. dia., with support **150.00**

Ball Mills of other sizes quoted on application.

1247n. —— **Rolling, for Metals,** plain, with flat rolls.

Nos.	1	2	3	4	5
Size of rolls	2 x 1½	2½ x 1⅞	2 x 2¼	3½ x 2½	4 x 2¾ in.
Weight	60	75	115	130	165 lbs.
Each	**$30.00**	**40.00**	**50.00**	**60.00**	**75.00**

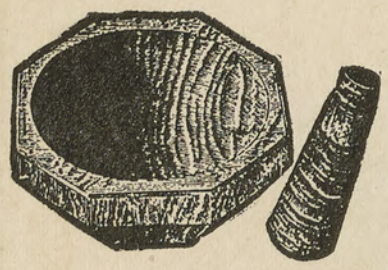
1247a.n. —— **Rolling, for Metals;** double geared hand mills, with flat rolls.

Nos.	3	4	5
Size of rolls	3 x 2¼	3½ x 2½	4 x 2¼ in.
Weight	150	170	200 lbs.
Each	**$75.00**	**85.00**	**100.00**

Price of rolling mills for power furnished on application.

Note—The above hand rolling mills for assayers and jewelers are mounted upon cast iron column. The rolls are evenly tempered, truly ground, finished with a high polish, and are fully warranted. The gears are all cut, cranks of steel, boxes of bronze, and the pressure screws of steel, with the points tempered.

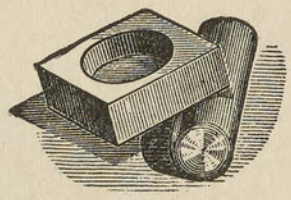
RICHARDS & CO. LTD. New York. Chicago. Newark. Hamburg.



1248



1250



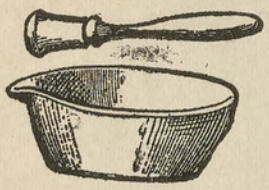
1251



1252



1253



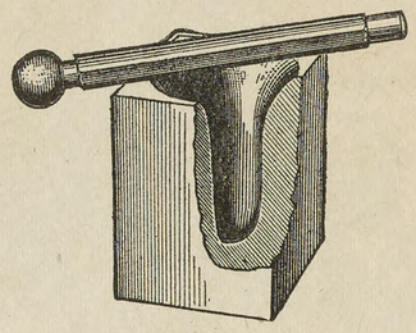
1254



1255



1256



1257

MORTARS.

No.

1248. **Mortars, Agate,** with pestles; best quality.

Dia.	40	50	55	65	70	75	80	90 mm.
"	1½	2	2¼	2½	2¾	3	3¼	3½ in.
Each	$1.30	1.85	2.25	2.75	3.25	3.75	4.50	5.50

Dia.	95	100	115	120	125	150	150 mm.
"	3¾	4	4½	4¾	5	5½	6 in.
Each	$6.50	7.50	9.50	10.50	12.50	15.00	20.00

1249. — **Agate and pestles** mounted in wood; extra..... $1.00 to 2.50

1250. — **Steel, Diamond, Plattner's.**

	Sml.	Lge.
Each	$4.00	6.00

1251. — **Steel, Diamond, Leed's**..... ..... 2.00

1252. — **Steel,** polished inside and out, with pestle.

Dia.	3	3½	4	4½ in.
Each	$1.50	1.75	2.00	2.25

1253. — **Glass** with lip and pestle.

Capacity	1	3	4	8	16	32 oz.
Each	.20	.25	.30	.40	.60	.80

1254. — **Porcelain, shallow form,** with lip, rough inside, glazed outside, pestles for sizes above "00" set in wood handle.

No.	8	7	6	5	4	3	2	1	0
Dia.	2¼	2½	3¾	3¼	4¼	4¾	5½	6¼	7¼ in.
Each	.25	.30	.35	.40	.50	.65	.85	$1.00	1.20
No.	00	000	4.0	5.0	6.0	7.0	8.0	9.0	10.0
Dia.	7¾	8½	9½	10½	11½	12½	14	15½	16½ in.
Each	$1.50	1.60	2.20	2.80	3.50	4.50	5.50	6.50	7.50

1255. — **Porcelain, deep form,** with lip and pestle.

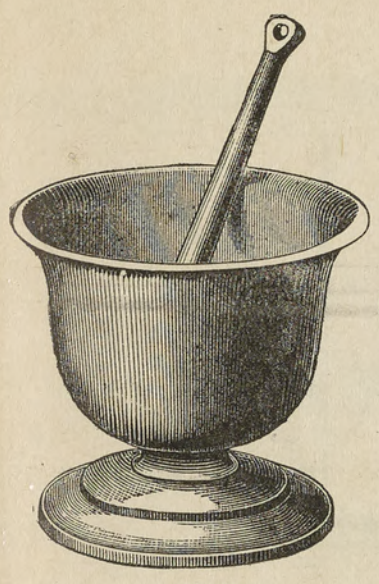
No.	4	3	2	1	0	00	000
Dia.	3¼	3¾	4¾	5¼	6	7	8 in.
Each	.45	.60	.80	.90	$1.00	1.40	1 75

1256. — **Wedgewood,** pestle with wooden handle.

No.	0000	000	00	0	1	3	3	4
Dia.	3	3¼	3½	4	4½	5	6	6½ in.
Each	.35	.45	.50	.55	.65	.85	$1.00	1.25
No.	5	6	7	8	9	10	11	12
Dia.	7	8	8½	9½	10½	12	13	14 in.
Each	$1.65	2.00	2.50	3.25	4.00	4.50	5.25	6.00

1257. — **best tool steel,** forged, for powdering speigeleisen and white cast iron, each mortar and pestle guaranteed..... 15.00

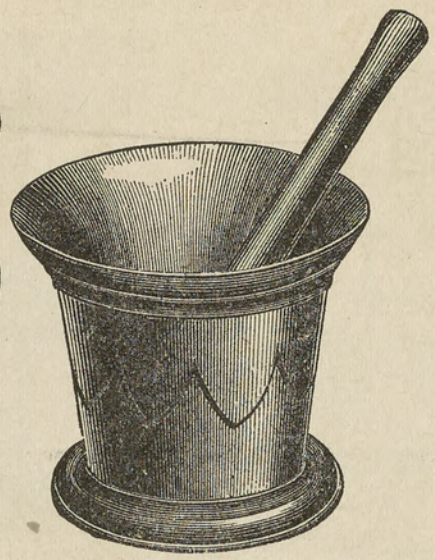
RICHARDS & CO. LTD. New York. Chicago. Hamburg.



1258



1259



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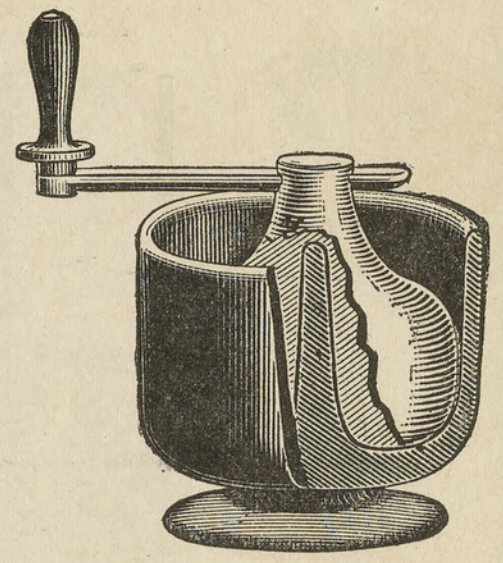

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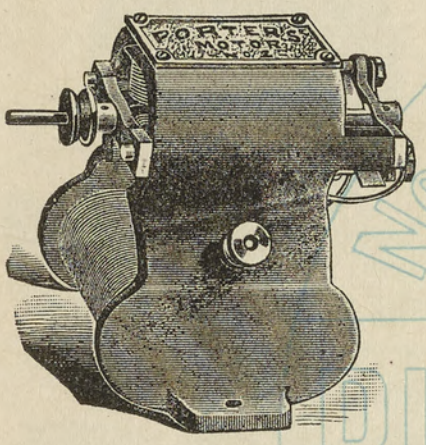

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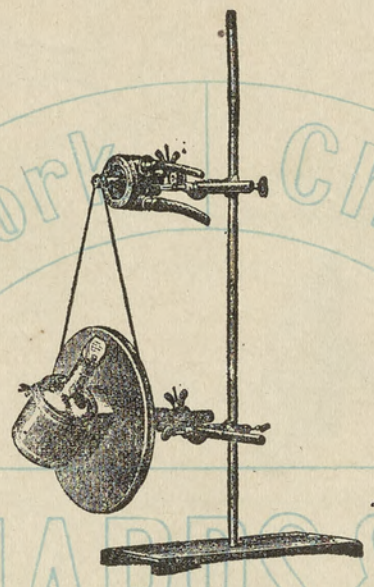

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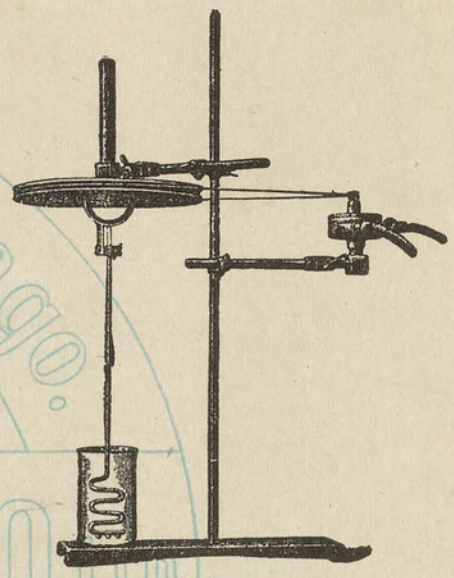


1263

No.

1258. **Mortars, Iron,** Urn shape, for powdering hard ores, etc.

Capacity	½	1	2 pts.	½	1	2 gal.
Each	.30	.40	50	75	$1.40	2.00

1259. — **Iron, extra heavy,** or Ore Crushers, wedgewood pattern, polished inside.

Capacity	1	2 pts.	¼	1	1½	2 gal.
Dia.	3¾	4½	6	7½	9½	12¼ in.
Each	.60	.90	$1.50	2.25	3.25	5.00

1260. — **Iron, heavy,** Bell-shaped, finished inside, with pestle.

Capacity	½	1	2 pts.	½	1	2	3	4 gal.
Each	.30	.40	.60	$1.00	1.50	2.75	4.50	5.50

1261. — **Iron, Buck's, for grinding and amalgamating.** By the rotion of the muller a large sample of quartz can be ground in contact with quicksilver.

Dia.	6	8 in.
Each	$6.00	8.00

1262t. **Motors, Electric, operated by Battery current.**

for 2 volts, size, 3 x 3 in..... $4.00
" 4 " " 4 x 4, 1/16 H. P..... 6.50
" 6 " " 5½ x 4½, 1/12 " 12.00
"10 " " 5⅛ x 4½, ⅛ " 18.00

For Batteries to operate these motors, we recommend the Edison-Lalande.

1263. **Motors, Rabe's for water, vapor or expanded air.** Can be used for either stirring or shaking.

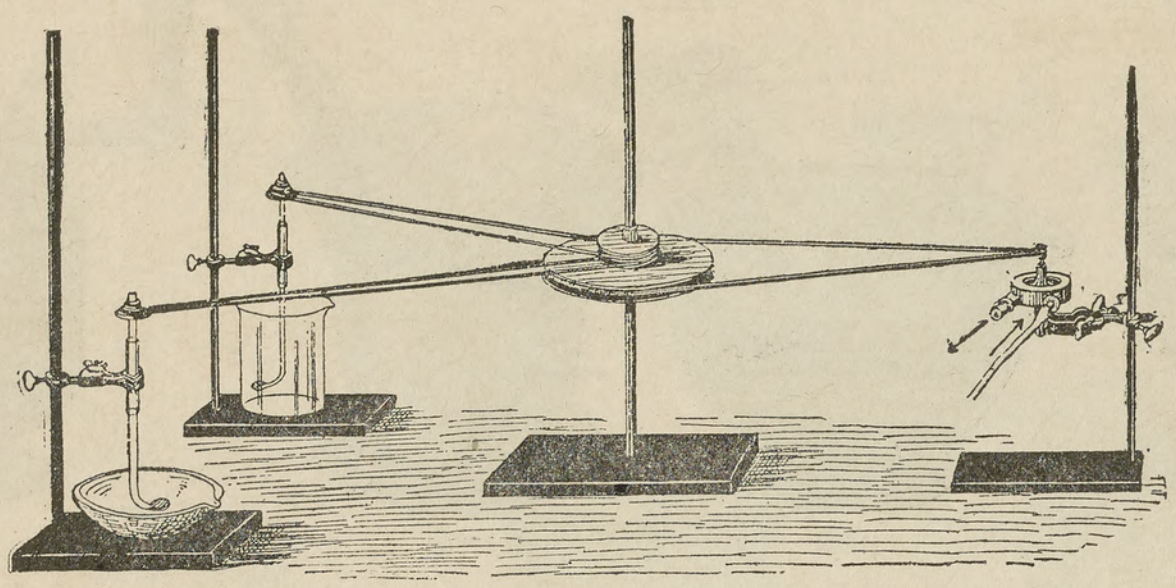
(Berichte d. Deutsch Chem. Ges., 1888, XXI, 1200 and Chem. Zeitg, 1888, No. 39.)..... 12.00

1263a. — **Turbine** 7.50

1263b. — **Zinc Disc,** 10½ dia., with stirring arrangement and axle shaft..... 4.50

1263c. — " " with shaking arrangement and axle shaft..... 5.50

New York Chicago. RICHARDS & CO. LTD. Warrington Hamburg



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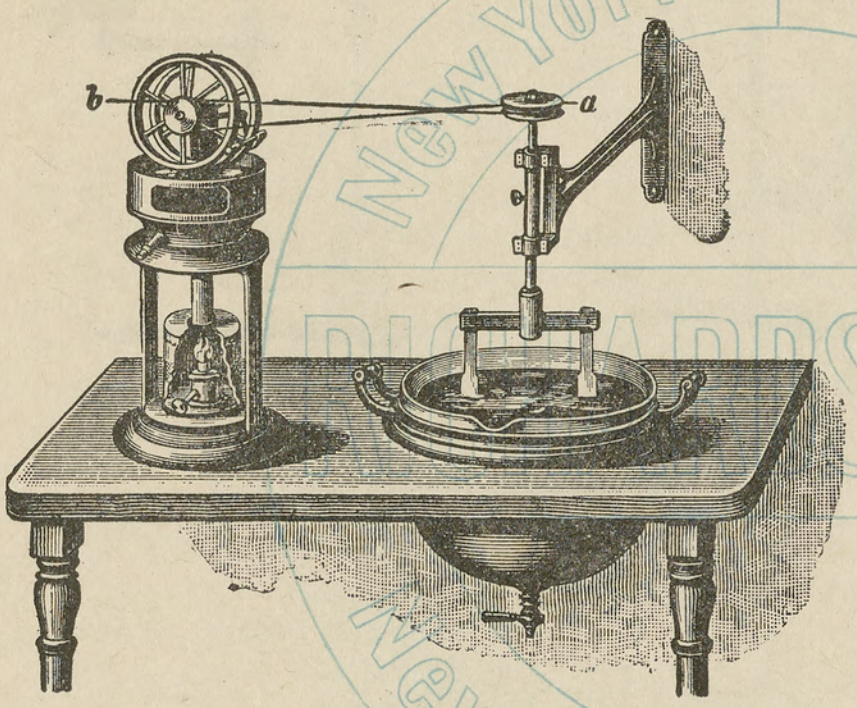

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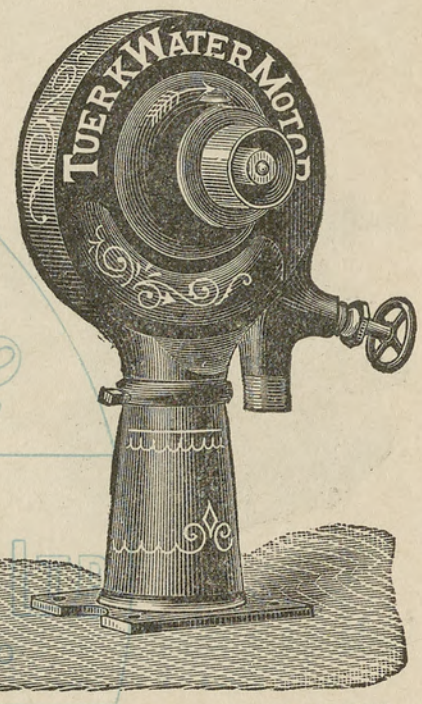


No. 9, 10 and 10½ MOTORS.
WITH
ADJUSTABLE STAND BRACKET,
Used when Motor is placed in Show Window, or away from wall.

1267

No.

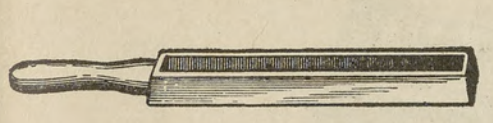
1264. **Motor, Tæuber's, for water, vapor or expanded air,** used for stirring, and arranged for operating two vessels at same time. Complete as illustrated..... ..... $25.00

1265. **Motor, Hot-Air, Laboratory** size for stirring solutions; **operated by alcohol**..... 35.00

1266. —— **same as above; operated by gas**..... 75.00

1267. **Motor, Tuerk's Water,** for stirrers, blowers, ore crushers, etc.

size 1, from 1 S. M. to ¼ H. P., according to pressure of water 15.00
" 2, " ⅛ H. P. to 1 H. P. " " " 30.00
" 3, " ¼ " to 2 H. P. " " " 50.00
" 4, " ½ " to 4 H. P. " " " 75.00
" 5, " 1 " to 6 H. P. " " " 100.00
" 6, " 2 " to 12 H. P. " " " 175.00
" 7, " 3 " to 20 H. P. " " " 285.00



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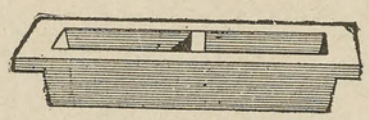

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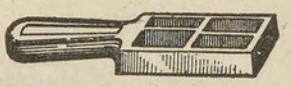

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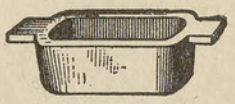

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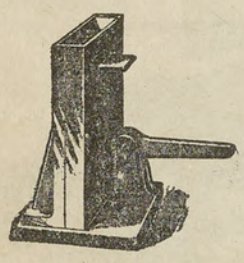

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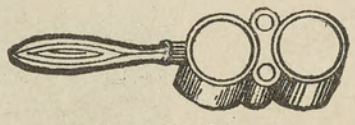

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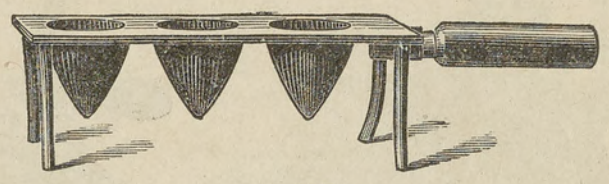

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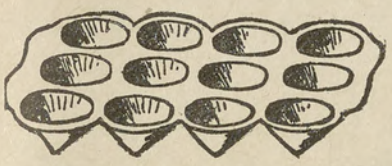

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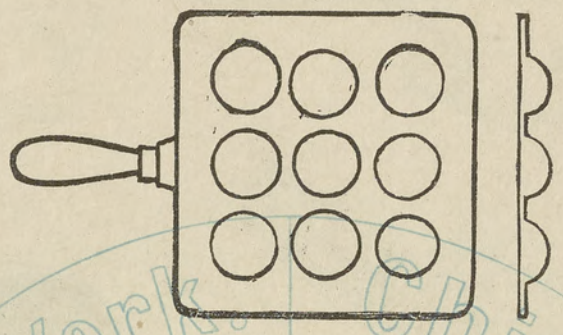

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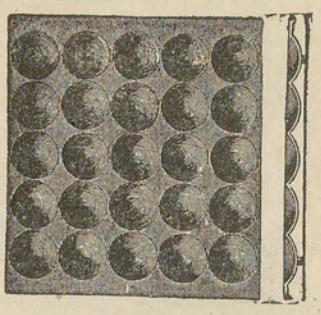

1280

MOULDS.

No.

1268. **Moulds, Ingot, with handles.**

Size	3 x ½ x ½	3 x 1 x 1	4 x 1 x 1½	4 x 1½ x 2¼	6 x 1¾ x 1¾ in.
Each	.50	.65	.75	.90	$1.00

1269. — **Ingot or Bullion,** making a bar 1½ x 1½ x 8 in., **with slide to cast** any length desired.... $1.50

1270. — **Ingot, quadruple,** for sample bars..... 1.00

1271. — **Ingot, round corners,** 5½ x 2½ x 2 in..... 1.25

1272. — **Ingot, upright.**

Size	3 x 2¾ x 3 1/16	4½ x 2¾ x ¼	6 x 2¾ x ¼ in.
Each	$3.40	4.20	5.40

1273. — **Pouring, cast iron,** with handles, 2 cavities drilled smooth..... 1.00

1274. — **Pouring, iron,** with handle, 3 conical cavities turned inside..... 1.00

1275. — **Pouring, iron,** with handle, 4 conical cavities..... 1.75

1276. — **Pouring, copper,** with handle, 4 conical cavities..... 3.50

1277. — **Pouring, cast iron,** with 12 conical cavities..... 1.00

1278. — **Pouring, iron,** with handles, 6 cavities..... .90

1278a. — " " 9 " 1.00

1278b. — " " 12 " 1.25

1279. — **Pouring, copper,** with handles, 12 cavities..... 5.00

1279a. — " " 16 " 6.00

1280. — **Pouring, cast iron,** with 25 depressions..... 1.50

1281n. — **Fletcher's,** to obtain in a few minutes 2 ounce ingots of gold, silver, etc., without the use of a furnace: (See Cut, page 122.)

melting arrangement, with both wire and plate moulds..... 3.25

blowpipe..... 2.25

wire moulds..... 1.25

plate moulds..... 1.25

extra carbon crucibles, without slides.....doz. 1.00

same, with slides..... " 1.75

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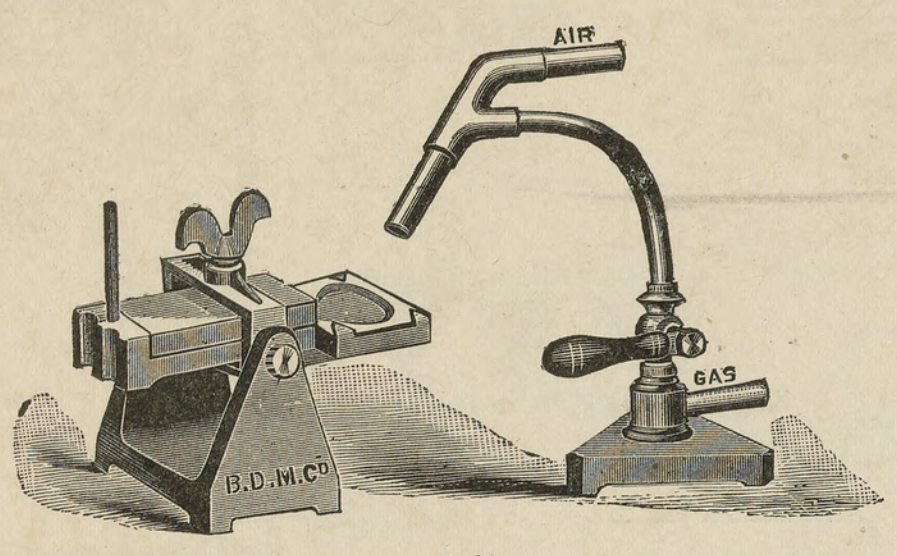

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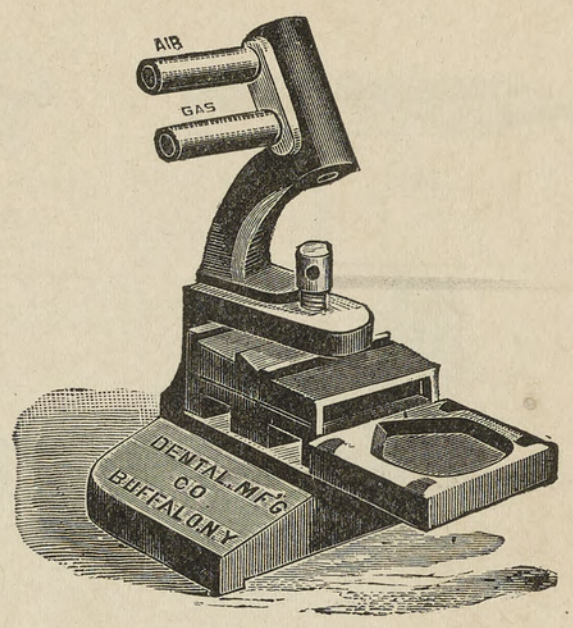

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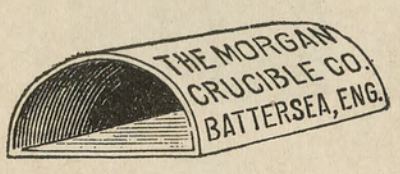

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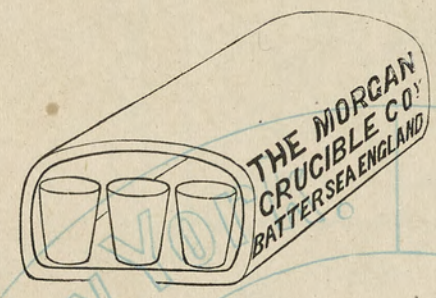

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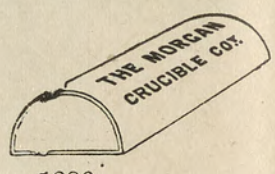

1286

No.

1282n. **Moulds, Fletcher's,** new melting arrangement for 3 ounce ingots of gold, silver, etc., complete..... $3.00
ingot mould, separately..... 1.25
extra carbon crucibles, without slides.....doz. 1.00
same, with slides..... " 1.75

1283. **Muffles. Battersea,** regular form.

No.	A	B	C	D	E	F	G	H	J	K	L
Length	7	7½	8	8½	9	10	11	10½	12	14	15 in.
Width	3½	4⅜	4¾	5	5½	6	4	5¼	6	8	9 "
Height	2½	2⅞	3	3¼	3⅝	4	3¼	3⅞	4	5	6 "
Each	.30	.45	.55	.65	.70	.80	.60	.65	.80	$1.20	1.30

1284. — **Battersea, Colorado** form. Manufactured specially for the U. S. A. The shape is such that Crucible work can be done in them.

No.	L L	M	N	O	P	Q
Length	15	15	16	16	18	1 in.
Width	9	11	10	11	11	13 "
Height	6¼	6¾	7	7	7	7 "
Each	$1.30	1.80	1.80	1.95	2 20	2.45

NOTE : L L and N take two crucibles abreast ; M O P and Q take three abreast.

1285. — **Battersea Hoskin's** form with opening on top.

Length	10 and 8	in.
Width	6 "	4¾ "
Height	4 "	3 "
Each	.80	.55

1286. — **Battersea, Judson's** form, open at both ends.

Length	12 and 15	in.
Width	6 "	9 "
Height	4 "	6 "
Each	$1.00	1.50

NOTE : In addition to those priced above, Muffles are made of all shapes and sizes, suitable for Assayers, Enamellers, Dentists, etc.

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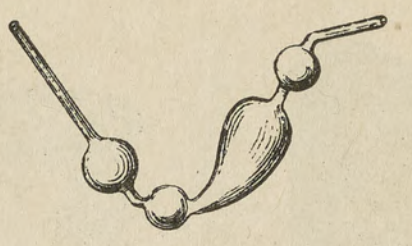
1289



1290



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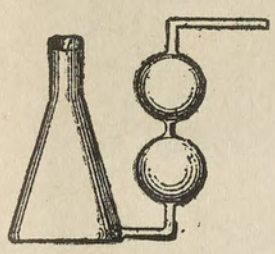

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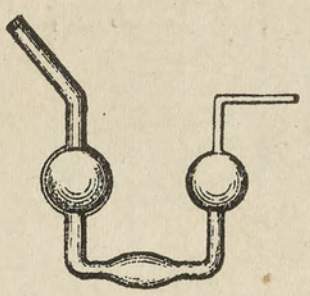

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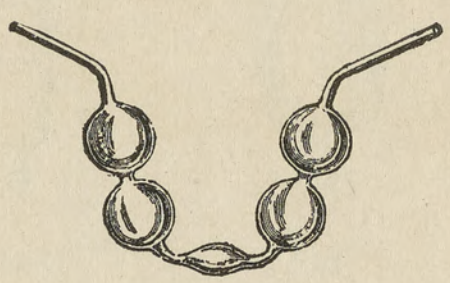

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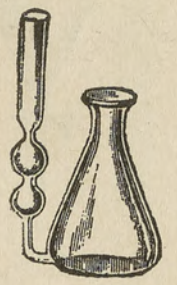

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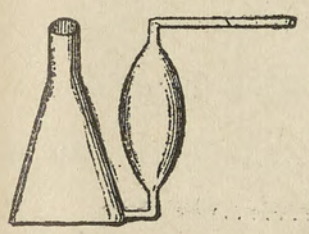

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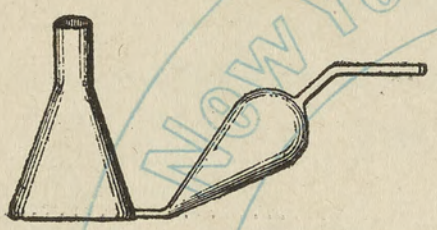

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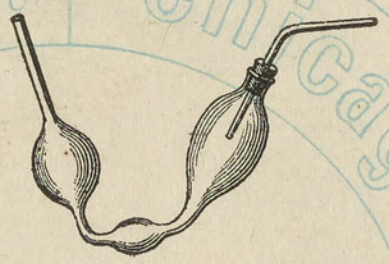

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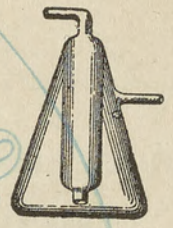

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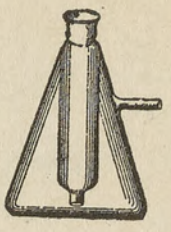

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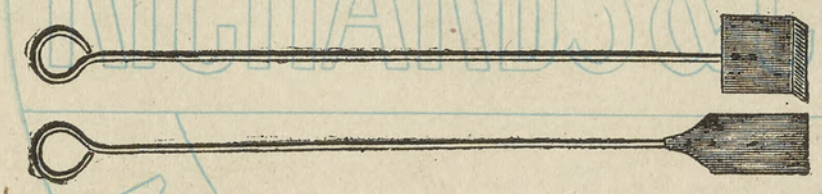

1287 and 1288

No.

1287. **Muffle Scrapers,** of steel, to clean muffles from slags, flat ..... each **$0.50**

1288. —— of steel, bent ..... " **.50**

1289. **Nitrogen Bulb, Arndt's,** with 4 bulbs ..... **.35**

1290. —— **Wills & Varentrapp's** with 3 bulbs ..... **.35**

1291. —— " " " 4 bulbs ..... **.40**

1292. —— **Fresenius'** ..... **.50**

1293. —— **French** form ..... **.35**

1294. —— **Kraut's** ..... **.50**

1295. —— **Vollhard's,** right angle bulb ..... **.50**

1296. —— ,, obtuse angle bulb ..... **.50**

1297. —— " latest form ..... **.60**

1298. —— **Shepherd's,** with glass tube and cork ..... **.50**

1299. —— **Habermann's,** with narrow neck **1.00**

1300. —— " with wide neck **1.00**

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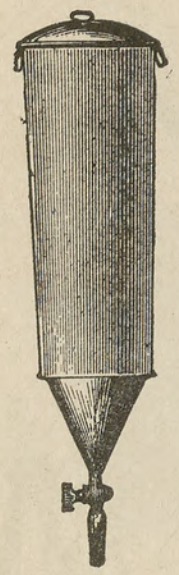

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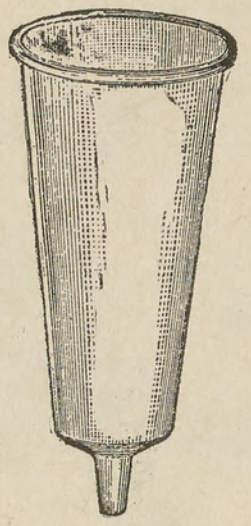

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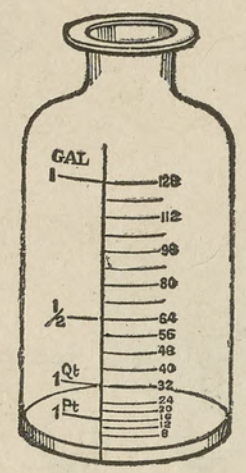

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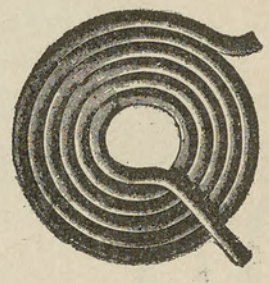

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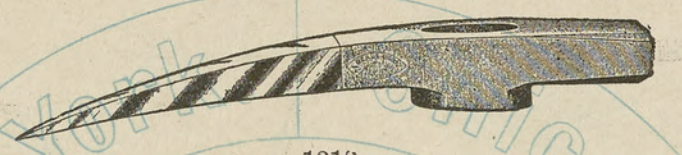

1312

No.

1301. **Paper, Black glazed,** for sampling, etc., ... per quire $0.40

1302. —— **Manilla,** medium ..... per lb. .15

1303. —— " heavy ..... " .15

1304. —— **Parchment,** light ..... " .60

1305. —— " heavy ..... " .60

Paper for other purposes, see Index.

1306. **Pencils, Carbon,** for cutting glass ..... each .10

1307. —— for **writing** on glass—blue and yellow ..... each, 10c. doz. 2.00

1308. **Percolators,** heavy flint glass, conical.

Capacity	½	1 pt.	1 qt.	½	1	2	2 gal.
Each	.20	.25	.35	.55	.85	$1.75	3.00

1309. —— **Oldberg's** narrow.

Capacity	½	¾	1	1½	2½ pts.	2	3 qts.	1	1 gal.
Each	.30	.35	.40	.55	.70	.90	$1.10	1.75	2.40

1310. **Percolating Jars,** graduated in ounces.

Capacity	1 qt.	½	1	2 gal.
Each	$1.20	1.75	2.70	4.00

1311. **Percolators,** tin, plain and with stopcock.

	Capacity	1 qt.	½	1	2	3	5 gal.
	Plain	$1.00	1.20	1.50	2.10	2.80	3.60
1311a.	With stopcock.	1.60	1.80	2.10	2.80	3.50	4.30

1312. **Picks, Prospecting, Freiberg Pattern,** face ⅞x⅞ in., with handle 1.50

1313. **Pipes, pure block tin,** 3/16, ¼, 5/16, ⅜, ½ in. inside dia. ..... lb. .60

1314. —— **Lead,** 1/18, 3/16, ¼, ⅜ ½ in. inside dia ..... " .25

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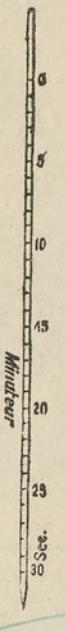
1315



1316



1318



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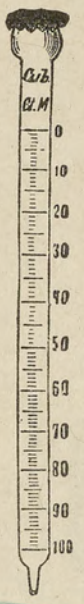

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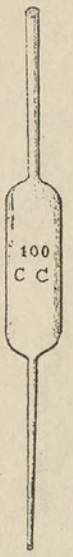

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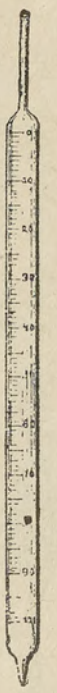

1323



1325

PIPETTES.

No.

1315. **Pipettes, small, with rubber bulb, straight end** ..... doz. $0.50

1316. — " " " " **bent end** ..... " .50

1317. — **straight, not fixed.**

Length	5	6	7	8	10	12	15	20 in.
Each	.05	.05	.05	.06	.07	.08	.10	.12

1318. — **with bulb, not fixed.**

Capacity about	5	10	25	50	100	200 cc.
Each	.10	.15	.20	.25	.30	.50

1319. — **minute counter.**

Capacity	1	2 minutes
Grad. in.	$\frac{1}{4}$	$\frac{1}{4}$ "
Each	.75	$1.00

1320. — **with sheet rubber top.**

Capacity	5	10	25 cc.
Grad.	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$ "
Each	.50	.60	.75

1321. — **straight, graduated in minims.**

Capacity	30	60	100 minims
Each	.25	.35	.50

1322. — **Volumetric,** accurately marked.

Capacity	1	2	3	5	10	12	15	20	25	50	80	100	200 cc
Each	.10	.10	.12	.15	.20	.25	.25	.25	.30	.40	.50	.60	$1.00

1323. — **Mohr's,** accurately graduated in centimeters and fractions.

Capacity	1	2	5	10	10	20	25	50	50	100 cc.
Grad.	$\frac{1}{100}$	$\frac{1}{50}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{5}$
Each	.60	.60	.60	.70	.65	.80	.90	$1.25	1.00	2.00

1324. — **accurately graduated, with blue and white enameled back.**

Capacity	1	2	5	10	25	50 cc.
Grad.	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$
Each	.60	.65	.70	.75	$1.25	1.75

1325. — **Mohr's,** graduated as No. 1323, **with glass stopcock.**

Capacity	10	25	50	100 cc.
Grad.	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{5}$
Each	$1.50	1.75	2.00	2.50

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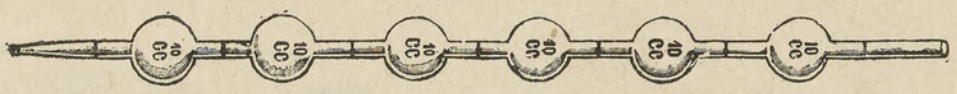

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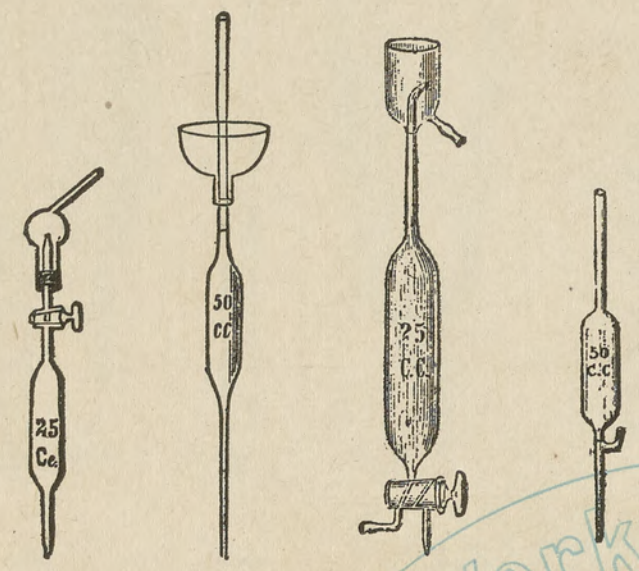

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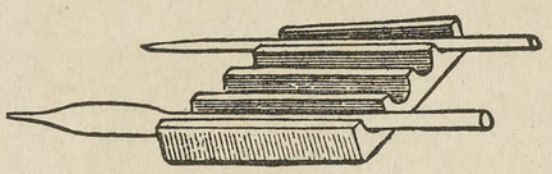

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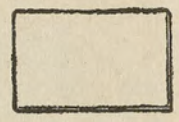

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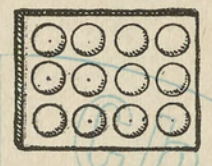

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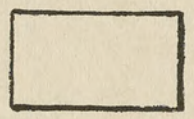

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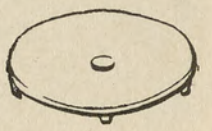

1338

No.

1326. **Pipettes, A. Le. Docte's,** with bulbs of 10 cc. capacity each.

Number of bulbs	1	2	3	5
Capacity	10	20	30	50 cc.
Each	.30	.40	.50	.60

1327. — **Volumetric Safety,** with stopcock and reservoir to receive the overflow.

Capacity	2	5	10	25	50	100 cc.
Each	$1.50	1.75	2.00	2.25	2.50	3.00

1328. — **Overflow, Rickett's,** for silver assay, plain $1.50

1329. — **Overflow, Rickett's,** 100 cc., with ground cup 2.50

1330. — **Overflow Fresenius',** with three ways stopcock.

Capacity	25	50	100 cc.
Each	$2.25	2.50	2.75

1331. — **Mohr's, with side tube,** and two marks.

Capacity	25	50	100 cc.
Each	.50	.60	.75

Other Pipettes, see Index.

1332. — **Rests,** of porcelain..... .65

Supports, see Supports.

1333t. **Plates, Porcelain, glazed.**

Sizes	4	5	6	8	10	12 in. square.
Each	.30	.50	.75	$1.00	1.25	1.50

1334. — **Porcelain, Royal Berlin,** unglazed for Arsenic test and for mineralogists, used as streak plates.

Size	1½x3	2x3½	3x4	4x5 in.
Each	.20	.25	.30	.40

1335. — **Porcelain, Royal Berlin,** very white for color reactions, size 6x8 in..... 1.50

1336. — " " 3½x4½ in., with 12 cavities for color reactions..... .65

1337. — " " 6x8 in., with hole for base of lamp support..... 1.50

1338. — " round, on 3 legs, with hole in centre for base of burette supports, dia., 11½ in..... 3.00

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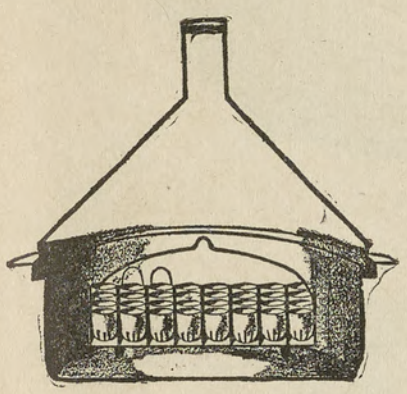

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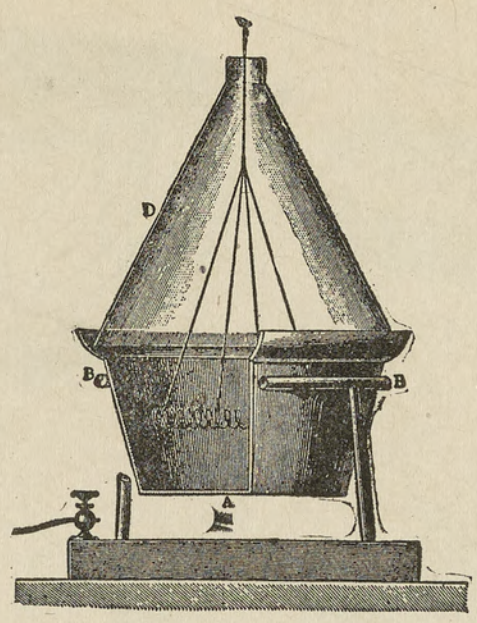

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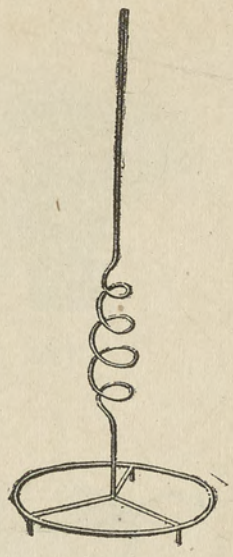

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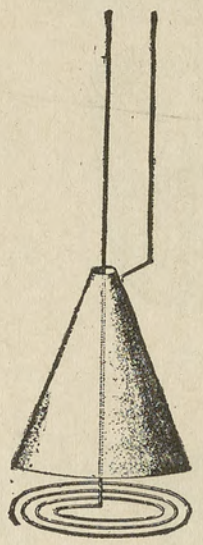

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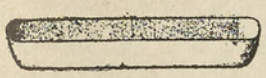

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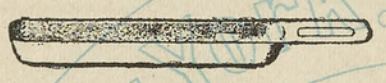

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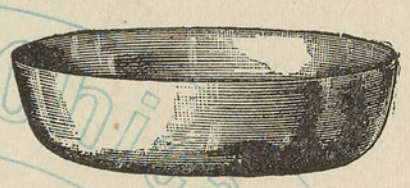


1348



1349

PLATINUM.

Our platinum ware is warranted pure and of superior make and shape. All ware is hammered and thoroughly tested after being finished. Special apparatus made to order. Old or scrap platinum bought at the highest market price. All weights given in this list are approximate only.

Prices will be governed by the market price of Platinum.

No.

1340. **Platinum, United States Mint** Parting and Assaying, with 20 to 32 cornets. Weight from 350 to 600 grammes.....Per gramme **$0.50**

1341. — **Apparatus, after Herpin,** consisting of a platinum dish on tripod and spiral, using a glass funnel as cover. Weight about 50 grammes.....Per gramme **.50**

1342. **Platinum Cylinder and Spiral,** for quantitative determination of copper by electrolysis, cylinder 2x1 in. weight about 15 grammes, (see Classen's Quantitative Chemical Analysis by electrolysis.) Per gramme **.50**

1343. **Platinum Cone and Spiral,** weight about 36 grammes.....Per gramme **.50**

1344. **Platinum Dish, Plate and Rod,** for quantatitive determination by electrolysis according to Classen.....Per gramme **.50**

1345. **Platinum Boats,** for combustions in organic analysis, plain form.

Size	2	2½	3 in.		
Weight	5	6½	8½ grammes	Per gramme	**.50**

1346. — **with handles.**

Size	2½	3	3½ in.		
Weight	6	7½	9 grammes	Per gramme	**.50**

1347. **Platinum Bottles.**

Capacity	125	250	500 cc.		
Weight	50	100	200 grammes	Per gramme	**.50**

1348. **Platinum Capsules,** flat bottom, corners rounded.

No.	0	1	2		
Dia.	1⅜	1⅝	2 in.		
Height	½	1	1¼ "	Per gramme	**.50**

1349. **Platinum Cones,** for filtering with vacuum pump; made solid in one piece.

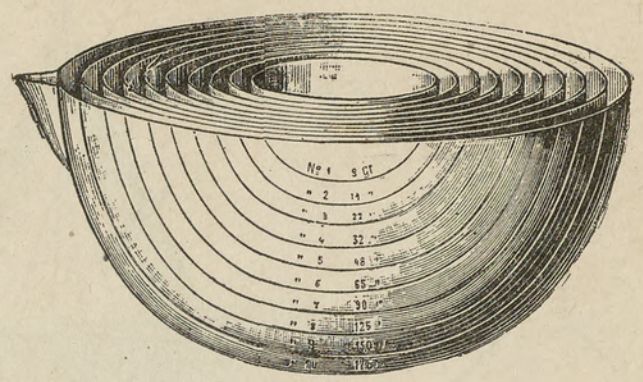
Dia. at top	¾	1	1¼	2	2½ in.	Per gramme	**.60**



1350



1352



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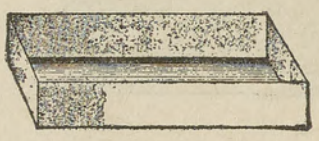


1358

No.

1350. **Platinum Crucibles,** with covers.

No.	1	2	3	4	5	6	7	
Capacity	10	15	20	25	30	40		50 cc.
Weight	10	15	20	25	30	40		50 grammes

Per gramme **$0.50**

1351. — **Plattner's,** for blow-piping; cone shaped. Dia. ⅜ in., weight 2 grammes ..... .70

1352. — **Gooch's,** form.

No.	1	2	3	
Capacity	20	25	30	cc.
Weight	25	30	37	grammes

Per gramme .50

1353. — **Holders of glass,** for filtering with the above ..... .25

1354. **Platinum Dishes,** evaporating, with lip.

No.	1	2	3	4	5	6	7	8	9	10	
Capacity	20	30	45	80	125	200	270	370	400	450	cc.
Weight	8	14	22	32	48	65	90	125	150	175	grammes

Per gramme .50

1355. — for **Iron and Steel Analysis,** with flat bottoms and straight sides, rim wired.

No.	1	2	3	
Dia.	90	100	100	mm.
Height	50	55	58	"
Weight about	80	100	125	grammes

Per gramme .60

1356. — for **Milk Analysis,** flat bottom.

No.	1	2	
Dia.	50	56	mm.
Height	19	25	"
Weight	14	17	grammes

Per gramme .50

1357. — for **Sugar Analysis,** shallow, with rounded bottom ..... " " .50

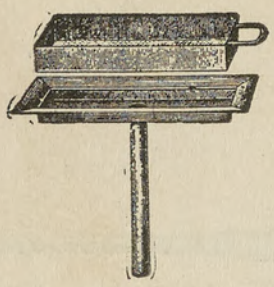
1358. — for **Incineration of filters,** square.

No.	1	2	
Dia.	1½	2	in.
Weight	10	20	grammes

Per gramme .50

NOTE: Platinum Cascade Apparatus, for Sulphuric Acid concentration; entirely new. **Patent applied for.** Write for descriptive circular.

New York. Chicago. Newark. Hamburg. RICHARDS & CO. LTD.



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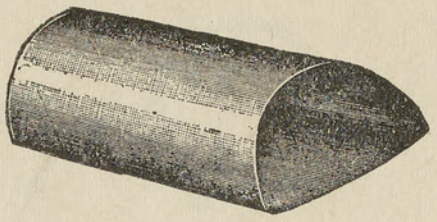

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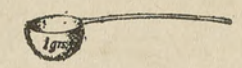

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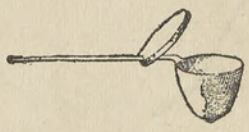


1371



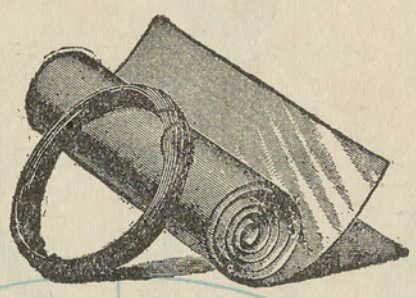
1365



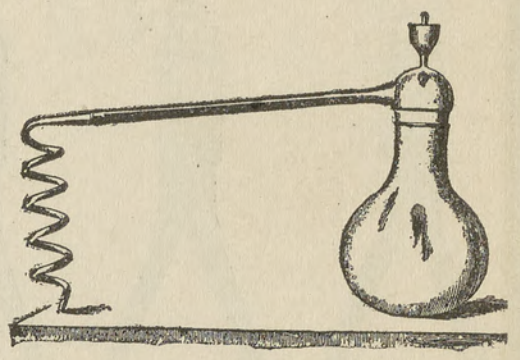
1366



1367



1361 and 1378



1372



1373



1375

No.

1359. **Platinum Filter Boats and Holders,** as used in iron and steel analysis; weight of boat about 15 grammes; weight of boat holder about 23 grammes.....per gramme **$0.60**

1360. **Platinum Filter Tubes,** for carbon determination..... " **.50**

1361. **Platinum Foil.**

	Light	Medium	Heavy
Thickness	$\frac{1}{1000}$	$\frac{1}{500}$	$\frac{1}{250}$ in.
Per gramme	.50	.40	.40

1362. **Platinum Gauze, fine,**.....per gramme .75

1363. —— **coarse,**..... " .60

1364. **Platinum Muffles,** after **Scheibler,** size $4\frac{1}{2}$x2x$1\frac{1}{2}$ in, ; weight about 50 grammes..... " .50

1365. **Platinum Spatulas,** with light platinum tube handle.

	Sml.	Lge.	
Weight	12	14	grammes..... " .60

1366. —— **length 3 and 4 inches;** weight 4 to 8 grammes..... " .50

1367. —— **with Buffalo handle, folding** like a knife,

	Sml.	Med.	Lge.
About	$7.00	9.00	12.00

1368. **Platinum Sponge**.....oz., **10.00;** dram. 1 50

1369. **Platinum Sponges, wired for hydrogen ignition**.....each, **.30;** doz. 3.00

1370. **Platinum Spoons,** without covers.

Nos.	1	2	3	
Dia.	10	13	16	mm.
Weight	1.5	2.4	3.0	grammes.....per gramme .60

1371. —— **with lid,** for blowpipe analysis.

Nos.	1	2	3	4	
Dia.	10	13	16	19	mm.
Weight	2.5	3.	4.	5.0	grammes..... " .60

1372. **Platinum Stills, Retorts** and **Condensers,** of any size and form, made to order.....per gramme .60

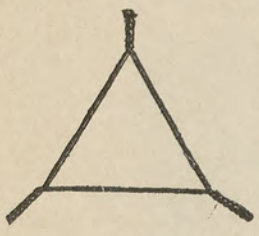
1373. **Platinum Tips,** for blowpipes, heavy, without seam.....each 1.00

1374. **Platinum Tubes,** for combustion. These tubes are intended for the estimation of carbon in iron and steel analysis. The tube is $\frac{5}{8}$ inch diameter, contracted at one end to $\frac{1}{8}$ inch, and drawn out from this, ends into a tube about 6 inches long. The tube is polished inside and out.

Length of tube	16	20	23	in.
Weight, about	150	180	210	grammes.....per gramme .60

1375. **Platinum Tube, Blair's,** for combustion; weight, about 200 grammes.....per gramme .60

New York. Chicago. RICHARDS & CO. LTD. London. Hamburg.



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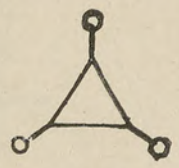

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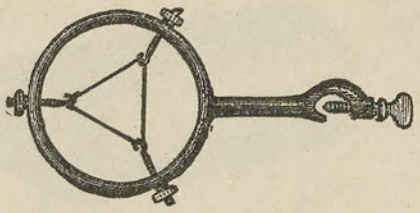

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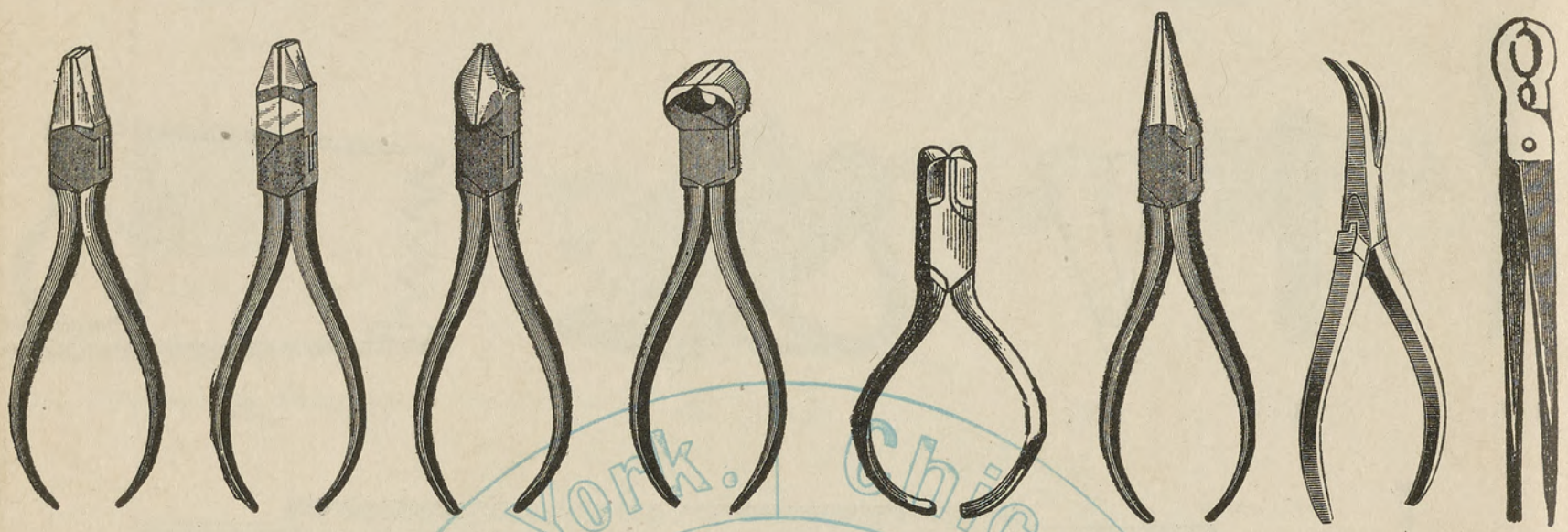


1380 1381 1382 1383 1384 1385 1386 1387

No.

1376. **Platinum Triangles,** made of Nos. 16 and 15 wire, very substantial.....per gramme **$0.50**

1376a. —— No. 16. Side of opening 30 35 40 45 mm.
Approximate weight 5.6 6.7 7.8 8 9 grammes.

1376b. —— No. 15. Side of opening 50 55 60 65 mm.
Approximate weight 12 13.1 14.2 15.4 grammes.

1376c. **Platinum Triangles,** made with No. 19 wire. To be used with triangle holder; No. 1377.....per gramme .50

1377. **Platinum Triangle Holder,** for holding platinum triangles firm and in place, it prevents the wire from bending down when heated, and requires much less platinum wire to make triangles...each 1.25

1378. **Platinum Wire.**

Nos.	12	14	15	16	18	20	24	
Approximate weight per in.	1.83	1.30	1.02	.73	.45	.28	.111	grammes.

Nos.	26	27	29	34	35	36	
Approximate weight per ft.	.8	.64	.39	.132	.101	.072	grammes.

Sizes Nos. 12 to 29.....per gramme .40
" 34 and finer..... " .50

1379. **Platinum Wire holders**..... .80

1380. **Pliers, flat nose.**

Size	4	5	6 in.
Each	.40	.50	.60

1381. —— **flat nose, side cutting.**

Size	4	5	6 in.
Each	.60	.70	.80

1382. —— **side cutting.**

Size	4	5	6 in.
Each	.60	.70	.80

1383. —— **end cutting.**

Size	4	5	6 in.
Each	.65	.75	.85

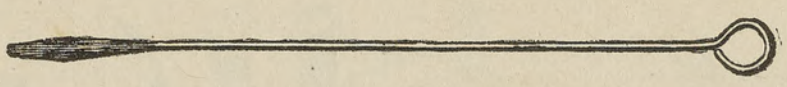
1384. —— **cutting edge parallel** with handle..... 1.00

1385. —— **button, straight,** for lifting cupel beads..... .50

1386. —— **button, turned-down nose**..... .60

1387. —— **for gaswork**..... .50

New York. Chicago. Newark. Hamburg. DIETZGEN & CO.



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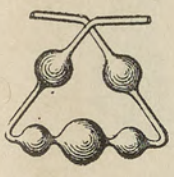

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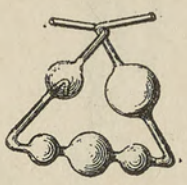

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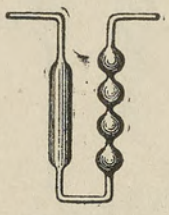

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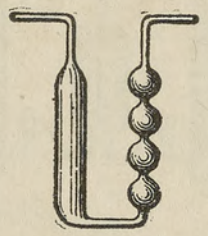

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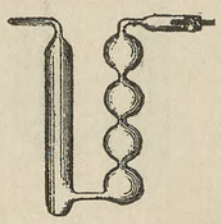

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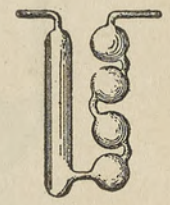

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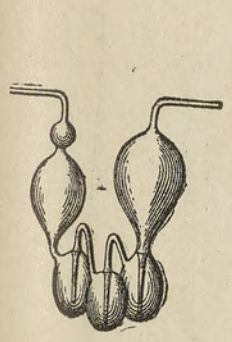

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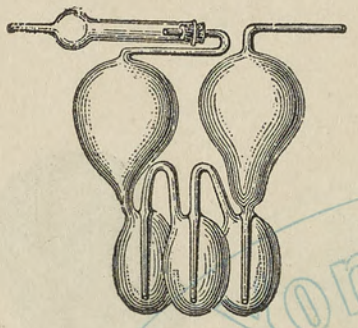

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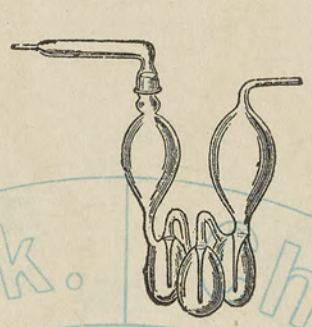

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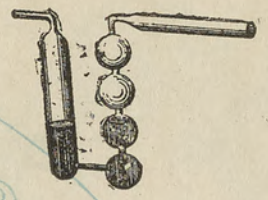

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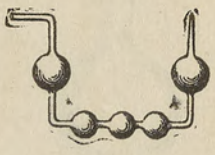

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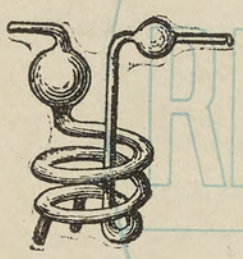

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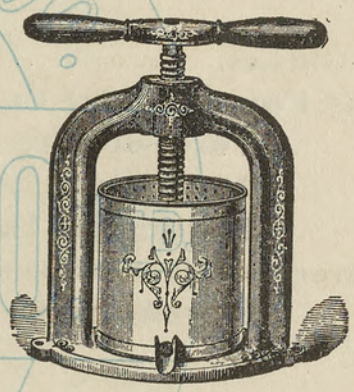


1400

No.

1387. **Pokers, of Iron** $0.50

1388. **Potash Bulbs, Liebig's,** with 5 bulbs ..... .50

1389. —— **Liebig's and Dittmar's** form ..... .85

1390. —— **Mitscherlich's** a, b, or c ..... .50

1391. —— **Mitscherlich—Konninck's** ..... .60

1392. —— **Geissler's** ..... .85

1393. —— **Geissler's,** with drying tube attached 1.20

1394. —— **Geissler's,** with Ca. $Cl._2$ tube ground on, new form 1.50

1395. —— **Schloesing's** ..... .75

1396. —— **Ure's** ..... .60

1397. —— **Winkler's** spiral ..... Small, .75, Medium 1.25

1398. **Precipitating Jars, heavy glass,** with lip.

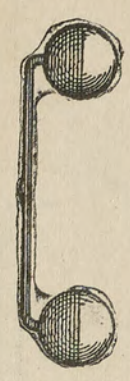
Capacity	¼	½	1 pt.	1 qt.	½	1	2 gal.
Each	.20	.25	.35	.50	.75	$1.10	2.40

1400t. **Presses,** for **Tinctures,** Herbs, Meat, &c.

Capacity	1 qt.	½	1	2 gal.
Each	$3.00	4.00	7.00	9.00

Presses for **Corks,** see Cork Presses.

New York. Chicago. RICHARDS & CO. Newark. Hamburg.



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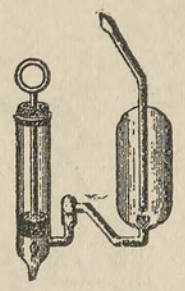

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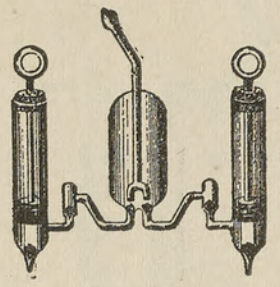

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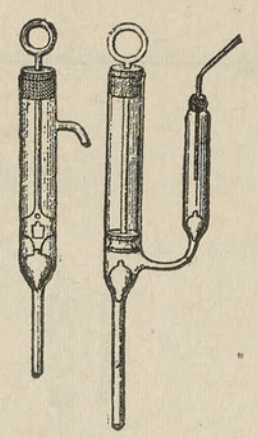

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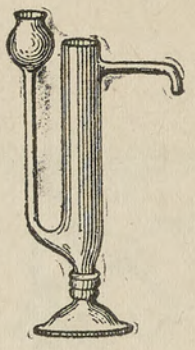

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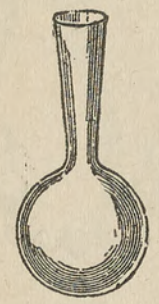

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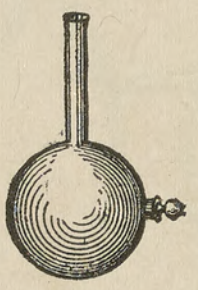

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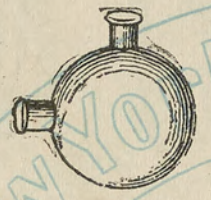

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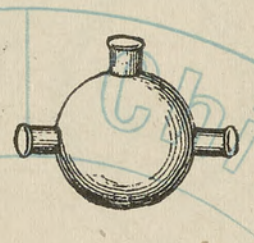

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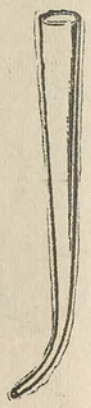


1413 1414

No.

1401. **Pulse Glasses,** ..... small .60, large $1.00

1402. **Pumps, Force, or Fire Engine,** single 1.75

1403. — **Force or Fire Engine,** double 3.00

1404. — **Lifting,** with conical valves 1.50

1405. — — **Lifting and Forcing,** with conical valves 1.75

1406. **Receivers,** with in and out flow, for small distillations ; used also as dripping glasses for acids ..... .85

1407. — **Florentine,** for collecting distillates.

Capacity	1 pt.	1 qt.	½ gal.
Each	.75	1.20	2.00

1408. **Receivers, for Retorts,** glass, plain.

Capacity	1	2	4	8	16 oz.	¼	½	1 gal.
Each	.10	.12	.15	.25	.30	.40	.65	$1.00

1409. — **for Retorts,** glass, with tubulature and glass stopper.

Capacity	1	2	4	8	16 oz.	¼	½	1 gal.
Each	.20	.25	.30	.40	.50	.70	$1.00	1.40

1410. — **glass, with two tubulatures.**

Capacity	8	16	32 oz.
Each	.40	.60	.80

1411. — **glass, with three tubulatures.**

Capacity	8	16	32 oz.
Each	.50	.70	$1.00

1412. **Respirators** to prevent lead poisoning and salivation. This respirator is invaluable to those engaged in dry crushing quartz mills, quicksilver mines, white lead corroding, and all occupations where the surrounding atmosphere is filled with dust, or poisonous vapors ..... each 3.00

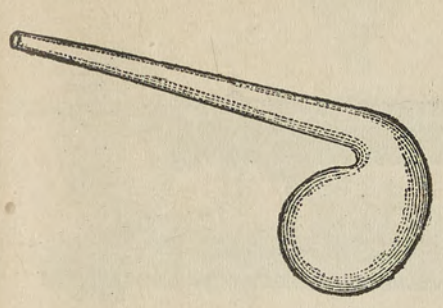
1413. **Retort Adapters, straight.**

Inner dia. at large end	½	1	1½	2 in.
Each	.20	.25	.35	.50

1414. — **Bent.**

Inner dia. at large end	½	1	1½	2 in.
Each	.20	.25	.35	.50

New York. Chicago. Richards & Co. Ltd. Newark, N.J.



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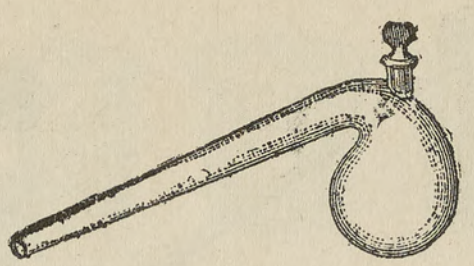

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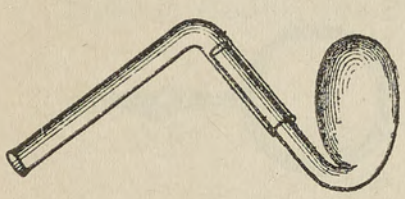

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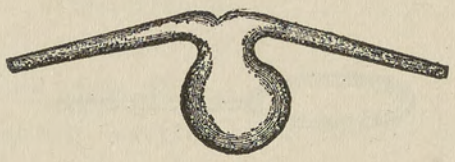

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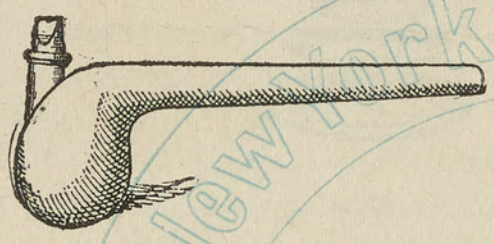

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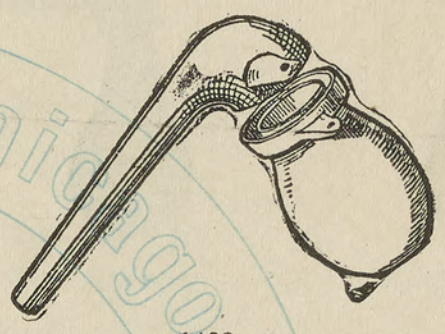

1422

RETORTS.

No.

1415. **Retorts, Bohemian glass, plain.**

Capacity	1	2	4	8	16 oz.	1 qt.	½	1	2 gal.
Each	.12	.15	.20	.25	.30	.40	.50	.75	$1.30

1416. — **Bohemian glass, with tubulature and glass stopper.**

Capacity	1	2	4	8	16 oz.	1 qt.	½	1	2	3	5 gal.
Each	.15	.20	.25	.30	.50	.60	.80	$1.25	1.75	2.50	4.50

1417. — **Glass, stoppered, with ground in receiver.**

Capacity	2	4	8	16 oz.
Each	.50	.75	$1.00	1.50

1418. — **Clark's, with tube receiver**..... $0.50

1419. — **Liebig's,** for introducing gases while distilling.

Capacity	8	16	32 oz.
Each	.75	$1.00	1.25

1420. — **Bohemian, hard infusible glass with two bulbs.**

Capacity	2	4	8 oz,
Each	.50	.60	.70

1421. — **Royal Berlin Porcelain** with tubulature and stopper.

Capacity	4	12	20 oz.
Each	$2.00	2.75	3.25

1422. — **Royal Berlin Porcelain** with detachable hood, capacity 1 pint..... 2.50

1423. — **Clay, Battersea,** with tubulature and stopper.

Capacity	2	3 pt.	2	3 qt.	1	1½	2	4 gal.
Each	$1.60	1.95	2.30	2.85	3.10	3.75	6.25	9.00

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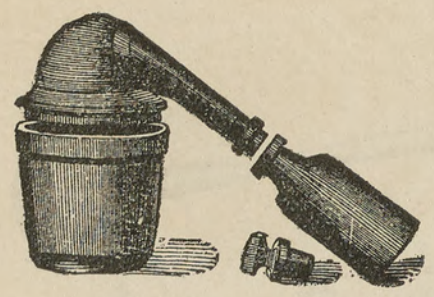

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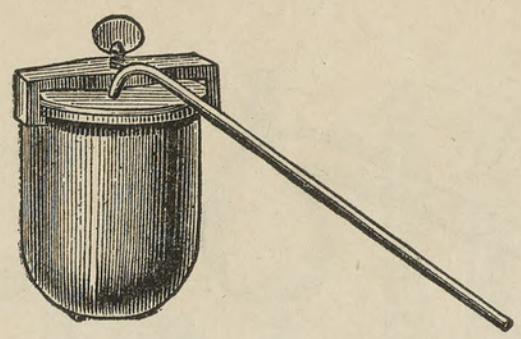

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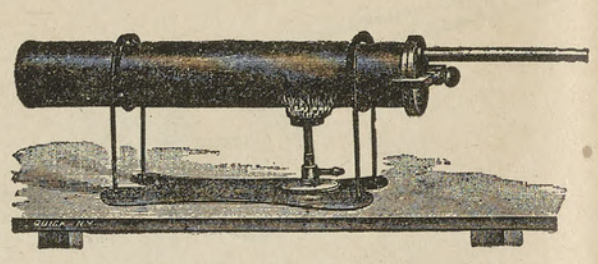

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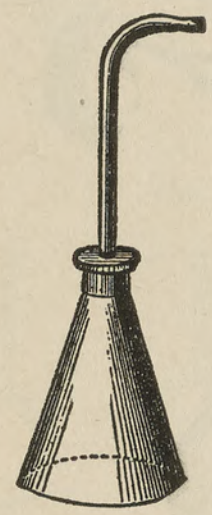

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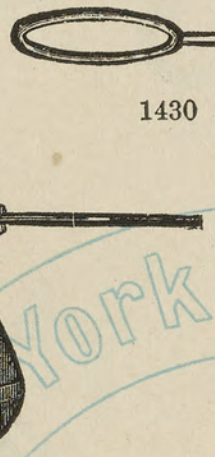

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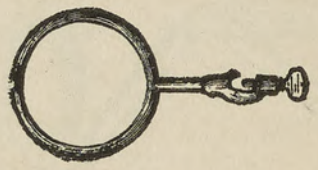
1430



1431



1432

No.

1424t. **Retorts, Lead, for Hydrofluoric Acid, etc.**

Capacity	1 pt.	1 qt.	½	1	2 gal.
Each	$5.00	7.00	10.00	12.00	15.00

1425. — **Iron, for distilling Mercury, etc.,** with cover, screw, clamp and delivery tube.

Capacity	¼	½	1 pt.	1 qt.	½	1	2 gal.
Each	$1.75	2.00	2.50	3.00	4.00	6.00	7.50

1426n. — **Russia Sheet Iron,** for generating oxygen ; length 18 in. dia. 3 in., with ground on cover and clamp. Complete with iron stand and burner. (One charge of 2½ lb. chemicals will generate 75 gallons of oxygen) $10.50

1427. — **Copper, for Oxygen, conical form,** very heavy.

Capacity	1 pt.	1 qt	½ gal.
Each	$3.25	3.50	4.00

1428. — **Copper, for oxygen, with iron clamp** and delivery tube, fitted by ground joints.

Capacity	½	1 pt.	1 qt.	½ gal.
Each	$2.00	2.25	2.75	3.50

Retorts, Platinum, see Platinum.

Retorts, Copper, tin lined ; see Part II. Distilling Apparatus.

1429. **Rings, Porcelain,** concentric, **for Water Baths.**

Set of 5	Set of 6	Set of 7
$1.00	1.50	2.00

1430. — **Iron, for Supports;** with holders, length adjustable.

Size	Sml.	Med.	Lge.
Each	.40	.45	.50

1431. — **Iron, for Supports;** with clamp, can be attached to any size rod.

Dia.	2	3	4	5	6 in.
Each	.15	.20	.20	.25	.25

1432. **Roasting Dishes, Battersea.**

Dia.	2½	3	4	5	6	7 in.
Doz.	.65	.80	.90	$1.10	2.10	2.75

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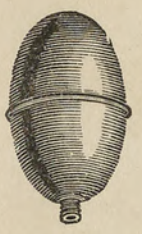

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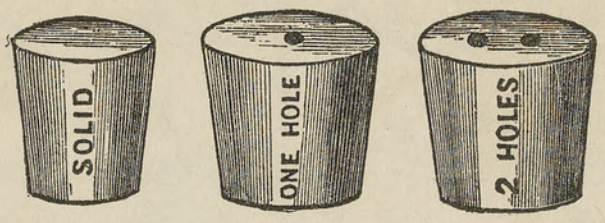
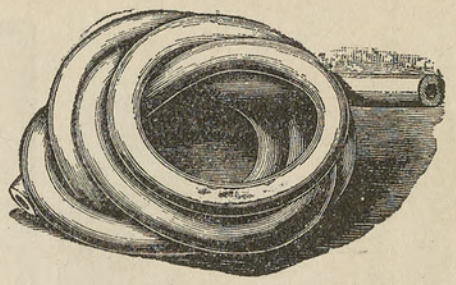


1442



1445

No.

1433. **Rubber Bulbs, for Pipettes,** capacity about 2 cc ..... Each **$0.05**

1434. — " " from 20 to 25 cc ..... " **.25**

1435. — " " from 40 to 50 cc ..... " **.30**

1436. — **extra large,** capacity about 250 cc ..... " **1.00**

1437. — **with valve for wash bottles etc.,** capacity from 40 to 50 cc ..... " **.50**

1438. — **pure soft rubber,** for Orsats Gas Apparatus ..... " **.50**

1439. **Rubber Caps,** for Test tubes, etc.

Dia.	3/4	1	3 in.
Doz.	.40	.50	$1.25

1440. **Rubber Cloth,** pure Gum ..... oz. **.20** lb. **2.50**

1440a. **Rubber Policemen,** for washing down Ba. $(OH)_2$ etc. from walls of beakers, etc ..... doz. **.60**

1441. **Rubber Sheeting,** white ..... per yard **1.00**

RUBBER STOPPERS.

1442. We wish to call the **attention of chemists** to our high grade of Rubber Stoppers, which are made of **pure Para Gum** and not having any adulteration, they will **float on water.** (A simple text of purity.) They are elastic and soft, and do not become hard by age.

No.	Large end.	Small end.		per oz.	per doz.
A	12 mm.	8 mm.	solid	$.20	$.15
B	13 "	9 "	"	.20	.20
C	14 "	10 "	"	.20	.25
D	15 "	11 "	" or 1 hole	.20	.30
E	17 "	13 "	" " "	.20	.35
F	19 "	15 "	" " " or 2 holes.	.20	.45
G	21 "	18 "	" " " " " "	.20	.65
H	23 "	20 "	" " " " " "	.20	.75
I	25 "	21 "	" " " " " "	.20	.85
J	27 "	24 "	" " " " " "	.20	1.05
K	32 "	28 "	" " " " " "	.20	1.45
L	36 "	31 "	" " " " " "	.20	1.85
M	40 "	35 "	" " " " " "	.20	2.20
N	44 "	38 "	" " " " " "	.20	2.75
O	50 "	42 "	" " " " " "	.20	3.80

1443. **Rubber Stoppers,** ordinary quality, perforated with one or two ½ in. holes; dia. at top 2 in., dia. at bottom 1½ in. ..... Each **.50**

1444. **Rubber Tissue** ..... oz. **.25**

1445. **Rubber Tubing, white,** best quality, hand-made, wrapped for laboratory uses, gas, etc., in 12 foot lengths.

Inside dia.	1/8	3/16	1/4	5/16	3/8	1/2	3/4	1 in.
Per foot	.06	.09	.13	.15	.20	.25	.32	.43

1446. — **black, pure gum.**

Inside dia.	1/8	5/32	3/16	1/4	5/16	3/8	1/2 in.
Per foot	.07	.08	.10	.12	.15	.20	.30

1447. — **extra heavy walls, for Vacuum Pumps, etc.**

Inside dia.	3/16	1/4 in.
Per foot	.16	.18

1448. — **pure gum, for Gooch Crucibles.**

Inside dia.	1	1¼	1½ in.
Per foot	.15	.20	.25

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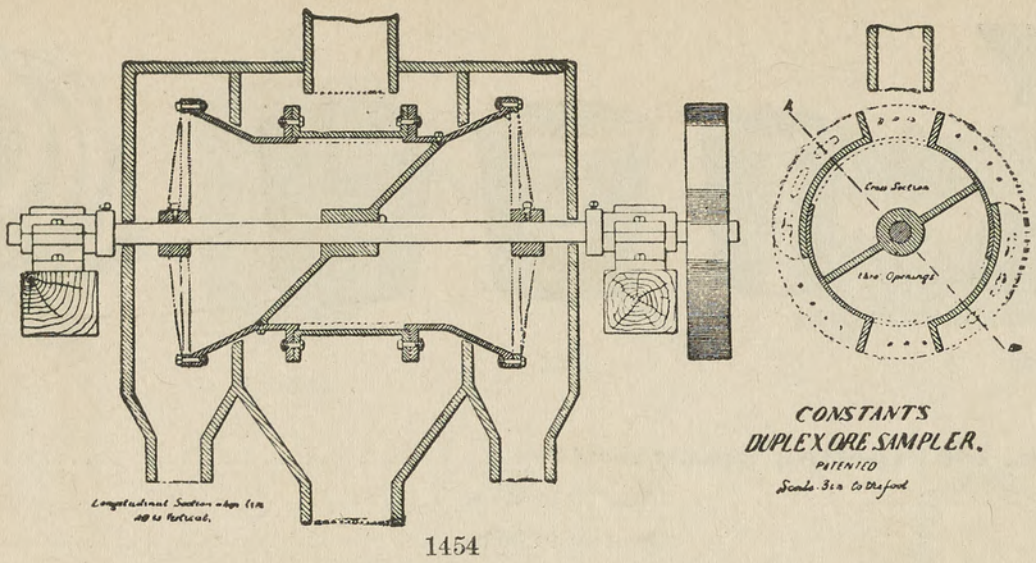

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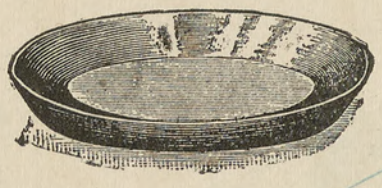

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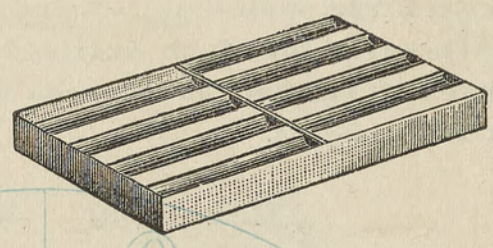

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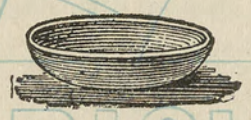

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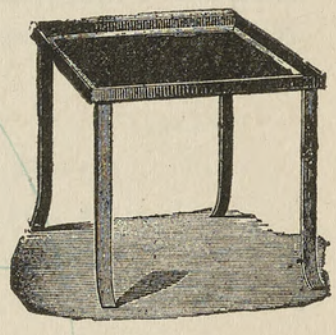


1457

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

No.

1449. **Ruppert Drops**.....per doz. **$0.30**

1450. **Sample Dishes,** Russia Iron, flat.

Dia.	2	2½	3	4 in.
Each	.10	.15	.20	.25

1451. **Sample Pans, for ore,** of seamless tin.

Dia.	5	6	7	8	10 in.
Each	.10	.12	.15	.20	.25

1452. **Samplers,** of tin.

Size	6x8	9x12 in.
Each	.50	.75

1454. **Sampler Ore, Constant Duplex.** Draws **two** independent, duplicate samples at one passage of the material over the machine, but can be adjusted to draw but one sample if desired. For ores, waters, minerals, fertilizers, grain, etc. (Descriptive circulars sent on application.)..... **250.00**

1455. **Sand Bath,** Russia Sheet Iron, **shallow.**

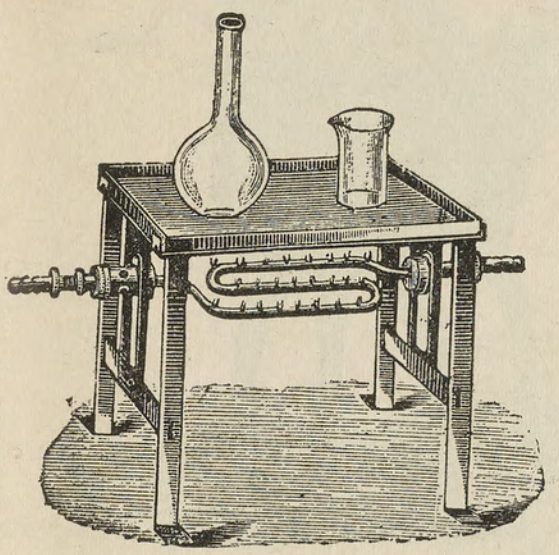
Dia.	2	3	4	5	6	8	10 in.
Each	.10	.12	.15	.20	.25	.35	.50

1456. —— Iron, **hemispherical.**

Dia.	3	4	5	6	8	10 in.
Each	.15	.20	.25	.30	.50	.70

1457. —— or **Hot Plate,** an iron plate on 4 legs.

Size	6x8	8x10	10x12 in.
Each	$2.50	3.00	4.00



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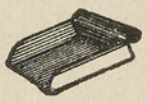
1462



1463



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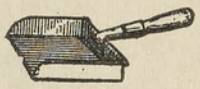

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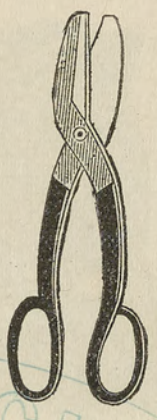
1466



1459



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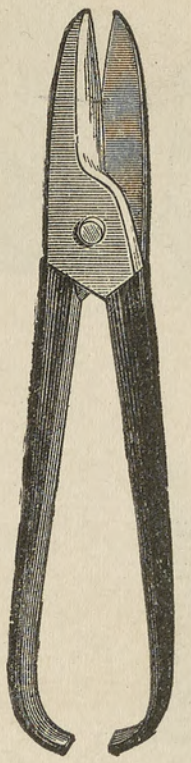

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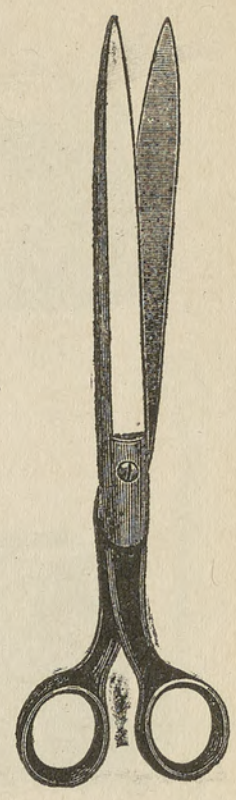

1479

No.

1458. **Sand Bath, Ruedorff's,** wrought iron ; 3 row burners, as illustrated.

Size	8x10	10x12 in.
Each	$7.00	8.00

1459. **Sand Glasses.**

For	1	3	5	10 minutes
Each	.40	.50	.60	.75

1460. **Sand Paper,** assorted ..... per sheet $0.05

1461. **Scoops, agate ware,** 3x5½ in ..... .20

1462. — **horn.**

No.	1	2	3	4
Bowl	3¼x2½	3½x3	4¼x3¼	4½x3½ in.
Doz.	.75	$1.00	1.50	1.75

1463. — **horn, for mixing** ..... .75

1464. — **Amalgam, and Sampling** Russia Iron, 5x4½ in ..... .50

1465. — **Amalgam,** and Sampling Russia Iron, **wood handle,** 5x5½ in ..... .75

1466. **Scorifiers Battersea.**

Dia.	1	1¼	1½	2	2¼	2½	2¾	3	3½	4	5 in.
Per 100	$1.15	1.15	1.15	1.16	1.17	1.30	1.60	2.00	2.40	2.90	3.30

1467. **Sea Sand** ..... lb. .10

1468. **Shears,** polished steel, **Brown's.**

Length	6	7	8	10 in.
Each	$1.00	1.20	1.40	1.60

1469t. — steel, **Handshears.**

Length	10	12½	14	16 in.
Each	$1.50	2.50	3.00	3.60

1470. — for cutting **paper,** etc.

Length	5	6	8	9 in.
Each	.50	.75	$1.00	1.25

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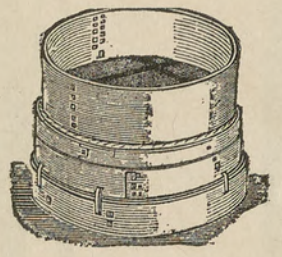

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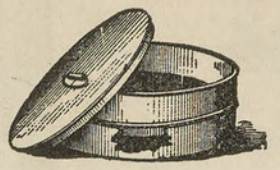

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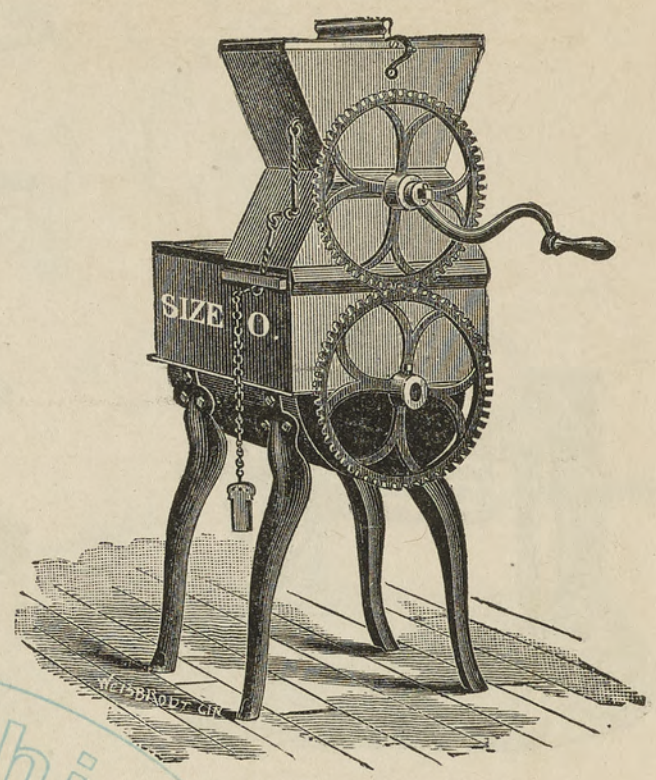

1484

SIEVES.

No.

Sieves, brass wire cloth, wooden frame.

			Meshes	20	40	60	80	100
1471.	——	Dia. 6 in.	Each	.40	.45	.50	.60	.75
1472.	——	Dia. 12 in.	Each	$1.00	1.15	1.25	1.70	2.25

—— **iron** gauze, wooden frame.

			Meshes	6	10	14	18
1473.	——	Dia. 12 in.	Each	.35	.35	.40	.40
1474.	——	Dia. 15 in.	Each	.55	.60	.65	.65
1475.	——	Dia. 18 in.	Each	.65	.70	.70	.75
1476.	——	Dia. 20 in.	Each	.75	.80	.80	.85

1477. —— **brass** gauze, seamless brass frame, with pan bottom.

Dia. 5 in.	Meshes	10	20	40	60	80	100
	Each	$1.00	1.00	1.10	1.20	1.30	1.40

1477a. —— **Covers** for same ..... each $0.30

1478. —— **brass** gauze.

Dia. 8 in.	Meshes	10	20	40	60	80	100
	Each	1.25	1.50	1.60	1.70	1.80	2.10

1478a. —— **Covers** for same ..... each .50

1479. —— **in sets of 5, brass gauze,** seamless brass frame, one sieve fitting on top of another with one cover and bottom, for separating substances into different grades of fineness.

Dia. 5 in.	Meshes	20	40	60	80	100	Per set	5.50

1480. —— **in sets of 5.** Dia. 8 in., otherwise the same as No. 1479 ..... " 8.00

Sifting Machines, Hunter's Lightning Lifter and Mixer.

1481. —— No. 0. Capacity 20 lbs 6.00

1482. —— No. 00. " 3 gal. or 15 lb flour 15.00

1483. —— No. 000. " 1½ " 8 " 10.00

1484. —— **Hunter's,** with gear wheels, so that both Sifter and Mixer can be operated at once. Capacity 50 lb. No. 0. Complete with one sieve, 50 mesh or under 35.00

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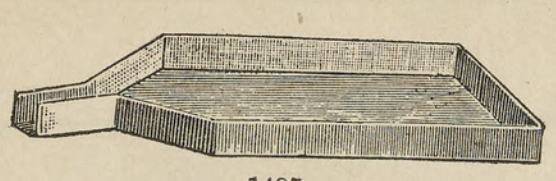

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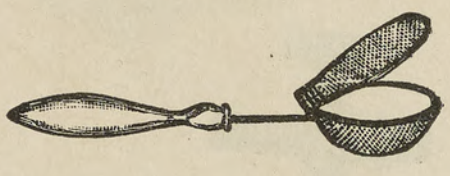

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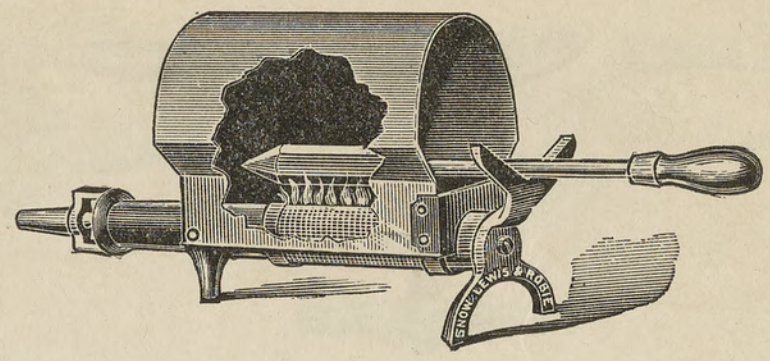

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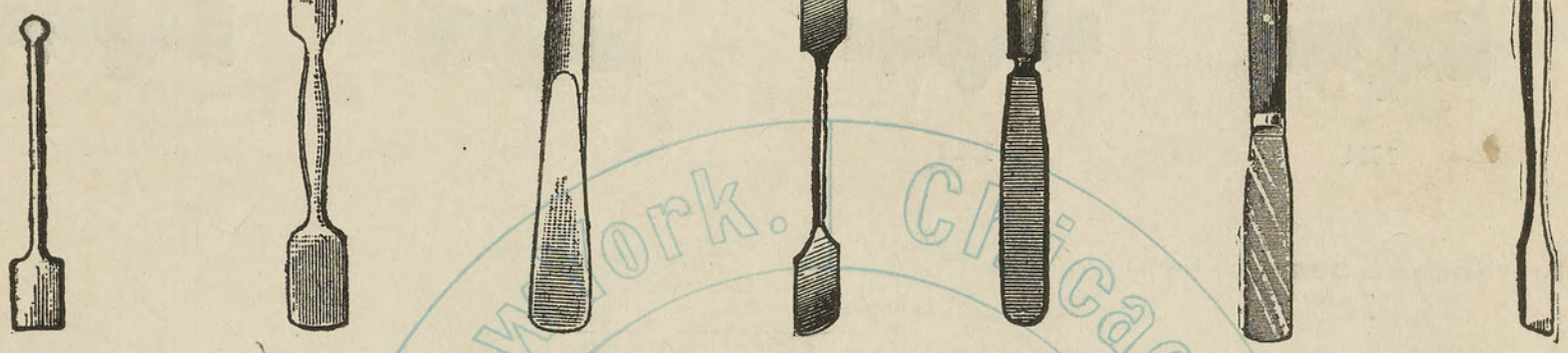

1491 1493 1497 1498 1499 1500 1496

No.

1485. **Sifting Pans,** zinc, for ores $1.50

1486. **Sodium Spoons** ..... .40

1487. **Soldering Iron** and **Scraper** ..... per set .50

1488. **Soldering Iron Heater,** for gas 1.25

1490. **Spatulas, bone,** best quality.

Length	6	7 in.
Each	.15	.20

1491. — **glass,** size 6 in ..... .10

1492. — " " " with ground blade ..... .25

1493. — **horn,** best quality, spatula on both ends.

Length	4	5	6	8	10	12 in.
Each	.08	.10	.10	.20	.35	.50

1494. — **horn, folding,** with handle ..... .30

1495. — **platinum,** see Platinum.

1496. — **porcelain,** spatula on both ends.

Length	6	8½	11	12½	15	17 in.
Each	.25	.40	.60	.65	.85	$1.05

1497. — **porcelain, Royal Meissen;** very stout, with handle and broad blade.

Dia.	9	12 in.
Each	.50	.65

1498. — **steel; spatulas on both ends.**

Length	5½	6½	7½	8½	9½	10½	12½ in.
Each	.20	.22	.25	.30	.35	.40	.45

1499. — **steel, nickel-plated;** with metal handle.

Length	3	4	5	6	8	10 in.
Each	.45	.50	.55	.60	.80	$1.25

1500. — **steel,** with **cocoa wooden handle.**

Length of blade	3	4	5	6	7	8	10	12 in.
Each	.25	.30	.35	.40	.45	.60	$1.00	1.75

1501. — **steel, pocket folding** ..... .85

1502. **Sponges, sheep's wool,** for laboratory use ..... per lb. 2.50

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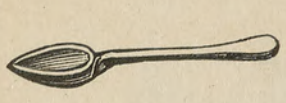

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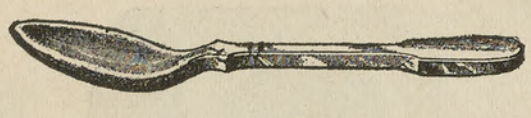

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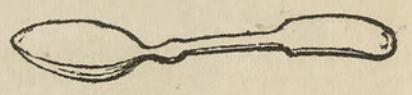

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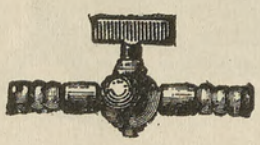

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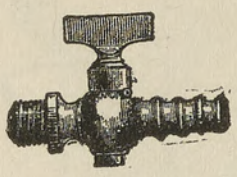

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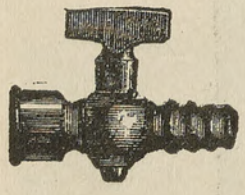

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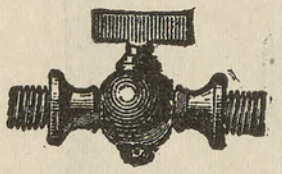

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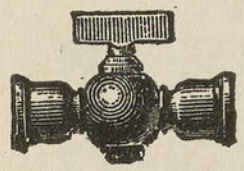

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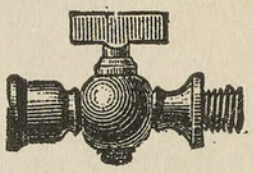

1514

No.

1503. **Spoons, bone,** best quality.

Length	5	6½ in.
Each	.15	.20

1504. — **light glass.**

	Tea Spoon.	Table Spoon.
Each	.20	.40

1505. — **heavy cut glass.**

	Tea Spoon.	Dessert Spoon.	Table Spoon.
Each	.25	.35	.50

1506. — **horn,** best quality.

Length	4	5	6	8	10	12 in.
Each	.08	.10	.12	.20	.35	.50

1507. — **horn, with spatula end.**

Length	5	6	8	10½ in.
Each	.12	.15	.25	.45

Spoons, Platinum; see Platinum.

1509. **Stopcocks, brass, double ends,** for tubing connection.

Bore	⅛	¼ in.
Each	.65	$1.00

1510. — **brass;** one end for tubing, the other with male screw.

Bore	⅛	¼ in.
Each	.75	$1.00

1511. — **brass;** one end for tubing, the other with female screw.

Bore	⅛	¼ in.
Each	.75	$1.00

1512. — **brass;** with **double male screws.**

Bore	⅛	¼ in.
Each	.75	$1.00

1513. — **brass;** with **double female screws.**

Bore	⅛	¼ in.
Each	.75	$1.00

1514 — **brass;** with **male and female screws.**

Bore	⅛	¼ in.
Each	.75	$1.00

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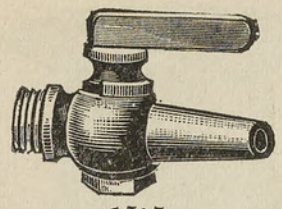

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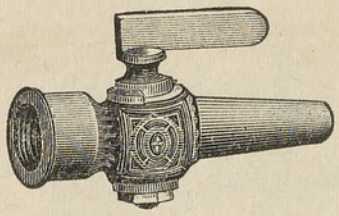

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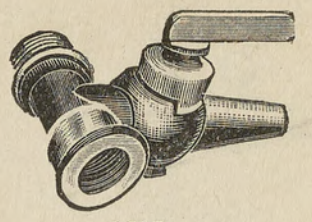

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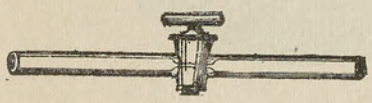

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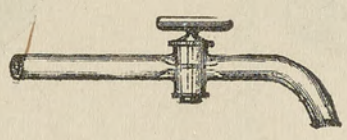

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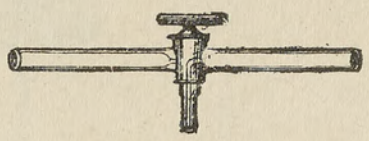

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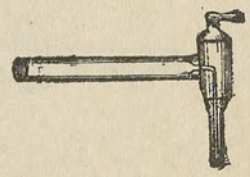

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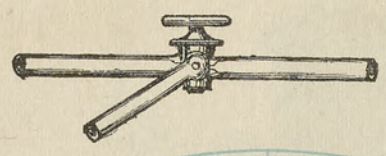

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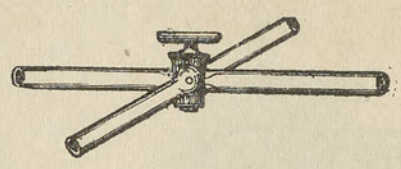

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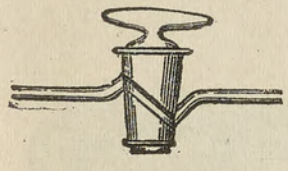

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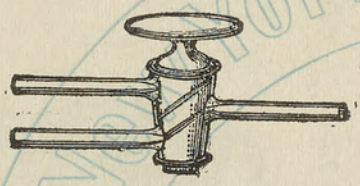

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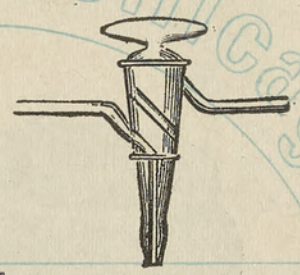

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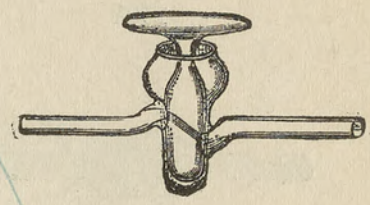


1528

No.

1515n. **Stopcocks, brass;** for gas supply, with **male** screw.

Bore	$\frac{3}{8}$	$\frac{1}{2}$ in.
Each	.90	$1.00

1516n. —— **brass;** for gas supply, with **female** screw.

Bore	$\frac{3}{8}$	$\frac{1}{2}$ in.
Each	.90	$1.00

1517n. —— **brass,** with T branch, bore $\frac{3}{8}$ in..... $1.25

1518. —— **glass, Geissler's.**

Bore	1	2	3	4	5	6	8	10 mm.
Each	.90	$1.00	1.25	1.75	2.25	2.75	3.50	5.00

1519. —— " **Geissler's** bent, same prices as No. 1518,

1520. —— " " 3 ways, new style.

Bore	1	2	3 mm.
Each	$1.25	1.50	1.75

1521. —— " " right angle. Bore 1 mm..... 1.00

1522. —— " " angle of 45 degrees. Bore 2 mm..... 1.50

1523. —— " " 3 ways.

Bore	1	2	3	5 mm.
Each	$1.25	1.50	1.75	3.00

1524. —— " " 4 ways.

Bore	1	2	3	5 mm.
Each	$1.50	1.75	2.00	3.50

1525. —— " " latest form, with plug bored at an angle, bore 2 mm..... 1.50

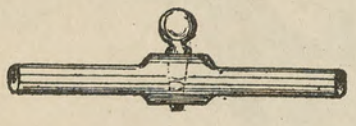
1526. —— " " " " 3 ways, bore 2 mm..... 2.50

1527. —— " " " " with downway outlets, bore 2 mm..... 2.50

1528. —— " " " with mercury seal..... 2.00

NOTE: Any of the above glass stopcocks can be used on any form of burettes, etc. made to order.

RICHARDS & CO. LTD. New York. Chicago. Newark. Hamburg.



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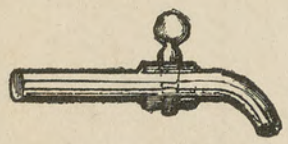

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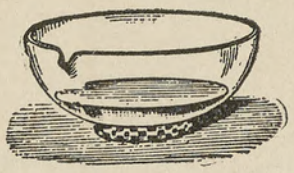

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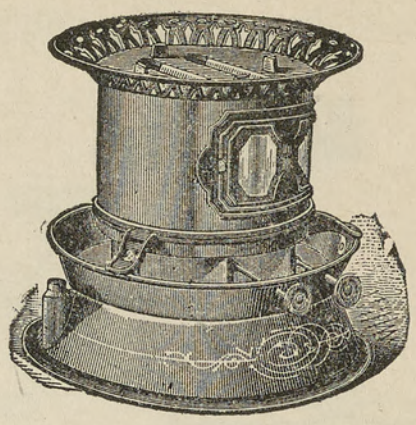

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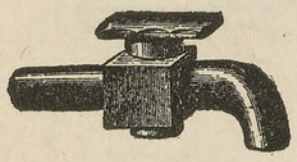

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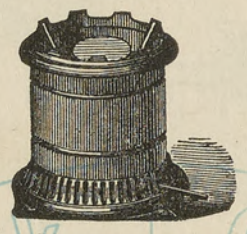

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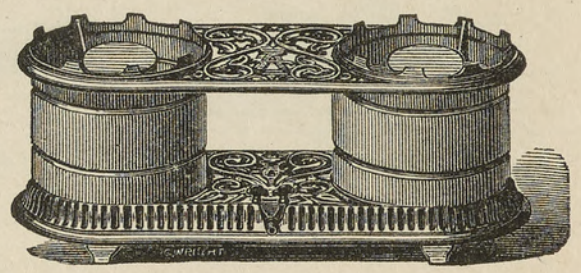

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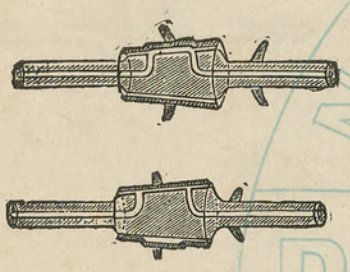

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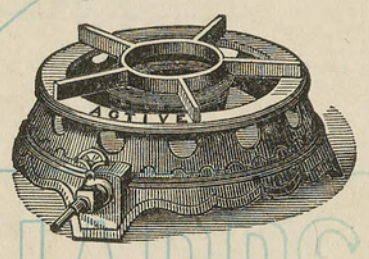

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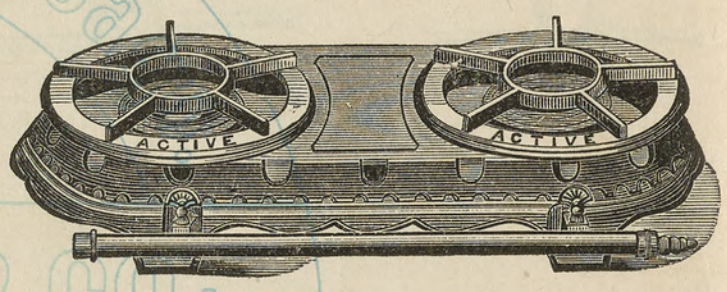


1536

No.

1529. **Stopcocks, heavy glass, straight.**

Bore	4	6	8 mm.
Each	$1.25	1.50	2.00

1530. — **heavy glass, bent.**

Bore	4	6	8 mm.
Each	$1.25	1.50	2.00

1531n. — **stone ware.**

Bore	¼	½	¾	1	1¼	1½	2	2½	3 in.
Each	$1.20	1.85	2.15	3.00	3.90	5.40	9.00	10.50	12.50

1532. — **glass, Sonden's** new pattern with hermetically tight joints..... $2.00

1533. **Stoves,** gas, **round flame.**

Dia. of top	4¾	5¾	6¾	8½
Each	.75	$1.00	1.25	1.50

1534. **Same,** with double burner and stopcock..... 4.00

1535. — for gas, **low shape economy,** height 4½ in., dia. on top 9 in..... 4.25

1536. **Same**, with double Burner and Stopcock..... 8.50

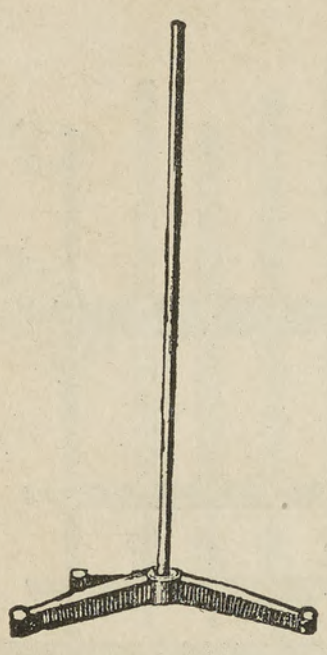
1537. — **Kerosene.** "Improved Summer Queen."

No.	0	1	2	3	3½
Width each wick	1½	3	3	4	4 in.
Number of burners	1	1	2	2	3
Each	$1.25	1.30	2.50	3.50	4.50

1538. **Straw Rings,** plaited.

Dia. inside	2	2½	3	4	5	6	8	10 in.
Each	.18	.20	.22	.25	.30	.35	.45	.60

New York Chica
RICHARDS & CO. LTD.
Newark, Hamburg.



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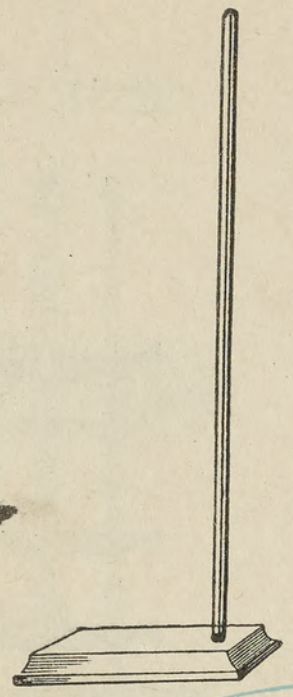

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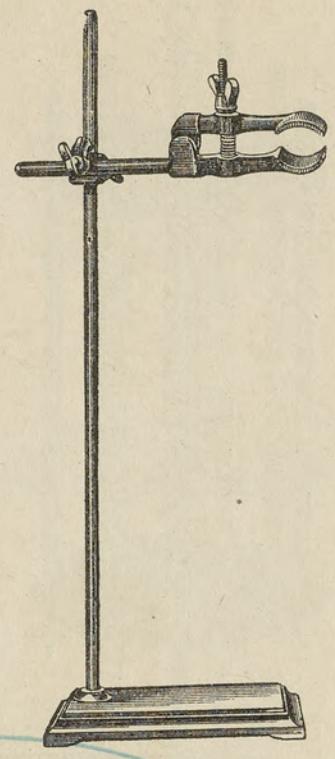

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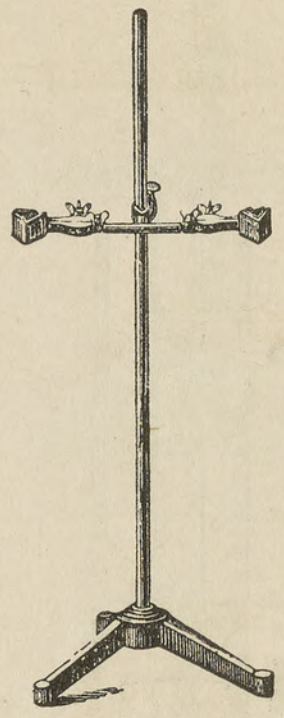

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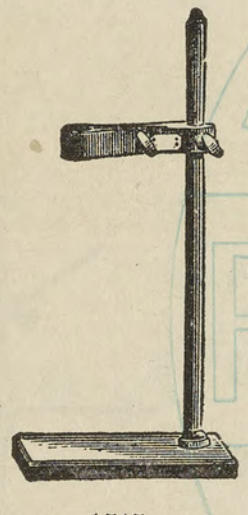

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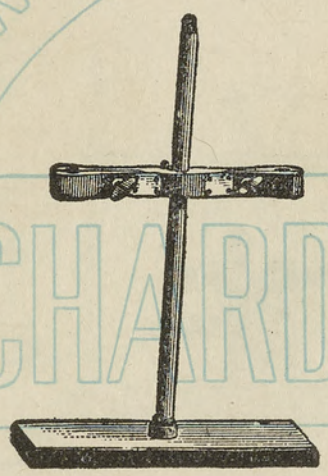

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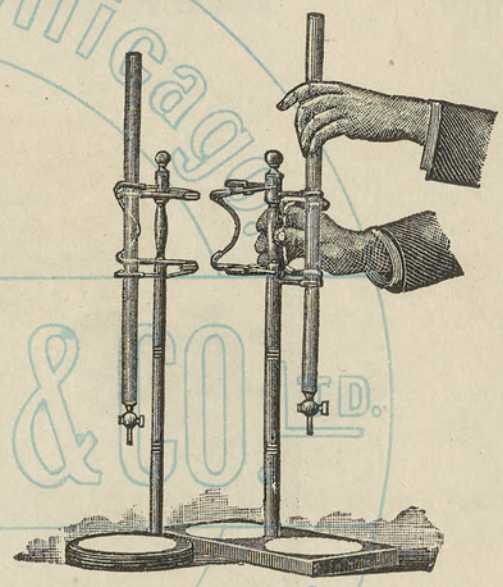

1548 1549

SUPPORTS.

No.

1540. **Supports, base and rod only,** a **triangular** base and rod, for use with any clamp.

Base	Sml.	Med.	Lge.
Length of rod	18	20	24 in.
Each	.35	.50	.75

1541. — **base and rod only,** a **square** base and rod.

Base	Sml.	Med.	Lge.
Length of rod	18	20	24 in.
Each	.35	.50	.75

1542. — for **burettes, iron,** base.

With	1	2	3 **iron** clamps
Each	.90	$1.40	1.90

1543. — for **burettes, iron,** base.

With	1	2	3 **brass** clamps
Each	$1.15	1.90	2.65

1544. — for **2 burettes, iron,** with 1 double **Hofmann** clamp $1.25

1545. — for **1 burette,** of **wood,** corklined ..... .95

1546. — for **2** " " " 1.25

1547. — for **1** " of **porcelain,** base and double clamp, used in iron laboratories 4.50

1548n. — for **1** " **Chaddock's,** with round milk glass plate 1.50

1549n. — for **2** " " with 2 milk glass plates 2.50

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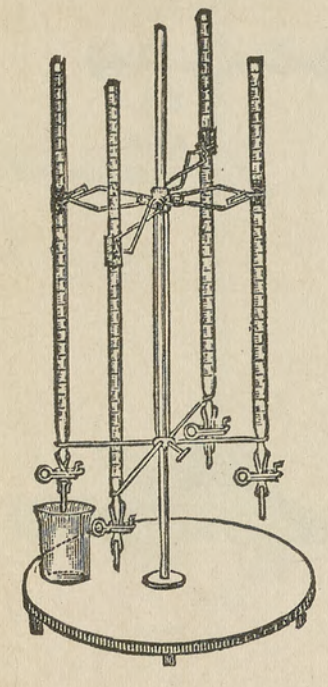

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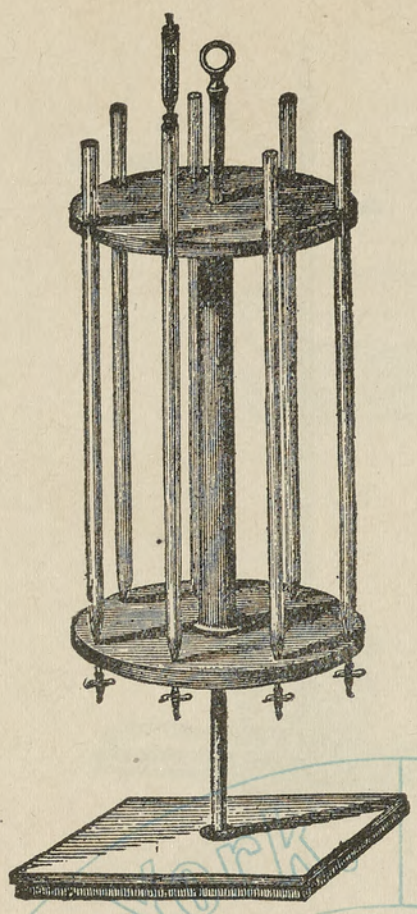

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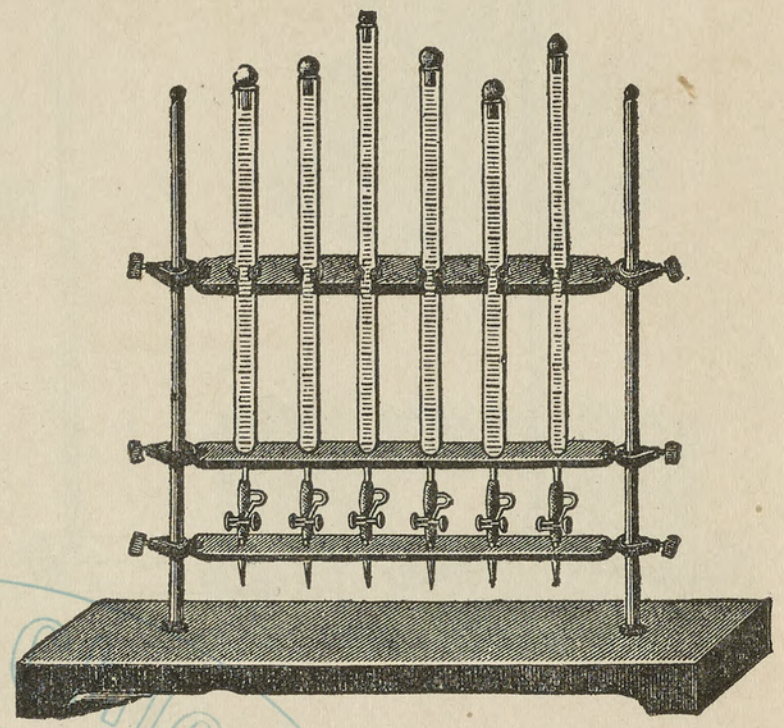

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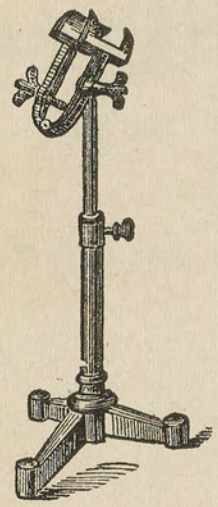

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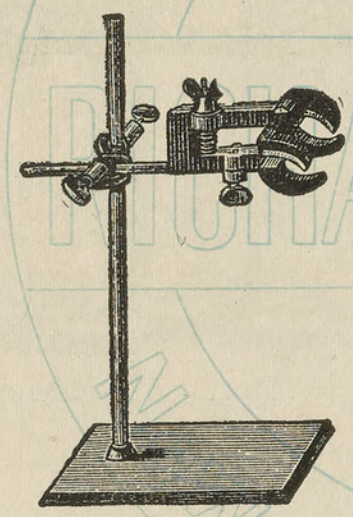

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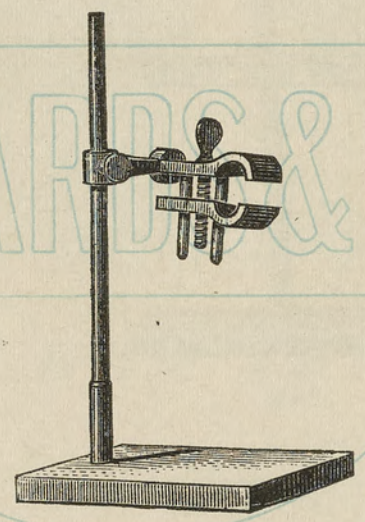

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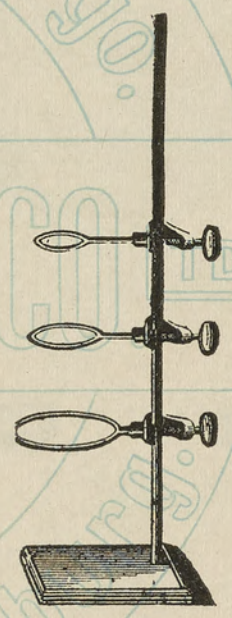

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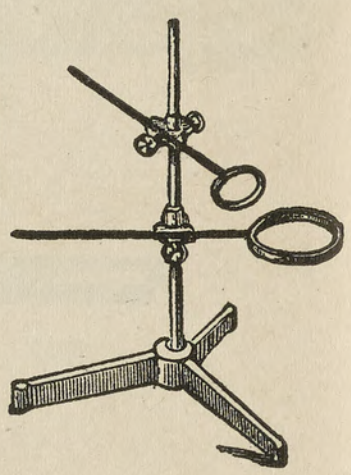

1558

No.

1550. **Supports,** for **2 burettes;** solid porcelain base, revolving clamps; a very desirable and elegant support **$5.50**

1550a. —— for **4 burettes;** otherwise as No. 1550 ..... **6.00**

1551. —— for **burettes,** of **wood, revolving** **3.00**

1552. —— for **a series of 6 burettes** **6.00**

1553. —— for **condensers, iron,** with **Bunsen's universal** clamp; height adjustable **3.00**

1554. —— for **condensers, iron,** with **Bunsen's** corklined clamp **2.50**

1555. —— for **condensers, wood,** after **Liebig** **1.75**

1556. —— for **dishes, flasks, retorts, etc.;** "ring stands," square base.

	Sml.	Med.	Lge.	Ex. Lge.
Number of rings	2	3	4	6
Each	**.45**	**.65**	**$1.00**	**1.50**

1557. —— for **dishes, flasks, retorts, etc.;** "ring stands," triangular base, same price as No. 1556.

1558. —— with **extension rings.**

Rings	2	3	4
Each	**.90**	**$1.25**	**1.50**

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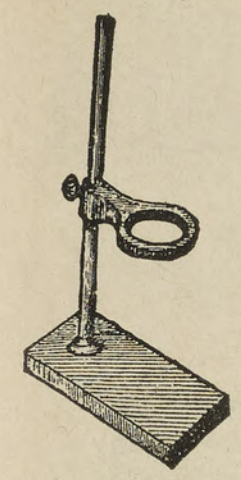

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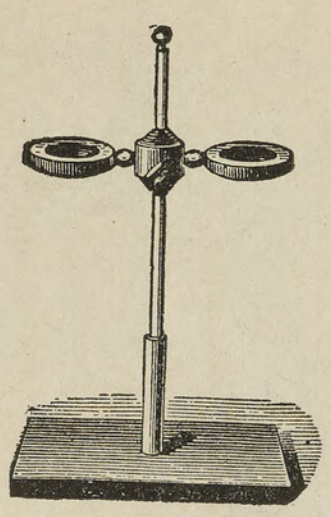

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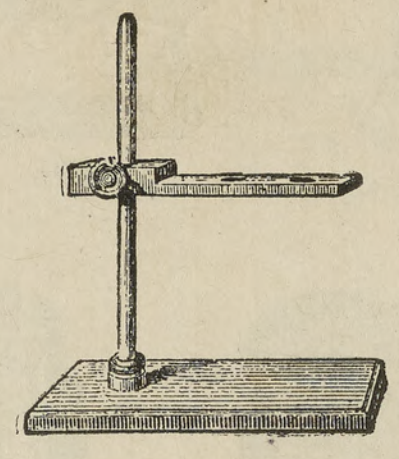

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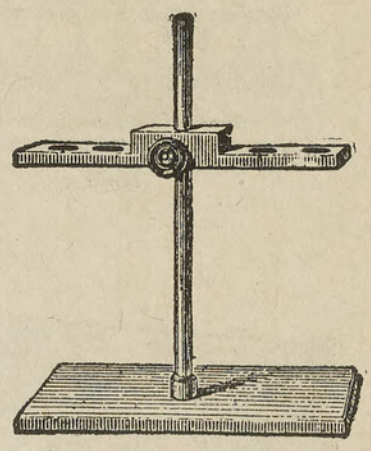

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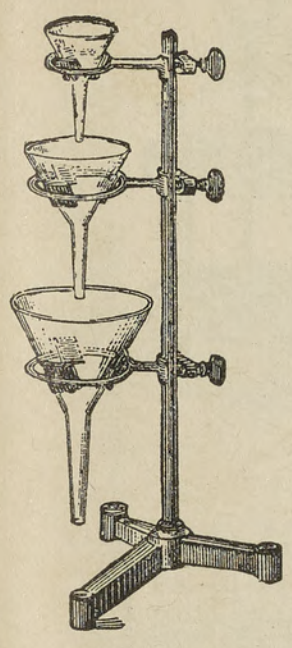

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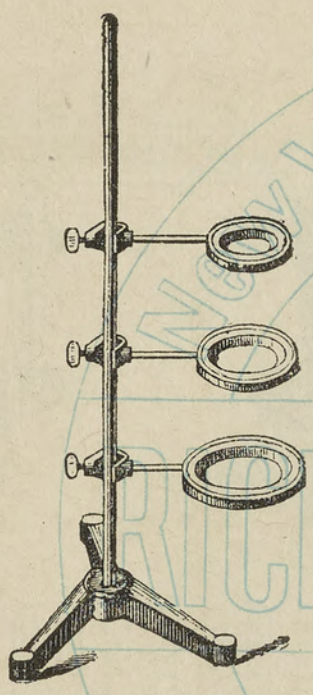

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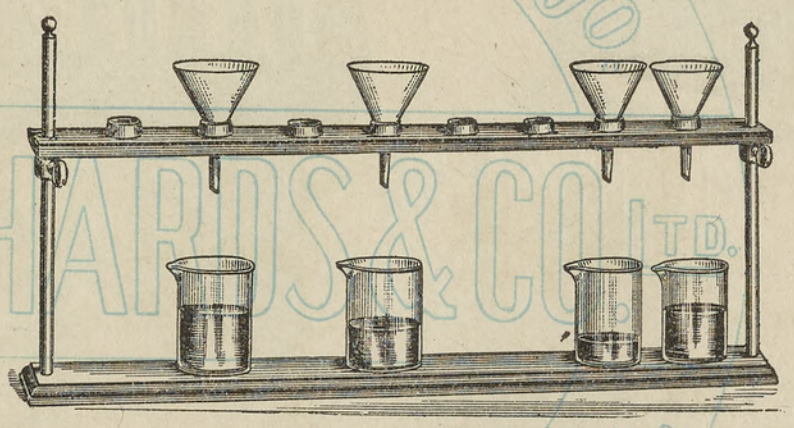

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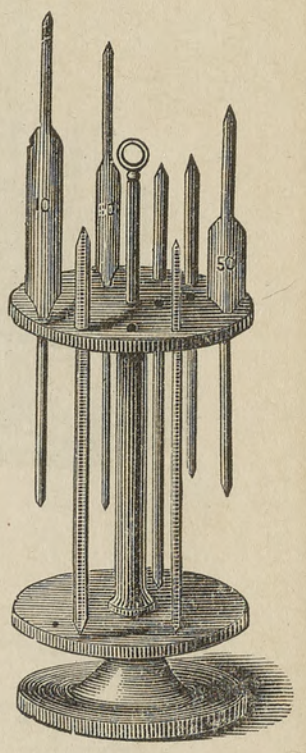


1567

New York. Chicago RICHARDS & CO. LTD. Newark. Hamburg.

No.

1559. **Supports,** for **funnels, wood,** with **1** arm **$0.85**

1560. —— for **funnels, wood,** with **2** arms **1.25**

1561. —— for **funnels, wood,** with **1** arm for 2 funnels ..... **.70**

1562. —— for **funnels, wood,** with **one double arm** for 4 funnels ..... **.90**

1563. —— for **funnels, iron,** with 3 flanged rings **1.00**

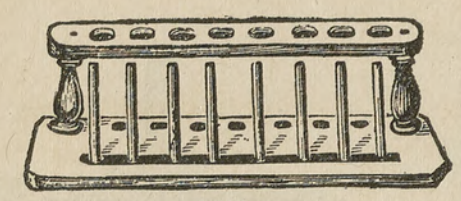
1564. —— for **funnels, iron,** with 3 wood lined rings **1.50**

1565. —— for **funnels, height adjustable,** 6 funnels in one line **3.50**

1566. —— same as above, for 12 funnels **5.00**

1567. —— for **pipettes,** wood, **revolving,** for 12 pipettes **2.50**

Supports for **retorts** the same as for **condensers.**



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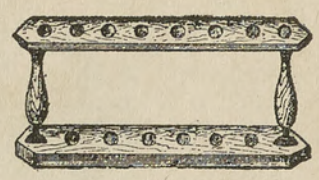

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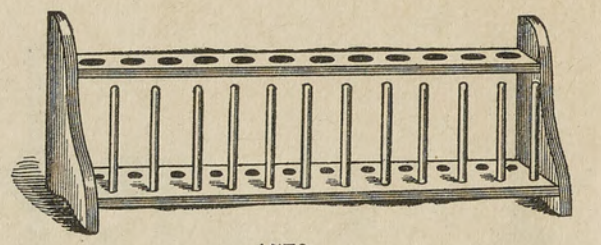

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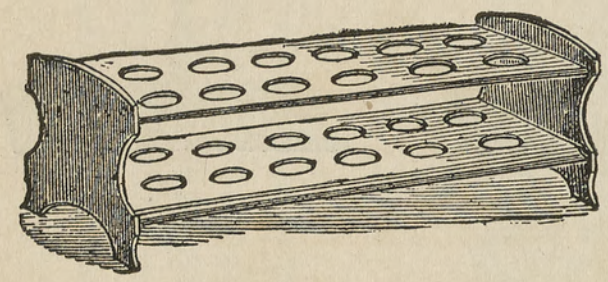

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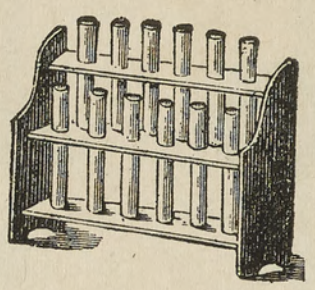

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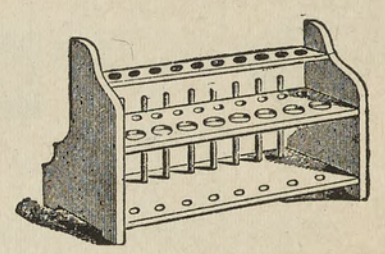

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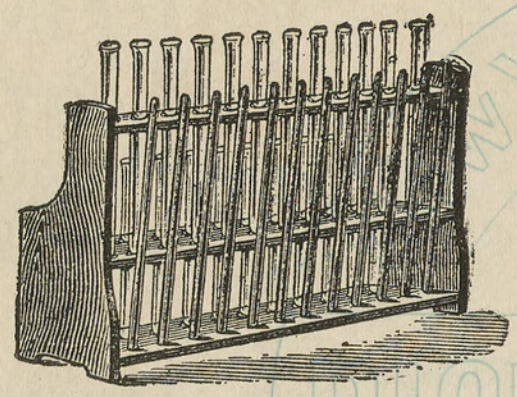

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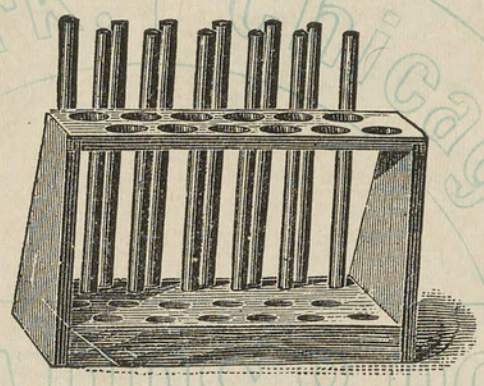

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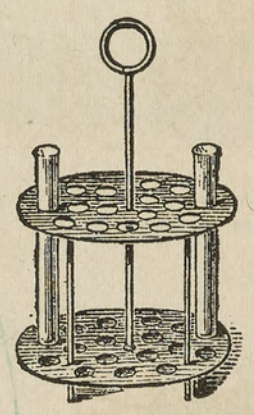

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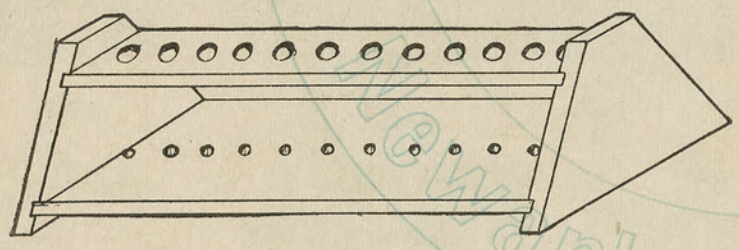

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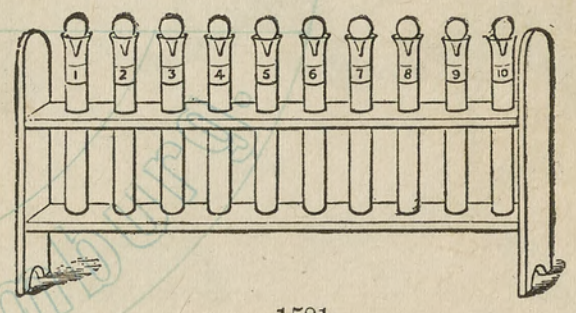
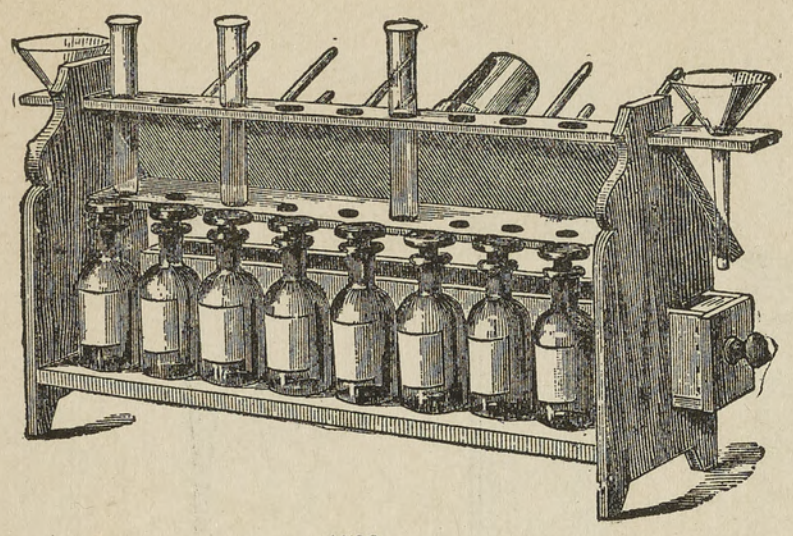


1581

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg

No.			
1568.	**Supports,**	for **test tubes** for **6 test tubes** with pins	$0.40
1569.	——	for **12 test tubes** in one row	.35
1570.	——	for **12 test tubes** in one row, with 12 pins	.50
1571.	——	for **10 test tubes** in one row, with 10 pins, heavy base	.50
1572.	——	for **12 test tubes** in two rows, for large tubes	.35
1573.	——	for **13 test tubes** in two shelves	.45
1574.	——	for **13 test tubes** in two shelves, with 7 pins	.65
1575.	——	for **12 test tubes** in two shelves for large tubes ($1\frac{1}{8}$ in. dia.)	.75
1576.	——	for **12 test tubes** in two rows with 12 pins, for **large tubes, after Fresenius**	1.00
1577.	——	for **extra large tubes** used for **lecture tables**	1.50
1578.	——	for **25 test tubes** in two shelves	.75
1579.	——	for **25 test tubes** in two shelves, with pins	1.00
1580.	——	for **18 test tubes**, of metal, round form	.50
1581.	——	for **color comparing tubes;** heavy.	

For	10	20 tubes.
Each	**$1.00**	**1.75**



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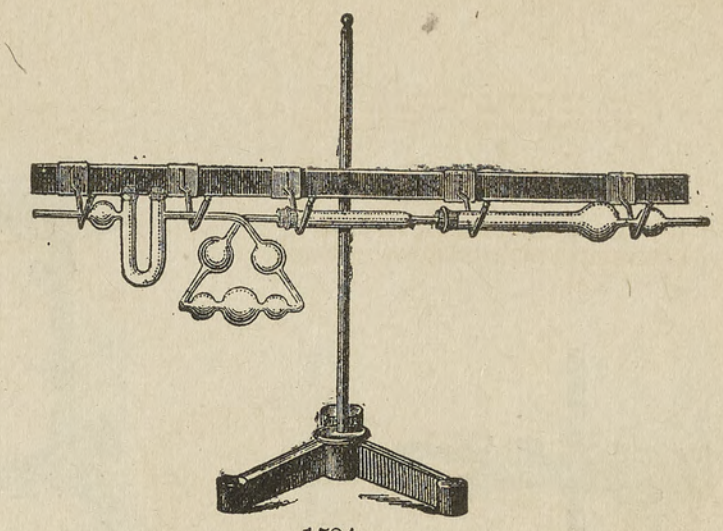

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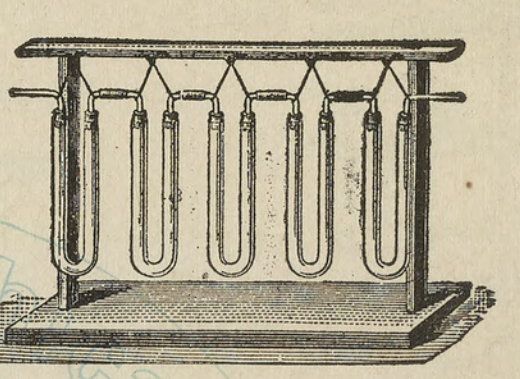

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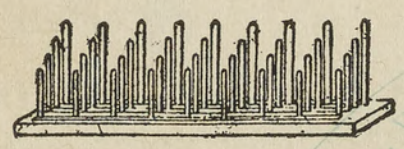

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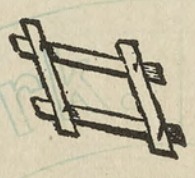

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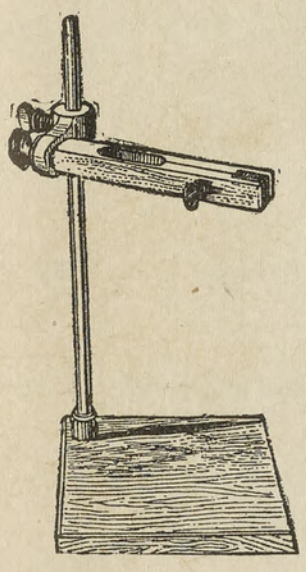

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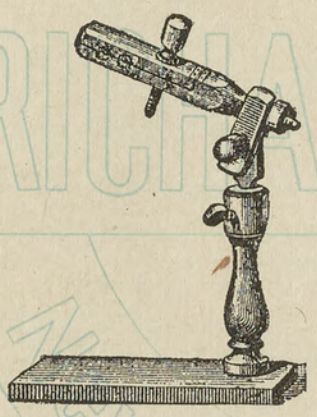

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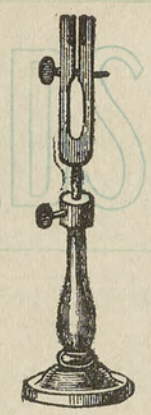

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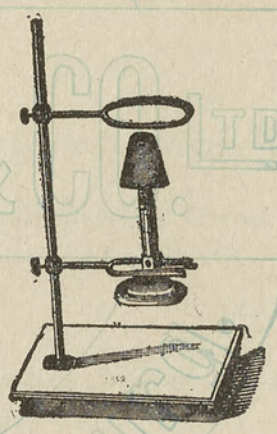

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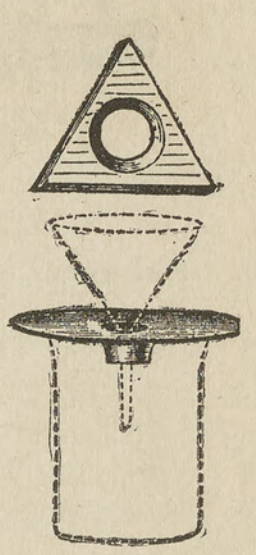


1591–1592

No.

1582. **Supports, fitted** with 18 test tubes, 2 pipettes, 2 stirrers, 8 reagent bottles, 2 funnels and 2 beakers..... **$4.75**

1583. —— for **U tubes, potash bulbs,** etc., of wood..... **2.00**

1584. —— for **U tubes, potash bulbs,** etc., with **adjustable** cross rod..... **2.00**

1585. —— for **drying test tubes.**

With	25	50 pins.
Each	**$1.00**	**2.00**

1586. —— **universal,** wood; **Gay Lussac's**..... **1.25**

1587. —— **universal,** wood; **Schellbach's**..... **2.00**

1588. —— **universal,** wood; **upright** form..... **1.00**

1589. —— with fork for **Bunsen's Burner,** and one ring..... **1.75**

1590 —— for **holding strainers, felt filters,** etc.

Size	6	8	10	12 sq. in.
Each	**.20**	**.25**	**.30**	**.35**

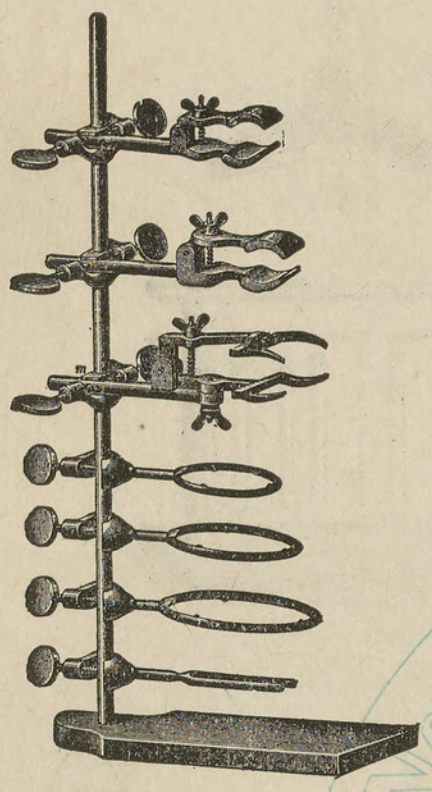
1591. —— for **funnels,** etc.; to put upon beakers, etc., **round.**

Dia.	3	4	5	6 in.
Each	**.20**	**.25**	**.30**	**.35**

1592. —— **Same as No. 1591; triangular.**

Length of side	3	4	5	6 in.
Each	**.25**	**.30**	**.35**	**.40**

New York Chicago. RICHARDS & CO. LTD. London. Hamburg.



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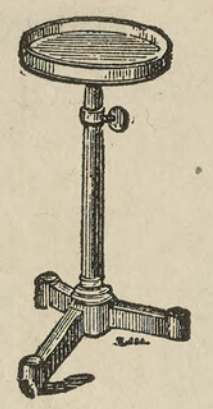

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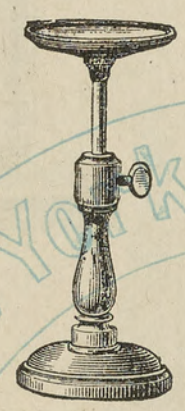

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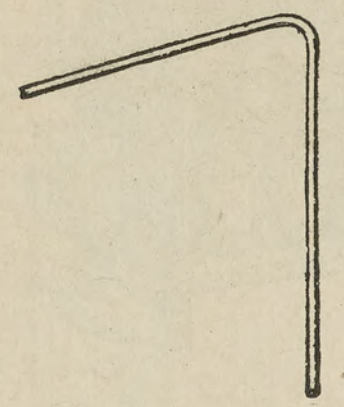

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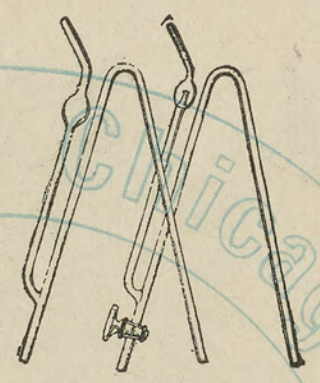
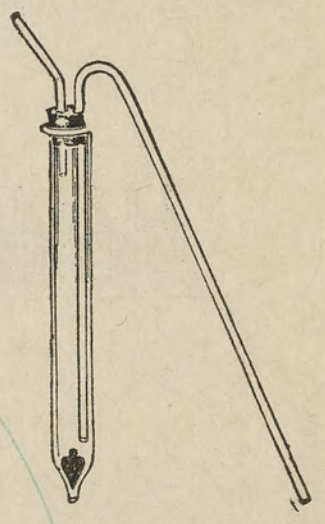


1597 1598



1599



1600

No.

1593. **Supports, universal,** after **Bunsen's; complete,** with 3 clamps, 3 rings, and fork for burner..... **$7.00**

1594. **Support Table, iron, adjustable,** wood top.

Height if drawn out	9	12	15	20	25 in.
Each	$1.25	1.50	1.75	2.00	2.25

1595. — **polished wood, adjustable;** foot loaded with lead.

Height if drawn out	9	12	15	20	25 in.
Each	$1.25	1.50	1.75	2.00	2.25

1596. **Syphons, glass,** plain.

Length of limb	8	12	15	18	24	30 in.
Each	.15	.20	.25	.30	.40	.50

1597. — **glass,** with **suction tube.**

Length of limb	8	12	18	24	30 in.
Each	.25	.30	.40	.70	$1.00

1598. — **glass,** with **suction tube** and **stopcock.**

Length of limb	8	12	18	24	30 in.
Each	$1.10	1.25	1.40	1.60	1.80

1599. — to take out samples from barrels, etc. "Thief glasses."

Size	Sml.	Lge.
Each	.50	.75

1600. — **glass, Sedlaczek's** with valve operated by blowing.

Size	12	20 in.
Each	$1.25	1.50

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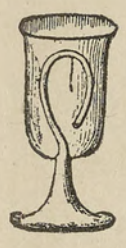
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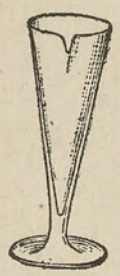
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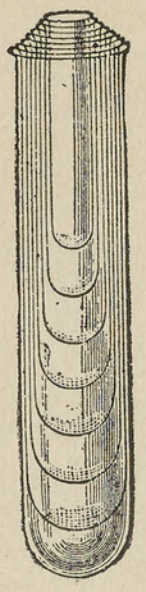
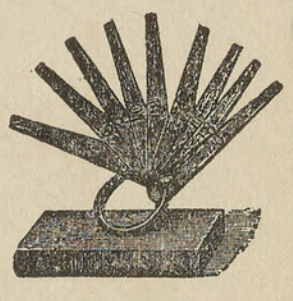

1604


1605


1606


1607


1608

No.

1601. **Tantalus Cup** $0.65

1602. **Test glasses,** conical.

Capacity	1	2	4	6	8 oz.
Each	.15	.20	.25	.30	.35

1603. **Test Paper, Litmus;** blue, red, neutral, and Turmeric.

in bottles ..... Each, .10; Doz. 1.20

in small books ..... " .05 " .50

in sheets ..... " .05 Quire .75

TEST TUBES.

1604. **Test Tubes,** best German glass, even thickness, well annealed, **free from lead.**

Size,	3x⅜	4x½	5x½	5x⅝	6x½	6x⅝	6x¾	7x⅞	8x1	9x1	10x1	12x1 in.
Doz.	.20	.25	.30	.30	.30	.35	.40	.50	.60	$1.00	1.25	2.00
Gross	$1.75	2.50	2.75	3.00	3.50	3.75	4.00	5.00	6.50	10.00	12.00	20.00

1605. —— graduated,

Capacity	5 cc. 1/10	10 cc. 1/10	15 cc. 1/10	20 cc. 1/10	25 cc. 1/10
Each	.50	.55	.60	.65	.75

1606. —— **with side neck.**

Length	5	6	8	10 in.
Doz.	.85	$1.00	1.50	2.00

1607. —— **on foot,** plain.

Height,	4	5	6	8	10 in.
Doz.	.75	.85	$1.00	1.50	2.00

1608. —— **on foot, graduated.**

Capacity	5	10	15	25 cc.
Grad.	½	½	½	½ "
Each	.25	.30	.40	.50

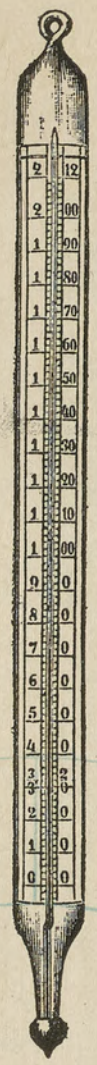
1609. —— **hard Bohemian glass.** See Tubes Ignition.

1610. **Testers, for gold;** for testing the fineness of jewelry, etc., 8 to 20 Karats. Set complete with stone and acid bottle 2.00

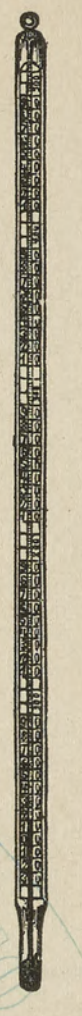
RICHARDS & CO. LTD. New York. Chicago. Newark. Hamburg.



1611



1615



1620

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

THERMOMETERS.

BEST EUROPEAN MANUFACTURE.

Thermometer, chemical, scale engraved on the stem, with white back, very exact; each in pasteboard case.

No.							
1611.	——	Grad. up to	100	150	200	250	360° C.
		Each	$1.50	1.60	1.70	1.80	2.00
1612.	——	Grad. up to	212	400	600° F.		
		Each	$1.50	1.75	2.00		

chemical, milk glass scale, enclosed in glass tube; each in pasteboard case.

1613.	——	Grad. up to	100	150	200	250	360° C.
		Each	$1.50	1.60	1.70	1.80	2.00
1614.	——	Grad. up to	212	400	600° F.		
		Each	$1.50	1.70	2.00		

chemical, with paper scale, enclosed in glass tube; each in pasteboard case.

1615.	——	Grad. up to	100	150	200	250	360° C.
		Each	.90	$1.10	1.25	1.40	1.50
1616.	——	Grad. up to	212	400	600° F.		
		Each	.90	$1.25	1.50		

1617. —— **chemical, with two scales, paper,** enclosed in glass tube, 100° C. and 212° F..... $1.00

chemical, with two scales, engraved on the stem.

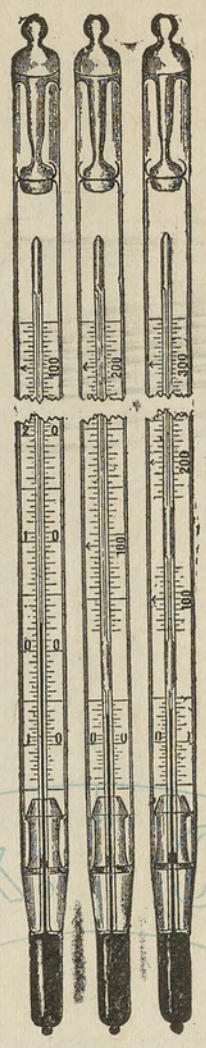
1618. —— registering 100° C. and 212° F..... 2.00

1619. —— " 300° C. and 600° F..... 2.50

chemical, filled with nitrogen, to prevent the separation of the Mercury; engraved

1620. —— on the stem; graduation, 0° to 400° Celsius in $\frac{1}{1}$° 3.50

1621. —— " 0° to 750° Fahrenheit in $\frac{1}{1}$°..... 3.50



1631

No.

Thermometers, chemical, engraved on stem,

1622.	from 0° to 100° C. in $\frac{1}{5}$°	each	$3.50
1623.	from 0° to 100° C. in $\frac{1}{10}$°	"	4.50
1624.	from 100° to 200° C. in $\frac{1}{5}$°	"	3.50
1625.	from 100° to 200° C. in $\frac{1}{10}$°	"	4.00

— **normal, of Jena Normal Glass, engraved on the stem,**

1626.	from 0° to 100° C. in $\frac{1}{5}$°	each	10.00
1627.	from 0° to 100° C. in $\frac{1}{10}$°	"	12.00
1628.	from 100° to 200° C. in $\frac{1}{5}$°	"	10.00
1629.	from 100° to 200° C. in $\frac{1}{10}$°	"	12.00

NOTE: Yale Observatory Certificate of Correction furnished with above Thermometers if desired.

1630. — **Anschuetz, Jena Normel Glass,** standard set for chemical work, especially for fractional distillations; length, 10 to 14 cm., dia. 6 mm. Each instrument is provided with ring for suspending. No. 4 to 7 are filled with nitrogen. (Chem. Centralblatt, 58, 131.)

No. 1,	from	about	10° to 55° C.
No. 2,	"	"	45° to 105° C,
No. 3,	"	"	96° to 160° C.
No. 4,	"	"	140° to 220° C.
No. 5,	"	"	195° to 265° C.
No. 6,	"	"	240° to 310° C.
No. 7,	"	"	295° to 360° C.

1630a.	Set as above, in case, graduated in $\frac{1}{1}$°		25.00
1630b.	" " " " $\frac{1}{5}$°		32.50

1631. — after **Allihn,** with certificate of the "Deutsche Physicalisch technische Reichsanstalt," in set of three. Each thermometer 300 mm. long, 8 mm. dia.; with zeropoint correction on milk-glass scale. (Chem. Ztg., 88, p. 1555.)

1631a.	Scaled in graduation in $\frac{1}{2}$° from 10° to 100° C.,	each	8.00
1631b.	" " $\frac{1}{2}$" " 100° to 200° C.,	"	10.00
1631c.	" " $\frac{1}{2}$" " 200° to 300° C.,	"	10.00

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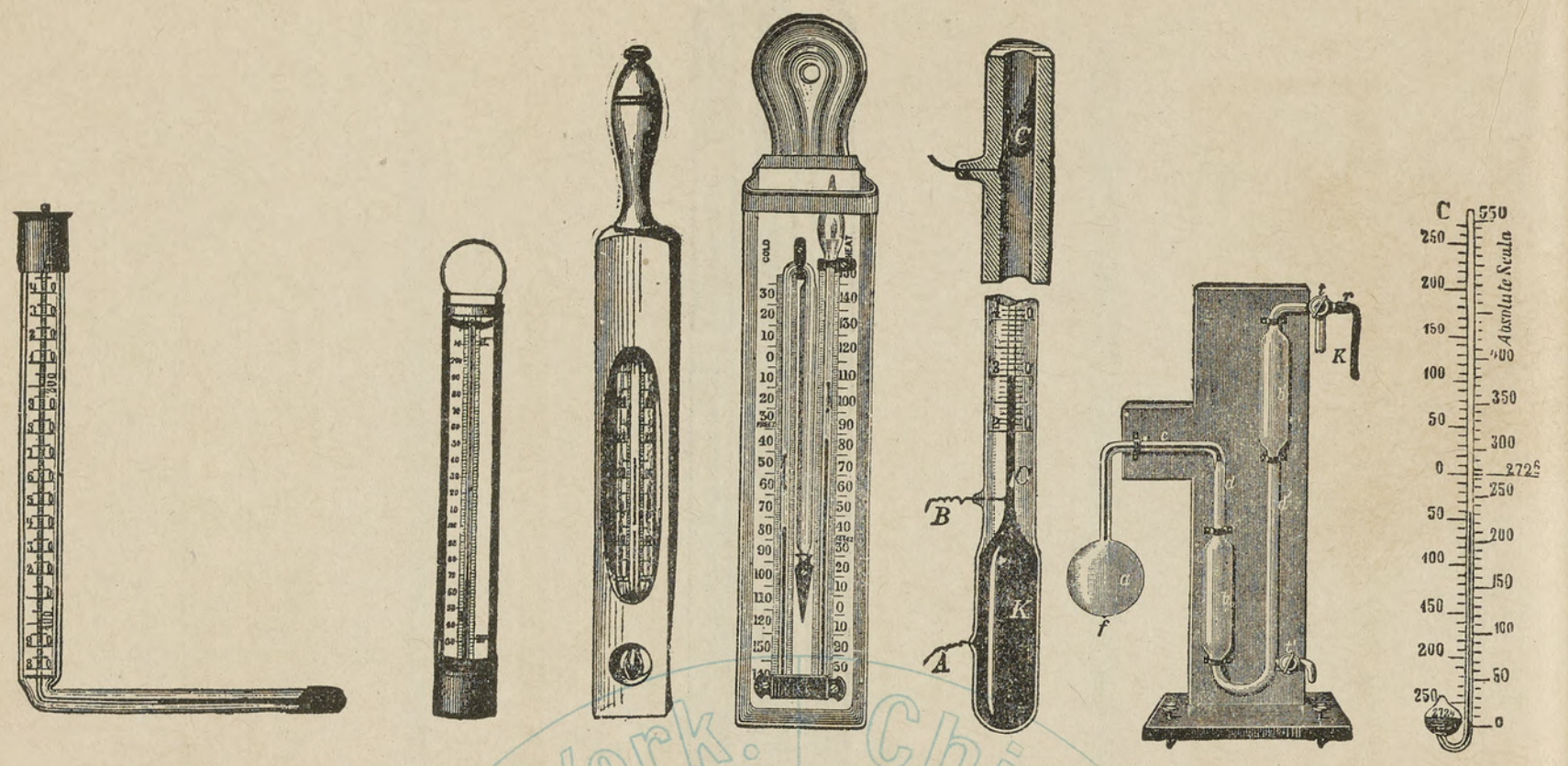

1632 1633 1634 1637 1638 1639 1640

No.

1632. **Thermometers, chemical, bent at right angles;** scale enclosed in glass tube

1632a. graduation up to 100° C. ..... each **$2.00**

1632b. " up to 212° F. ..... " **2.00**

1633. —— in Japanned **tin frames.**

Length	7	8	10	12 in.
Each	.18	.20	.25	.30

1634. —— in **wooden frame,** with handle, length 10 inches ..... **.50**

Thermometer, Floating Dairy, see Part II: Milk Analysis.

1635. —— Mercurial **Maximum, self registerings;** 10 inches, on finely polished wooden frame..... **1.75**

1636. —— Spirit **Minimum, self registerings;** 10 inches, on finely polished wooden frame..... **1.75**

1637. —— **Sixes,** self registering, **Maximum** and **Minimum,** mounted together on one plate; 10 inches..... **3.50**

1638. —— **Self registering Alarm,** after Stahl, with Platinum wires fused in; **for Incubators** and **other bacterioscopical work.** (see Fres. Zeitschr. 1889, P. 523). According to graduation..... **$3.50** to **8.00**

1639. **Air-Thermometer, Bottomley's.** (see Fresenius Zeitschr. 1889, P. 317)..... **10.00**

1640. —— for **Lectures,** with an Absolute and a Celsius Scale; on Support..... **25.00**

1641. **Thermometer, Pocket,** porcelain scale, hard rubber case, graduated to 220° F., length, 6 inches., doz. **13.00**

1642. —— **Pocket,** porcelain scale, hard rubber case, graduated to 220° F. and R.,..... " **14.00**

1643. **Thermometer Tubes, Air Thermometers,**

Dia. of bulb	1½	2	2½ in.
Each	.25	.30	.40

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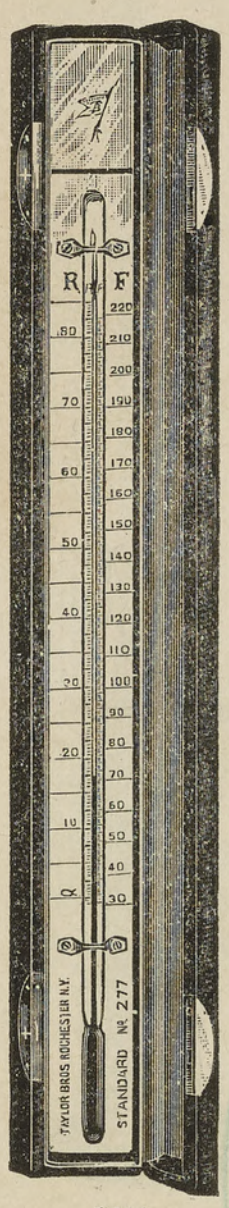
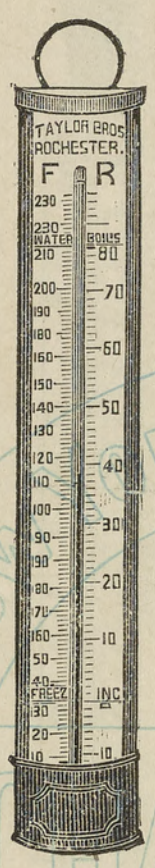


1644



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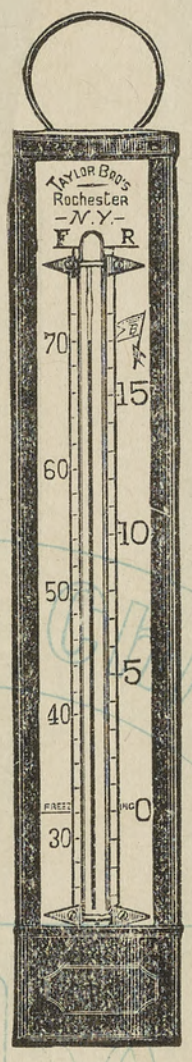
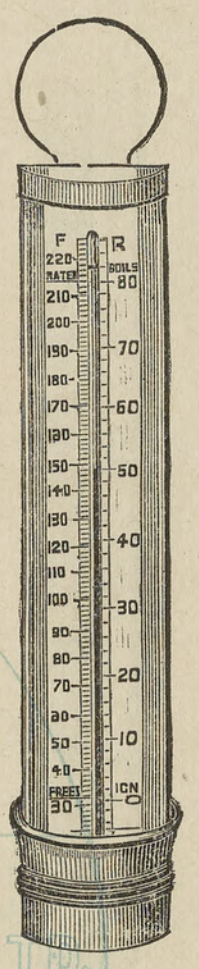


1650



1652

THERMOMETERS FOR BREWERS.

These instruments are made with extreme precision for the purpose of making delicate tests and for making comparisons with the less sensitive, ordinary thermometers used in brewing. All brewer's thermometers are made with Fahrenheit and Reaumure scales unless otherwise ordered.

No.

1644. **Thermometer, Standard, F. scale** graduated on the plate in single degrees from 0 to 220°. **R. scale** is graduated on the tube in $\frac{1}{4}$°, with figures and every fifth degree line on scale marked on plate; length 14 in. In Morocco case..... **$6.00**

1645. —— **Standard,** same range as preceding. Both F. and R. scales are graduated on the tube in $\frac{1}{4}$°, with figures and every fifth degree line of scales marked on plate; length 14 in. In Morocco case. **10.00**

1646. —— **Standard, set of two,** one graduated from 10 to x40° R., the other from x30 to 80 R. The F. scales are graduated on the tube in $\frac{1}{5}$°, with figures and every fifth degree line ot the R. scales marked on plate. Length 12 in. In Morocco case.....per set **10.00**

1647. —— **Standard, set of two,** same ranges as preceding. Both F and R scales are graduated on the tube in $\frac{1}{5}$°, with figures and every fifth degree line of the scales marked on plates; length 12 in. In Morocco case.....per set **18.00**

1648. —— **tin case,** extra heavy scale and tube.

Length	10	12	14 in.
Doz.	**$13.00**	**16.00**	**20.00**

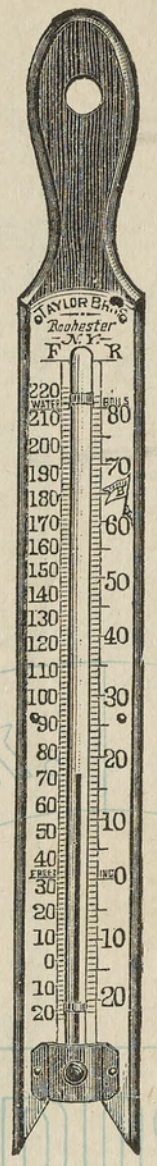
1649. —— **tin case,** graduated from 0 to 120° F. for cellar use, length 12 in.....doz. **16.00**

1650. —— " " graduated from 30° to 70° F. with expansion chamber..... " **21.00**

New York. Chicago. RICHARD & CO. Ltd. Newark. Hamburg.


1653


1654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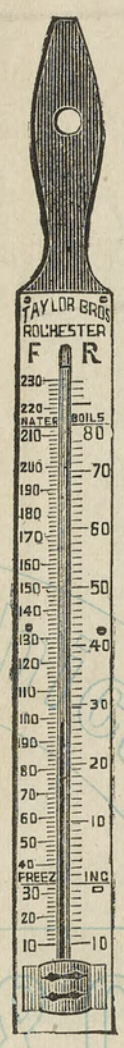

1656

1661

No.

1651. **Thermometers, copper case,** extra heavy scale and tube.

Length	10	12 in.
Doz.	$18.00	20.00

1652. — **copper cup case,** extra heavy scale and tube. (See cut, page 153.)

Length	10	12	14 in.
Doz.	$20.00	24.00	30.00

1653. — **V. grooved, walnut case,** extra heavy, length 12 in.....doz. $16.00

1654. — " **ash case,** with handle extra heavy, length 14 in..... " 20.00

1655. — **walnut strap case,** open bottom, tube sunk..... " 20.00

1656. — " " " extra heavy.

Length	12	14 in.
Doz.	$14.00	18.00

1657. — **all brass bow frame,** extra heavy.

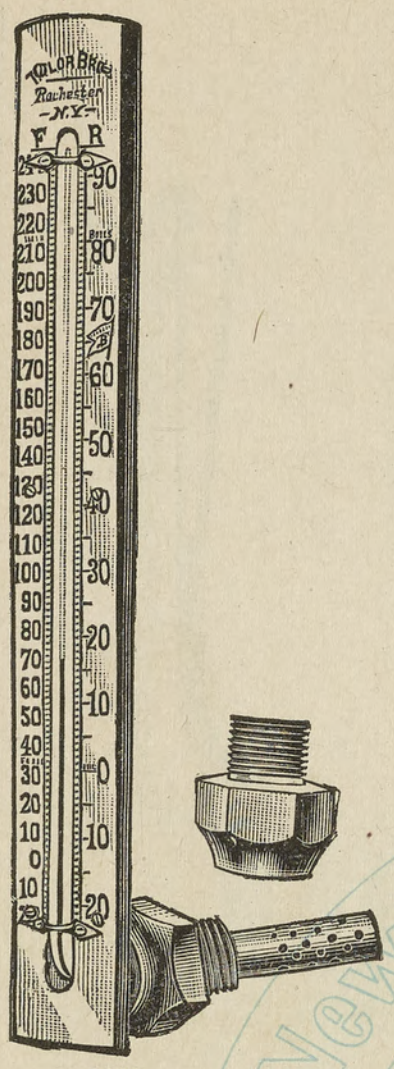
Length	12	14 in.
Doz.	$40.00	48.00

1658. — **wood frame,** for mash, length 36 in.....doz. 48.00

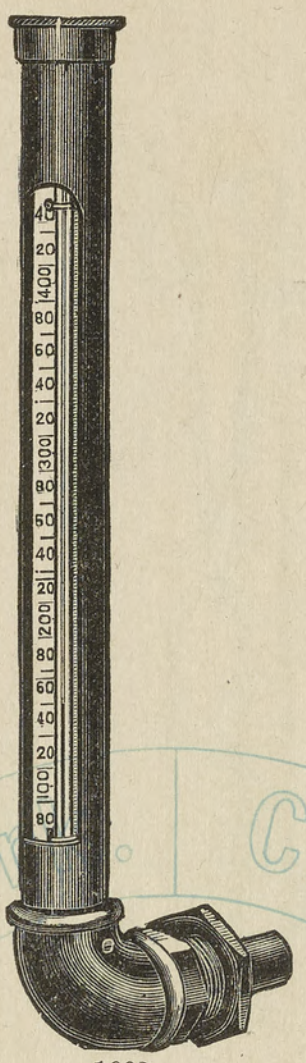
1659. — **all glass,** blue spirit tubes for cellars, length 12 in..... " 12.00

1660. — " " angle, length 12 in..... " 20.00

1661. — **copper can,** with thermometer, for use with saccharometer.....each 5.00



1662



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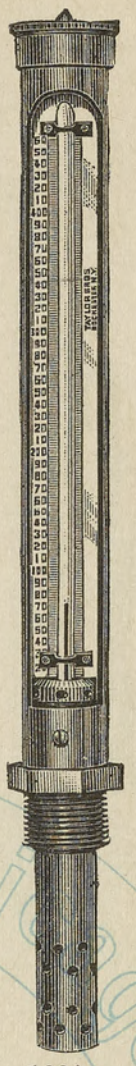
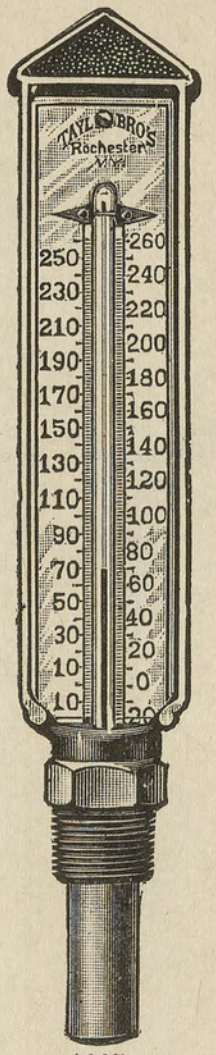


1664



1665

Thermometers, in Brass and Iron Frame, for Steam, Hot Water, Hot Air Brine, Ammonia, Ovens, Vacuum Pans, Stills, Varnish Makers, Sugar Houses, etc.

No.

1662. **Thermometers, iron frame angle,** length of scale 11 in., graduated not to exceed 600° F., one in. pipe thread on separable hexagon connecting nut—length of the tube beyond shoulder of nut not to exceed :

	4	8	12 in.
Each	$7.00	9.00	12.00

1663. — **Brass Cylindrical Frame angle,** with jam nut, length above elbow 10 in. graduated not to exceed 600° F., one in. pipe thread connection—length of tube beyond shoulder not to exceed:

	4	8	12 in.
Each	$8.00	11.00	14.00

1664. — **Brass Cylindrical Frame,** length above hexagon nut, 9½ inches, graduated not to exceed 600° F., on inch paper pipe thread connection. Length of tube below hexagon nut not to exceed:

	4	8 in.
Each	$6.00	8.00

1665. — **Straight Iron Frame**, specially adapted for steam and hot water heating, length of frame, above hexagon nut, 8 inches, graduated not to exceed 300° F, one inch pipe thread connection. Length of tube beyond shoulder of hexagon nut not to exceed:

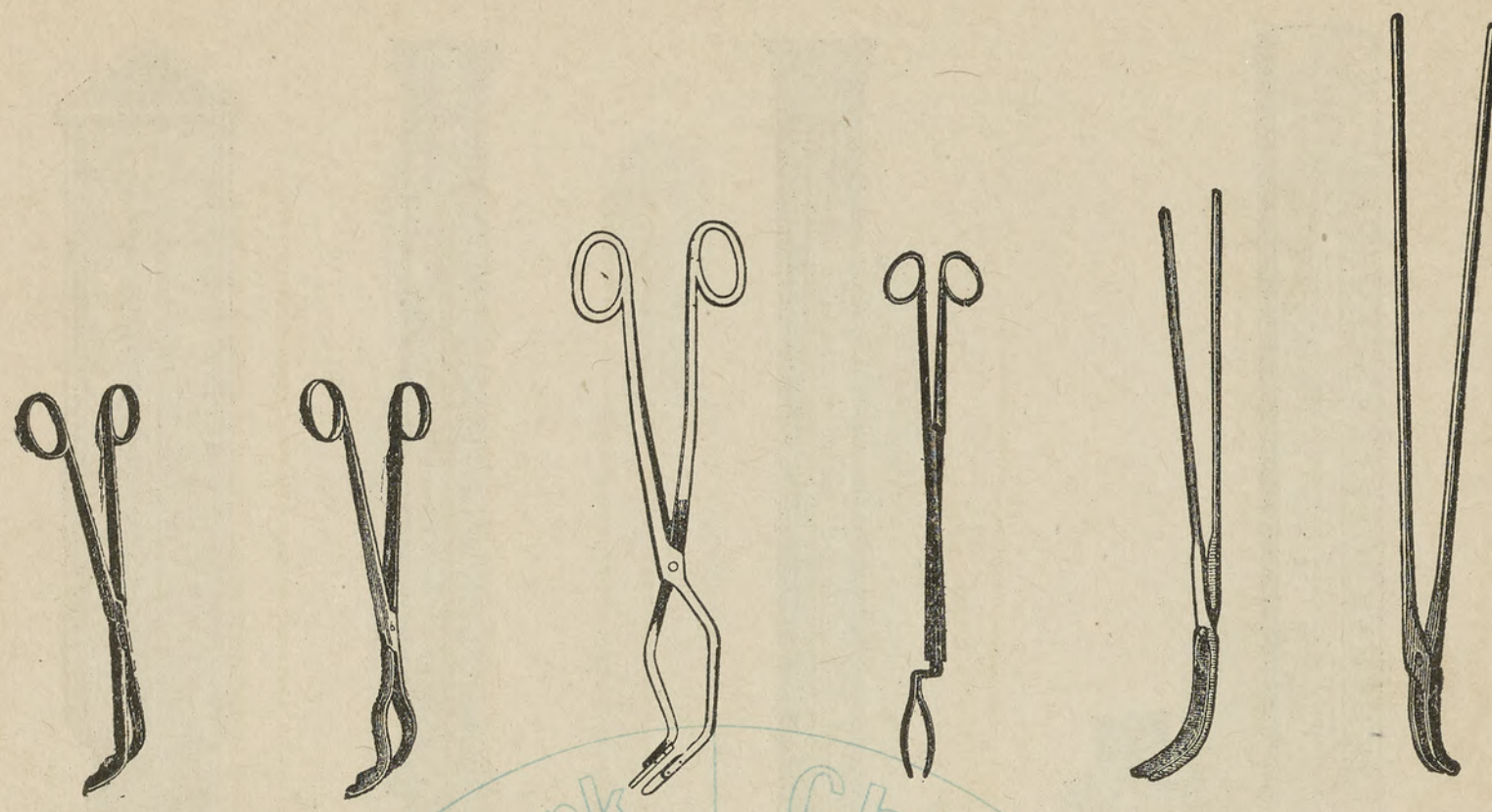
	3	8	12	24 in.
Each	$4.00	6.00	9.00	15.00

1665a. — **Brass Cylindrical Flanged,** length of scale, 10 inches, graduated not to exceed 600° F., one inch pipe thread connection. Length of tube below shoulder of flange not to exceed:

	12	24	36 in.
Each	$12.00	18.00	27.00

Any of the Thermometers with two scales, F. and R., or F. and C, not to exceed 240° F., without additional charge.

RICHARDS & CO. LTD.



1671 1672 1677 1678 1680 1681

TONGS.

No.

1666. **Tongs, Crucible,** malleable iron, double bent, tinned 8 in. long ..... $ .50

1667. —— **Iron**, single bent, japanned ..... .70

1668. —— **Brass**, double bent, 8 in. long ..... .75

1669. —— **Brass**, double bent, polished, 8 in. long 1.00

1670. —— **Brass**, double bent, nickel plated, 8 in. long 1.25

1671. —— **Forged Steel**, single bent, 9 in. long 1.00

1672. —— **Forged Steel**, double bent, 9 in. long 1.00

1673. —— **Forged Steel**, single bent, nickel plated, 9 in. long 1.25

1674. —— **Forged Steel**, double bent, nickel plated, 9 in. long 1.25

1675. —— **German Silver**, double bent, 8 in. long 1.50

1676. —— **pure wrought Nickel**, 8 in. long 3.00

1677. —— " " " provided with platinum tips, if required; price according to wgt. per gram. .60

1678. —— **Blair's**, with solid platinum shoes, according to weight of platinum ..... $6.00 to 8.00

1679. —— **Julian's** steel, nickel plated, bent with elbow, for lifting platinum crucibles from muffles furnace, 20 in. long 2.00

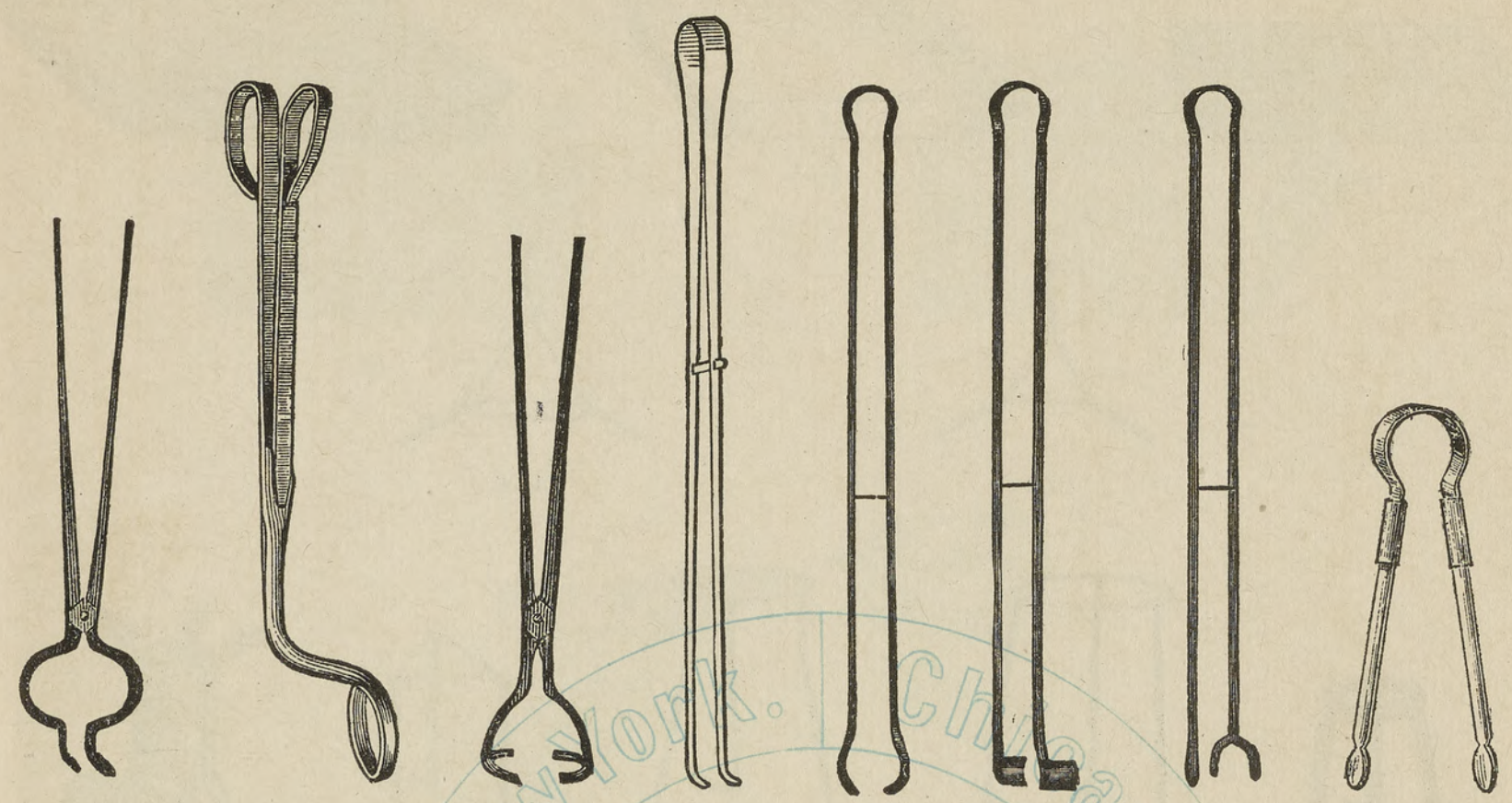
1680. —— **malleable Iron,** single bent.

Length	12	17 in.
Each	.40	.50

1681. —— **Crucible**, steel, single bent.

Length	18	24	32 in.
Each	$1.00	1.25	1.50

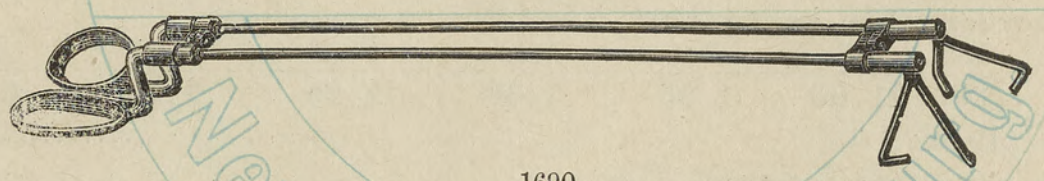
New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



1682 1683 1684 1685 1686 1687 1689 1691



1688



1690

New York. Chicago. RICHARDS & CO. LTD. Newark Hamburg

No.

1682. **Tongs, Crucible**, steel, double bent, 30 in..... $1.75

1683. —— **Crucible**, steel, double bent, **with elbows**..... 2.50

1684. —— **Crucible**, steel, for lifting vertically 2.00

Note:—Larger sizes made to order. Mention size or number of black lead crucibles they are wanted for. Price according to size.

1685. —— **Cupel**, steel, light **with guide.**

Length	20	25	30 in.
Each	$1.25	1.25	1.25

1686. —— **Cupel**, steel, with rounded ends..... 1.00

1687. —— **Cupel**, steel, with flat rounded ends..... 1.00

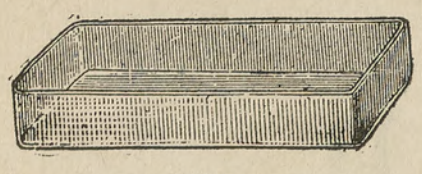
1688. —— **Cupel**, after **Judson**..... 2.00

1689. —— **Scorifier**, steel.

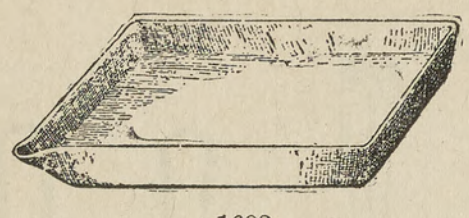
Length	20	25	30	36 in.
Each	$1.25	1.25	1.25	1.25

1690. —— **Scorifier**, after **Judson**..... 2.00

1691. —— **for Acids,** glass arms with metal handles..... 1.05



1692



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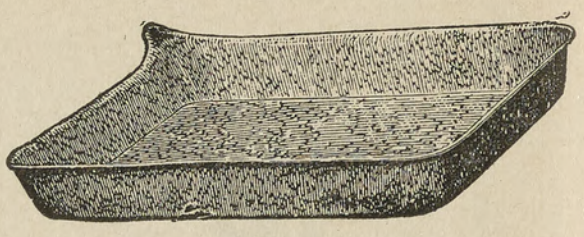

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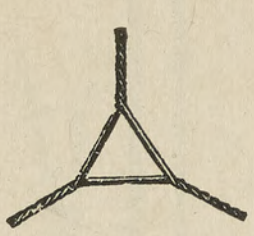

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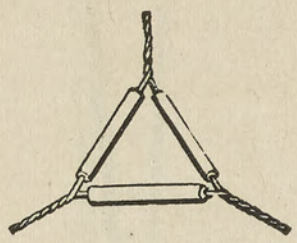

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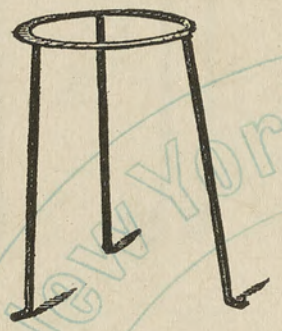

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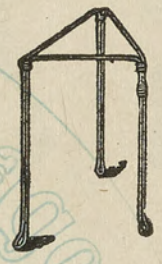

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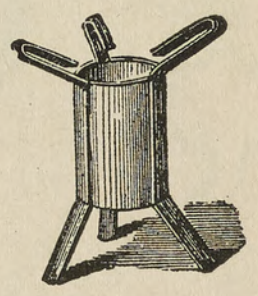


1703

No.

1692. **Trays,** glass, with polished rim.

Size	5x9	6½x10½	8x12	9x14 in.
Each	$2.00	2.50	3.00	4.00

1693t. —— **photographic, porcelain,** deep form (measures given are inside diameter.)

Size	5x9	7x9	8x10	10x12	11x14	14x17	15x19	19x24 in.
Each	.60	.80	$1.00	1.65	2.65	6.00	8.00	16.00

1694t. —— **photographic, agate ware,** deep form, (inside measures.)

Size	5x7	7x9	8x10	10x12	11x14	14x17 in.
Each	$1.00	1.25	1.60	2.25	3.35	6.00

1695. **Triangles,** iron, **plain;** 3 sizes..... Each, .05; Doz. $0.50

1696. —— iron, **pipestem covered;** 3 sizes..... " .10; " .75

1696a. —— **glass.**

Length of side	3	3½	4	5	6	7 in.
Doz.	$1.25	1.50	1.65	1.75	2.00	2.25

platinum, see Platinum.

1697. —— **pure nickel.**

Size	1½	2½	3¼ in.
Each	.15	.25	.35

1698. **Tripods, brass,** for alcohol lamp..... .60

1699. —— **iron, small,** for alcohol lamp..... .20

1700. —— **iron,** plain, without rings.

Dia.	5	6	8	10	12 in.
Each	.25	.35	.50	.65	.90

1701. —— **iron,** with concentric rings.

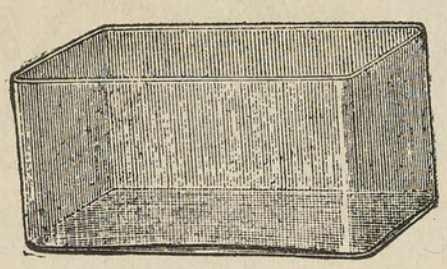
Dia.	5	6	8	10	12 in.
Number of rings	9	3	4	5	6
Each	.35	.50	.65	$1.00	1.25

1702. —— **iron, triangular** top.

Length of side	5	6	8 in.
Each	.30	.40	.50

1703. **Tripod and Chimney** combined, to set over burner.

Sml.	Med.	Lge.
.50	.65	.80



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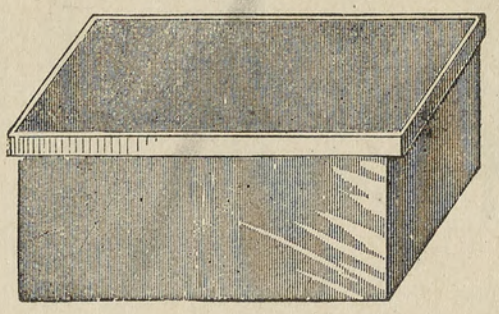

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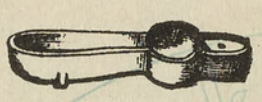

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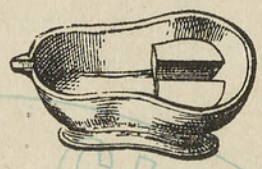

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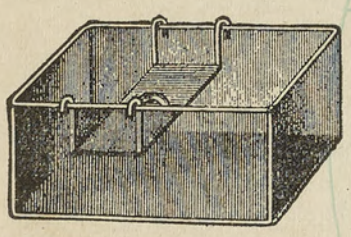

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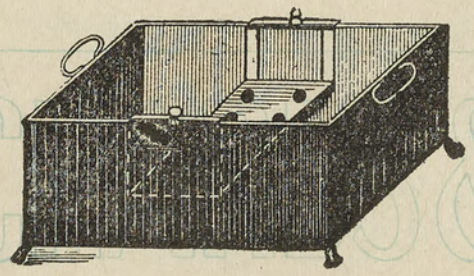

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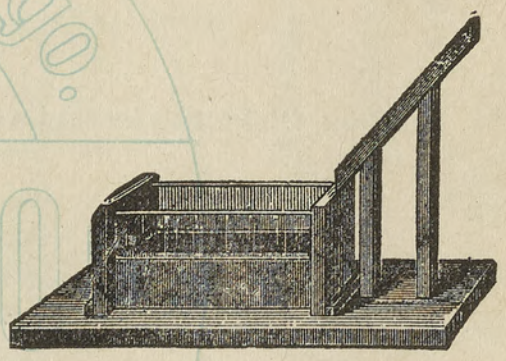


1710

No.

1704. **Troughs, glass.**

Length	8	10	12½	15 in.
Width	4	6	8	9½ "
Height	4	5	6	7 "
Each	$2.50	3.00	6.00	7.50

1705. — **stoneware.** According to size, $1.00 to $1.50 per gallon.

1706. — **pneumatic porcelain, cross form,** holding about 6 lb. mercury..... $0.90

1707. — **pneumatic, porcelain, oblong.**

For	8	16 lbs. mercury.
Each	$1.00	1.50

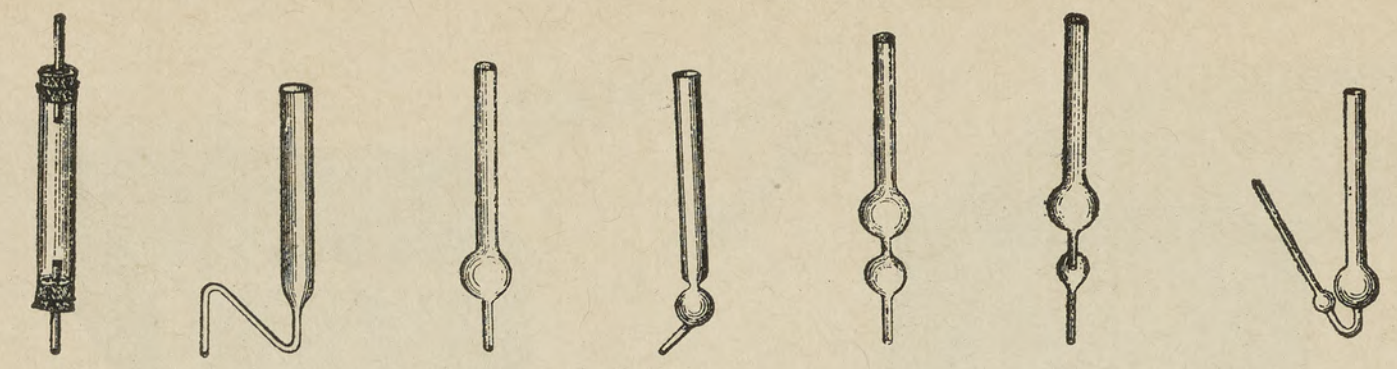
1708. — **pneumatic, glass,** with sliding shelf.

Size	8x4x4	10x6x5	12½x8x6	15x9½x7 in.
Each	$3.00	3.50	6.50	8.00

1709. — **pneumatic, japanned zinc,** with sliding shelf and overflow.

Size	5x9x12	6x11x15	8x12x18 in.
Each	$2.00	2.50	3.50

1710. — **pneumatic, Bunsen's;** of wood, with glass sides and support for endiometer..... 8.00



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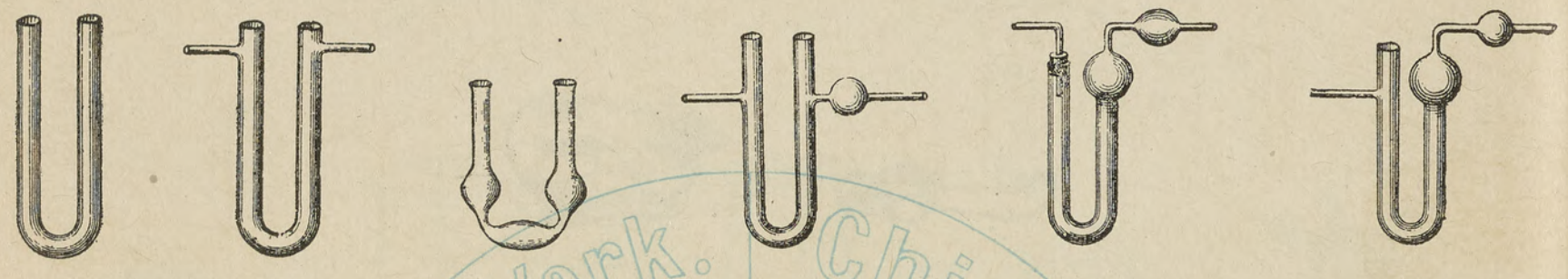


1718 1719 1720 1721 1722 1723

TUBES.

For those not mentioned see Index.

No.

1711. **Tubes, Chloride of Calcium,** fitted with corks and connecting tubes.

Length	4	6	8	10	12 in.
Dia.	3/5	3/4	4/5	1	1 "
Each	.15	.20	.25	.30	.35

1712. — **Chloride of Calcium,** with narrow bent tube..... $ .25

1713. — " " with 1 bulb.

Length	4	5	6	8	10 in.
Each	.11	.12	.13	.15	.20

1714. — **Chloride of Calcium,** with 1 bulb, bent end, same prices as No. 1713.

1715. — " " with 2 bulbs.

Length	3	4	5	6	8	10 in.
Each	.10	.11	.12	.15	.20	.25

1716. — **Chloride of Calcium,** with 2 bulbs and inner tube to collect moisture.

Length	5	6	8 in.
Each	.25	.30	.35

1717. — **Chloride of Calcium, Bunsen's,** dia. 8x4/5 in..... .25

1718. — " " **U shaped,** plain.

Length	3	4	5	6	8	10 in.
Each	.12	.14	.18	.22	.30	.40

1719. — **Chloride of Calcium, U shaped,** with side tubes.

Length	4	5	6	8 in.
Each	.15	.20	.25	.35

1720 — **Chloride of Calcium,** after **Woehler,** with 3 bulbs.

Length	5	6	8 in.
Each	.30	.35	.55

1721. — **Chloride of Calcium,** after **Vollhard,** with 2 side tubes and bulb.

Length	5	6	8 in.
Each	.30	.35	.40

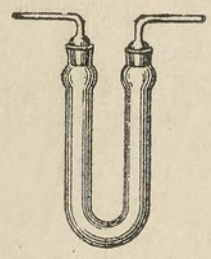
1722. — **Chloride of Calcium,** after **Marchand.**

Length	4	5	6 in.
Each	.30	.35	.40

1723. — **Chloride of Calcium,** after **Marchand,** with side tube.

Length	4	5	6 in.
Each	.30	.35	.40

New York. Chicago. RICHARDS & CO. LTD. Newcastle upon Tyne.



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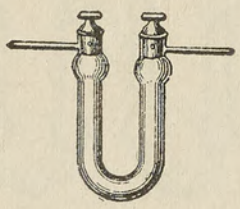

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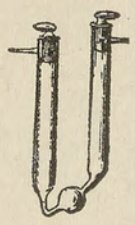

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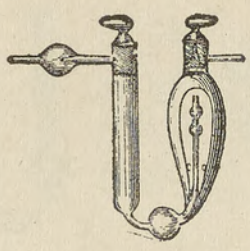

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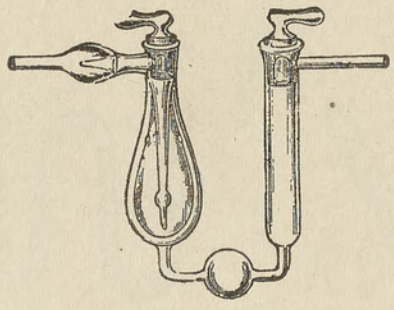

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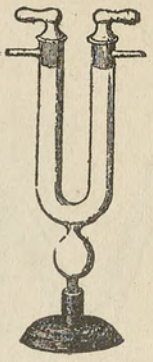

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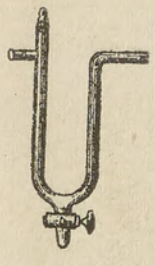

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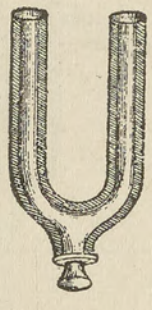

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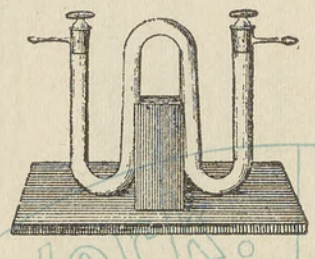

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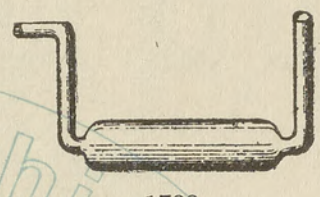

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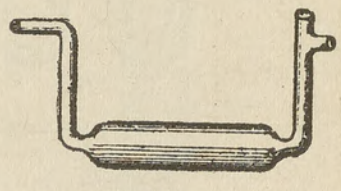

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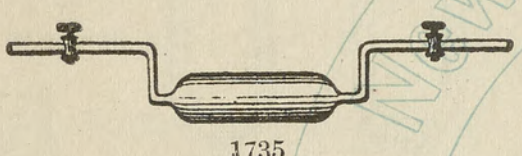

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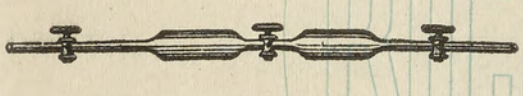

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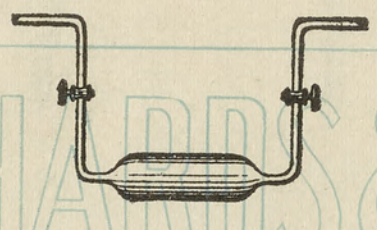

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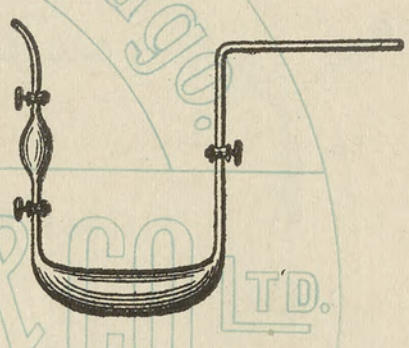

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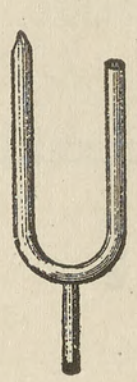

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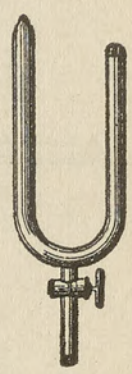


1740

No.

1724. **Tubes, Chloride of Calcium,** after **Bischof.**

Length	4	5	6 in.
Each	.75	.35	$1.00

1725. — **Chloride of Calcium,** after **Schwarz,** with side tubes and perforated glass stopper.

Length	4	5	6 in.
Each	$1.10	1.25	1.40

1726. — **Chloride of Calcium,** after **Reischauer,** with perforated stoppers.

Length	5	6 in.
Each	$1.50	1.75

1727. — **Chloride of Calcium,** after **Schmitz,** for H_2SO_4 and glacial phosphoric acid..... $2.00
(Fres. Zeits. 1884, P. 515.)

1728. — " " after **Preusser,** arranged so that the products of combustion pass first through H_2SO_4 (Fres. Zeit. 1889, P. 323. and Jl. Anal. Chem. 1890, A. 58.)..... 2.00

1729. — **Chloride of Calcium,** after **Wolf,** total height including base, 12 in..... 2.50

1730. — " " after **Baum,** with stopcock, height 6 in..... 2.00

1731. — " " after **Arnold,** height 6 in..... 1.00

1732. — " " after **Walter;** total length 10 in., with support..... 2.50

1733. — " " after **Liebig.**

Dia. of base	5	6 in.
Each	.35	.40

1734. — " " after **Mitscherlich.**

Dia. of base	5	6 in.
Each	.40	.50

1735. — **Condensing,** after **Liebig,** for sulphurous acid..... 2.50

1736. — " " **Meier,** for sulphurous acid..... 2.50

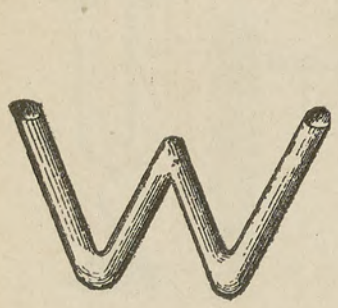
1737. — " " **Schumann,** for sulphurous acid..... 3.50

1738. — " " **Fischer,** for sulphurous acid..... 3.50

1739. — " " **Goebel**..... .50

1740. — " " " **with stopcock,** 6½ in. high..... 1.25

New York. Chicago. RICHARDS & CO. LTD. Newark, Hamburg.



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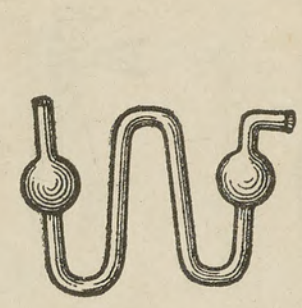

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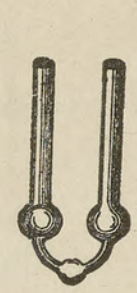

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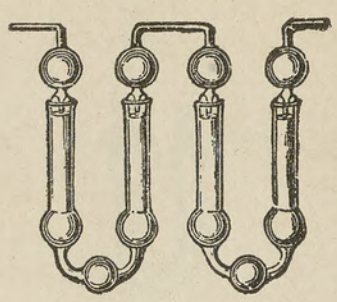

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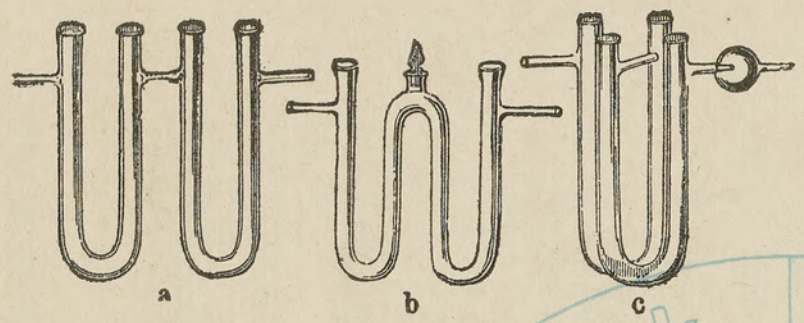

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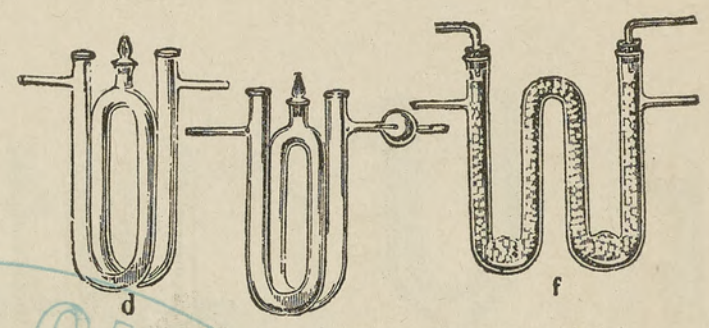

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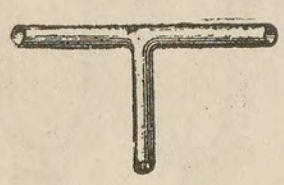

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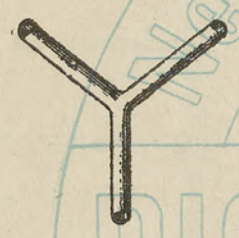

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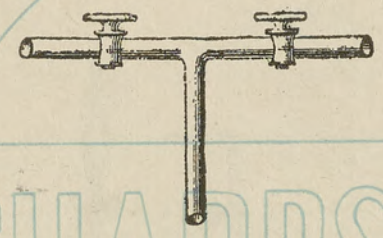

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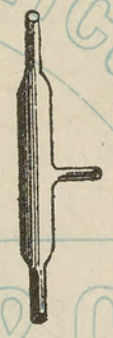

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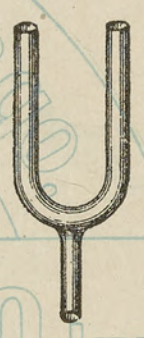

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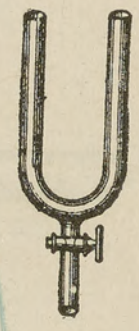

1754



1755

No.

1741. **Tubes, Condensing, W shape,** 6 in. high $0.50

1742. — " " with **2 bulbs,** 6 in. high ..... .60

1743. — " after **Woehler** ..... .40

1744. — " for **analysis of ores,** with ground in hollow stoppers, 9 in. high 3.00

1745. — " **U shape,** with drawn out point.

Length	8	10	12 in.
Each	.40	.50	.60

1746. — " after **Thoerner.** (Chem. Ztg. 1890, No. 98.)

Form	A	B	C	D	E	F
Each	$1.00	1.25	1.25	1.25	1.25	1.25

1747. — **Connecting, T shape, glass.**

Bore	1/8	1/4	3/8	1/2	3/4	1 in.
Each	.15	.20	.25	.30	.35	.40

1748. — " **Y shape, glass,** same prices as No. 1747.

1749. — " **T shape, brass.**

Bore	3/16	1/4	3/8	1/2	3/4	1 in.
Each	.30	.30	.40	.50	.65	.75

1750. — " **Y shape, brass,** same prices as No. 1749.

1751. — " **T shape,** with **2 Geissler's stopcocks** 2.25

1752. — " after **Liebig,** 3 ways ..... .25

1753. — " **U shape.**

Dia.	3/16	1/4	3/8	1/2 in.
Each	.15	.20	.25	.30

1754. — " **U shape, with stopcock.**

Dia.	3/16	1/4	3/8	1/2 in.
Each	$1.15	1.20	1.25	1.30

1755. — " **U shape, with** 1 large and 2 small ends.

Dia. of large end	3/8	1/2	3/4	1 in.
Each	.30	.40	.50	.60

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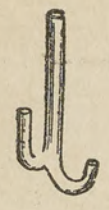
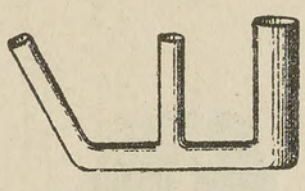


1756



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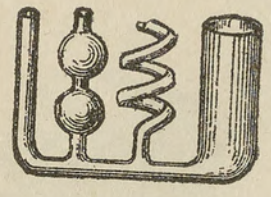


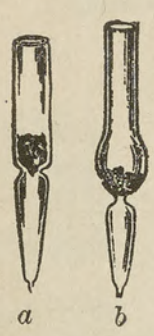
1757



1758



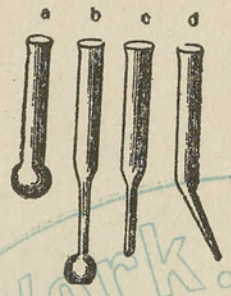
1767



1759



1761



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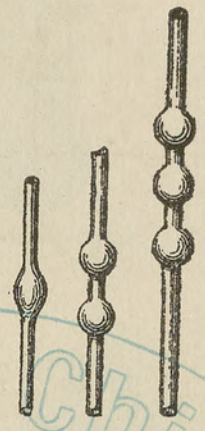

1765



1766

No.

1756. **Tubes, Edulcorating** $0.25

1757. — **Equilibrium.**

Set of	3	4 forms.
Each	$1.00	1.50

1758. — **Filtering,** for **Gooch Crucibles.**

Inside dia. of large end	¾	1	1⅛	1¼
Each	.20	.22	.25	.30

Filtering, of Platinum, see Platinum.

1759. — **Filtering,** after **Fresenius,**

Form	a.	b.
Each	.25	.25

1760. — **Filtering,** after **Reinhardt,** with perforated plate, 1½ in. diam. 1.50

Fractional Distillation, see Distilling Tubes.

1761. — **Ignition,** heavy glass.

Length	4	5	6	8 in.
Doz.	.45	.55	.65	$1.10

1762. — **Ignition, hard Bohemian glass.**

Length	5	6	8 in.
Each	.10	.15	.20

1763. — **Ignition,** hard Bohemian glass, with bulb at end.

Length	4	5	6	8 in.
Each	.15	.18	.20	.30

1764. — **Reduction,** for **Arsenic test.** Form a, b, c, d ..... per doz. .50

1765. — **Reduction, hard Bohemian glass.**

With	1	2	3 bulbs.
Each	.20	.25	.35

1766. — **Safety,** after **Babo** ..... .75

1767. — for **Water Analysis,** "2 foot tubes" 2.50

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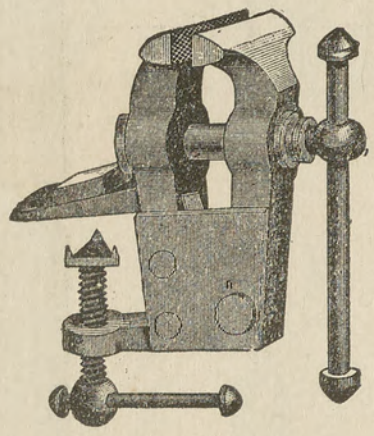
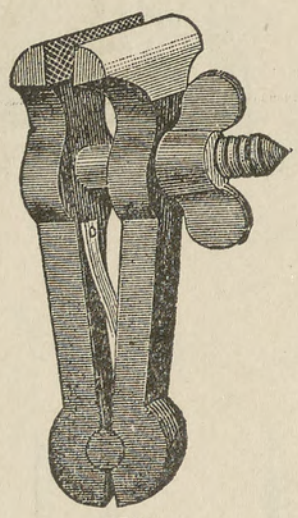


1768



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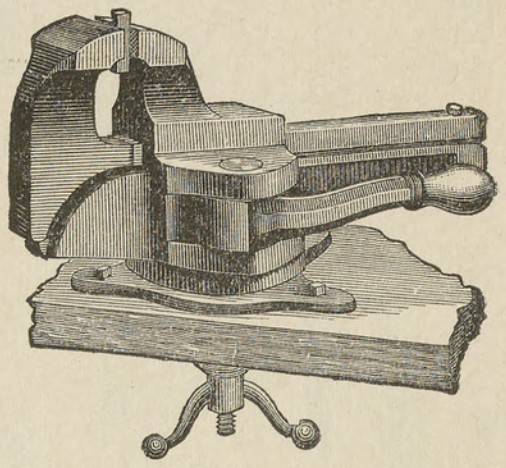

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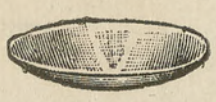


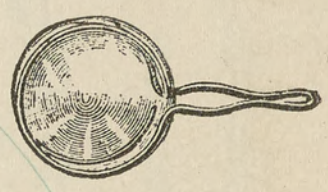
1771



1772



1773



1774

No.

1768n. **Vises, with Anvil**, steel faced.

Weight	2	3	4	6 lbs.
Each	$1.50	1.75	2.00	2.75

1769. — **Hand**, black, polished jaws.

Sizes	4	5	6 in.
Each	.60	.75	$1.00

1770t. — **Stephens**, with swivel base.

Width of Jaws	2	2¾	3½ in.
Weight	3	14	42 lbs.
Each	$4.00	6.00	10.00

1771. **Watch Glasses,** best quality, well annealed, with ground edges.

Dia.	1	1½	2	2½	3	3½	4 in.
Doz.	.20	.25	.25	$1.00	1.25	1.50	1 75

Dia.	4½	5	5½	6	6½	7	8 in.
Doz.	$2.00	2.50	2.75	3.00	4.00	5.00	6.00

1772. — **in pairs, accurately ground.**

Two	2	2½ in.
Set	.20	.25

1773. **Watch-glass Clamps,** new form, nickel-plated..... .25

1774. **Watch-glass Clips,** brass, nickel-plated..... .20

1775. **Watch Springs,** for burning in oxygen.....Doz. .30

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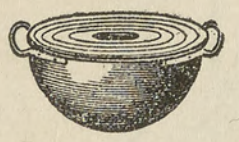
1776



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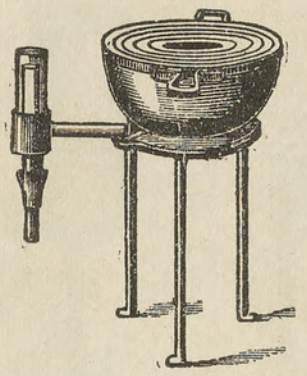

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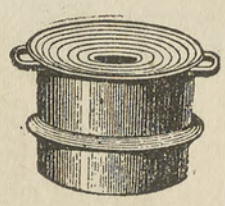

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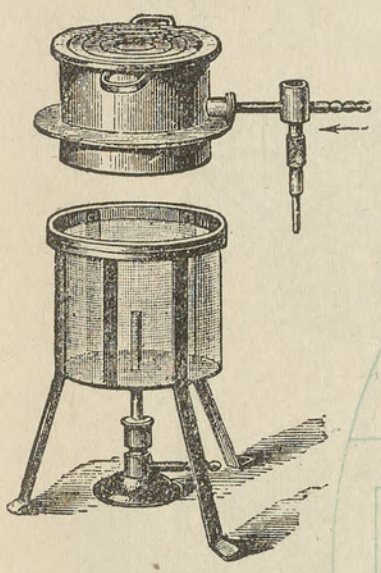

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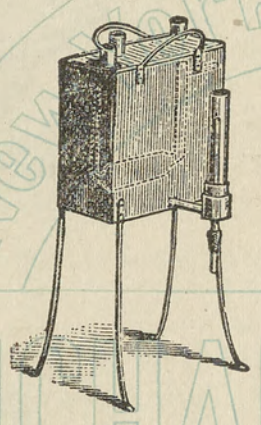

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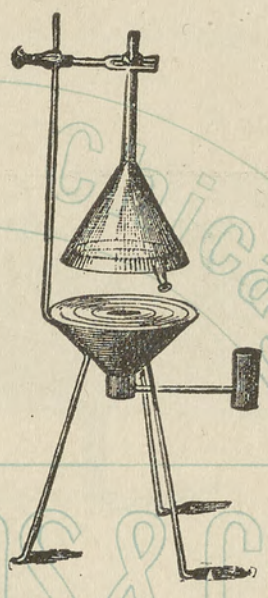

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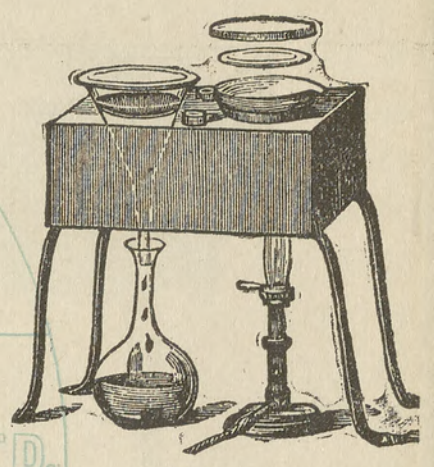


1783

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg

WATER BATHS.

No.

1776. **Water Bath,** of Royal Berlin Porcelain, 2 dishes, one fitting into the other. Diam. 5 in., each..... ..... **$1.60**

1777. —— of heavy copper, with concentric rings and cover in centre; with handles and steam escape.

Dia.	4	5	5½	6	8	10 in.
Each	.85	$1.00	1.25	1.40	2.25	5.00

1778. —— same as No. 1777, but with constant Water level.

Dia.	5	5½	6	8	10 in.
Each	$2.00	2.20	2.40	3.50	6.50

1779. —— of enameled iron, with tin lined copper rings.

Dia.	5½	6¾	8	9	10	12½ in.
Each	$1.60	2.50	3.00	3.50	6.00	7.50

1780. —— **Baumann's**, with constant level, burner and gauze protection **for heating inflammable substances**. Dia. 7 in..... ..... **8.00**

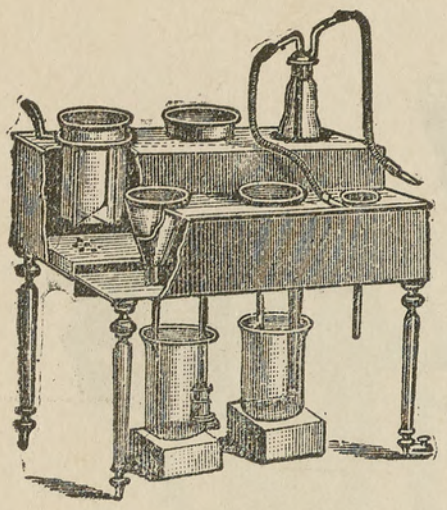
1781. —— **Anschuetz and Kekule's,** of copper, for drying in Liebig's drying tube, and estimating water of crystalization..... **6.00**

(Liebig's Annalen. Vol. 228, P. 303.)

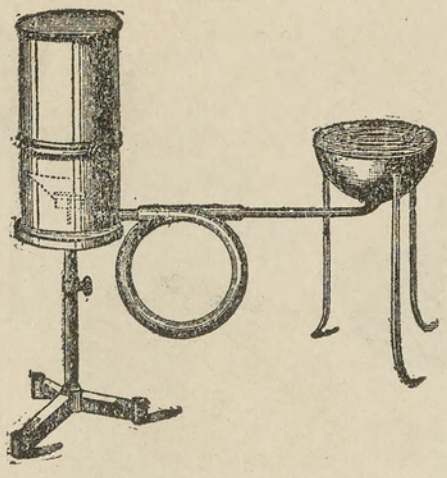
1782. —— of copper, with constant level and holder for Victor Meyer's Vapor Funnel, with concentric porcelain rings.

Dia.	6	8 in.
Each	$6.00	8.00

1783. —— **Griffins,** of copper, 13x7x5 in., on 4 legs, with Funnel Heater and concentric rings for dishes.. **12.50**



1784



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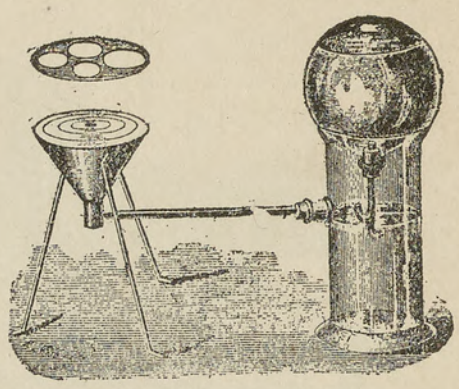

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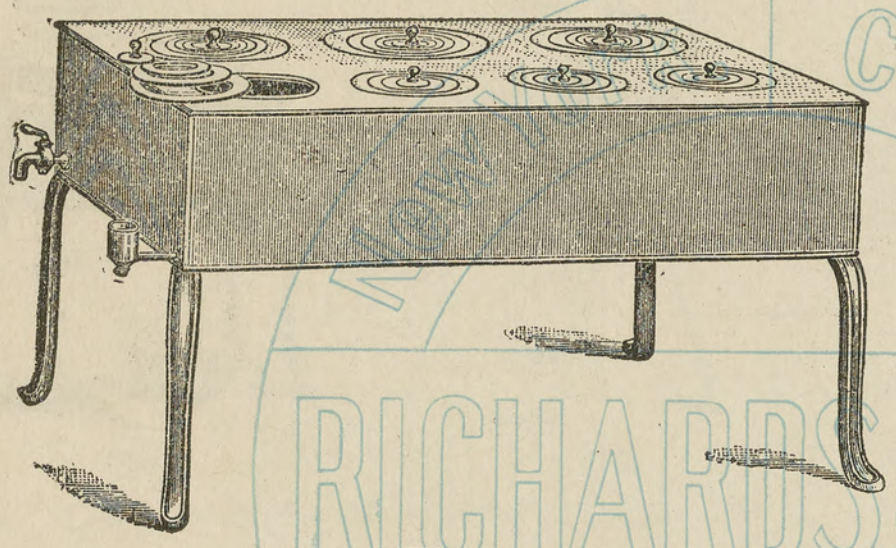

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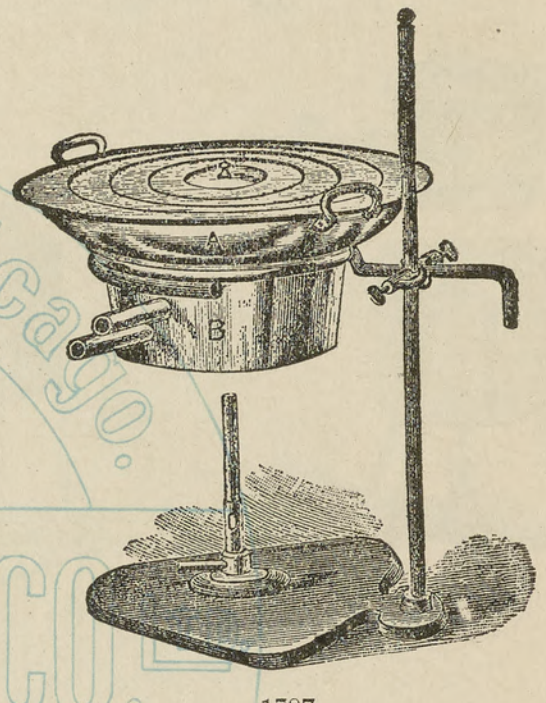


1787

No.

1784. **Water Bath, Landolt's,** of copper, for hot filtrations and evaporations, size, 15x10 in., 2 shelves, each with three openings **$25.00**

1785. —— **Fresenius,'** of copper, hemispherical, 6 in. dia., with tripod, connecting parts, reservoir of zinc, and support for same.

Dia.	6	8 in.
Each	**$6.00**	**8.00**

1786. —— **Victor Meyer's,** of copper, tin lined, with 2 porcelain plates as per sketch; 8 in. dia., with level consisting of cylinder and glass balloon. Complete **10.00**

1787. —— **Prof. Young's** of Northwestern University; heavy copper, tinned inside. The adjustable top A, 10 in. diameter, permits the heating of a large or small dish without varying the quantity of water heated, this being small in either case is quickly boiled, the device for maintaining the water level is enclosed within the bath, and projecting parts are avoided; it can also be used as a direct steam bath, by connecting the inlet tube to the steam supply instead of to the hydrant. We also furnish a top with four openings, 2½ in. diameter, whereby four small dishes can be used at the same time by taking out all the rings; the adjustable top A can be taken off and the two smaller rings used on B, which makes a bath 6 inches in diameter. With iron ring and fastener **4.00**

1787a. Support for same, with heavy base **1.00**

1787b. Extra top, with four openings ..... **.75**

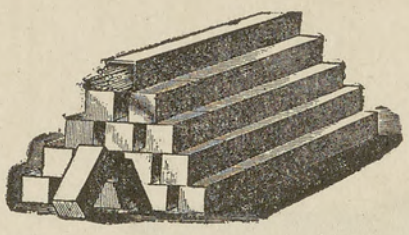
1788. — of heavy copper, with three 6 in., and four 4 in. openings, all provided with concentric rings and cover in centre; with stop cock and constant water regulator. Size 24x14x5 in **20.00**

See also **Sand Baths**, also Part II. **Apparatus for Extraction.**

RICHARDS & CO. Chicago. Newark. Hamburg.



1790



1791



1791a

No.

1789. **Water Heater, Fletcher's instantaneous,** to hang over lavatory sink.
In two sizes:—Large size 19 in., projection from wall 8 in.
Small " 18 " " " " 6 "

1789a. — small size, without taps $11.00
1789b. — " " with gas tap and pilot light 13.00
1789c. — " " " " " " " and coupled taps 20.00
Nickel-plating, extra 2.50
1789d. — large size, without taps 15.00
1789e. — " " with gas tap and pilot light 17.00
1789f. — " " " " " " " " and coupled taps 25.00
Nickel-plating, extra 3.00
For Gasoline Gas, extra 1.00

1790. **Waterhammers.**

	Med.	Lge.
Each	.50	.75

1791. **Wax Tapers,** put up 36 in a box ..... per box .15

1791a. **Wax Tape Holder** with **Slide and Key** ..... each 1.00

1792a. **Wire,** copper.

Size No.	12	14	16	18	20	22	24 B. & S. Gauge.
Per lb. spool	.50	.50	.50	.50	.70	.55	.60
Size No.	26	28	30	32	34	36	38 B. & S. Gauge.
Per lb.	.65	.75	.90	$1.00	1.30	2.00	2.50

1792b. — **copper, insulated, cotton** covered.

Size No.	4	6	8	10	12	14	16	18	20
Per lb. spool	.50	.50	.55	.55	.60	.60	.65	.70	.75
" Oz. "	—	—	—	—	—	—	—	—	—

Size No.	22	24	26	28	30	32	34	36
Per lb. spool	$1.15	1.30	1.60	1.90	2.30	3.10	4.50	6.80
" Oz. "	.10	.12	.14	.16	.18	.22	.30	.45

1792c. — **copper,** insulated, **silk** covered.

Size No.	16	18	20	22	24	26	28
Per lb.	$1.50	1.60	1.70	1.80	2.20	3.00	3.20
" Oz.	.14	.14	.15	.16	.18	.22	.25

Size No.	30	32	34	36	38	40
Per lb.	4.00	5.20	6.40	12.80	20.00	30.00
" Oz.	.30	.40	.50	.75	1.25	2.00

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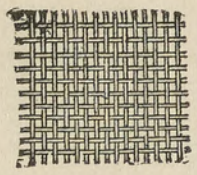
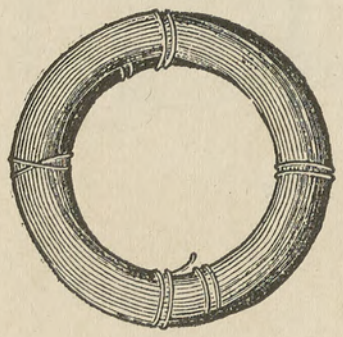


1796b



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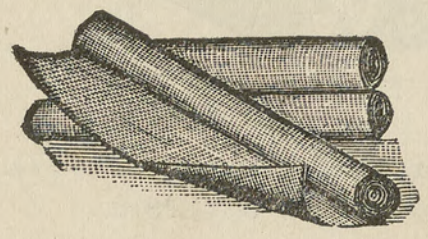

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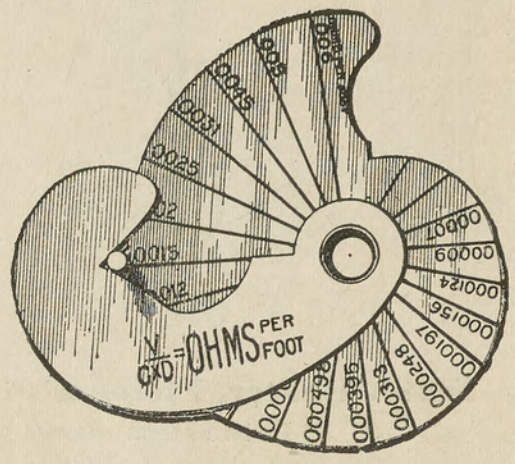

1800

No.

Wire, C. P. iron, for standardizing; see Chemical Price List.

1793. —— **aluminium.**

Size No.	12	16	20	22
oz.	.20	.25	.30	.35

1794. —— **nickel**.....oz., .20; lb. $2.50

platinum; see Platinum.

1795. **Wire Gauze, copper,** for combustions, etc.

Size	20	40	60	80 meshes.
Sq. ft.	.80	.95	$1.05	1.50

1796a. —— **iron.**

Size	6	10	14	16	20	40	60	80 meshes.
Sq. ft.	.20	.25	.28	.30	.30	.45	.70	$1.00

1796b. —— **iron,** correct thickness for heating beakers, dishes, etc.

Size	4	5	6	8 in. sq.
Each	.06	.08	.10	.20

1797a. —— **brass.**

Size	10	20	30	40	60	80	100 meshes.
Sq. ft.	.50	.50	.55	.60	.65	.90	$1.30

1797b. —— **brass,** correct thickness for heating beakers, dishes, etc.

Size	4	5	6	6 in. sq.
Each	.20	.15	.20	.40

1798. —— **nickel,** about No. 30.....per sq. ft. 2.50

1799n. **Wire Gauges, American standard.**

	No. 5 to 36	No. 0 to 36
Each	$2.50	3.50

1800n. **Wire Gauge, palette combination,** for determining the size of wire (B. & S.), safe carrying capacity, and shows resistance per foot of copper wire..... 1.00

Finis Partis Primae.

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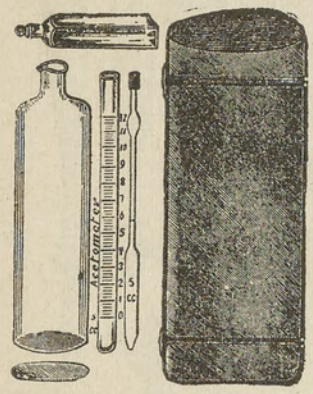
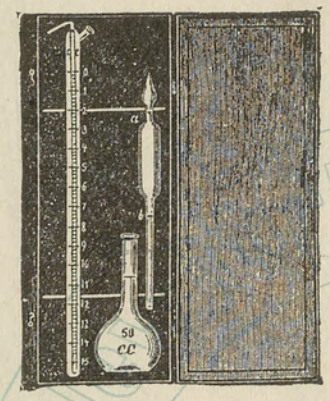
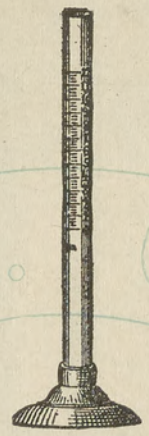


2000



2001



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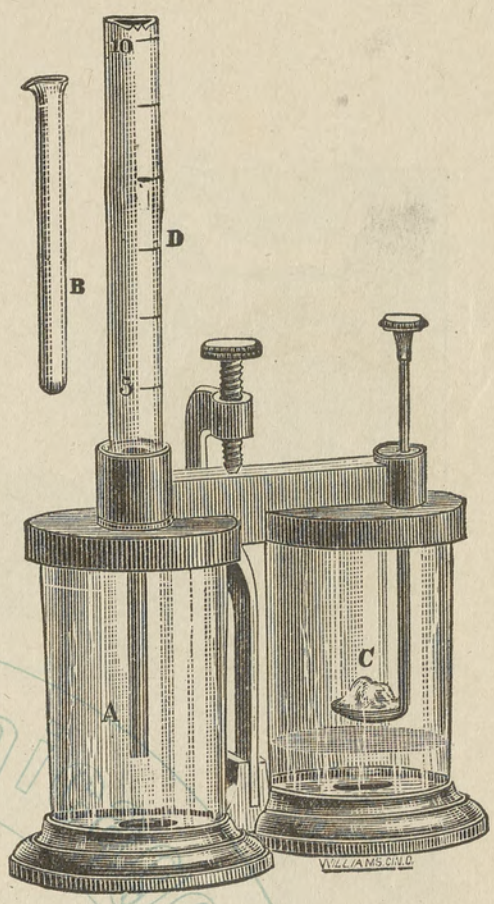


2003

PART II.

SPECIFIC ANALYTICAL AND PHYSIO-CHEMICAL APPARATUS.

1. APPARATUS FOR ACID DETERMINATION.

No.

2000. **Fresenius' Acidimeter** consisting of a graduated tube, pipette and glass stoppered bottle. In fine nickel-plated case, with directions..... $7.25

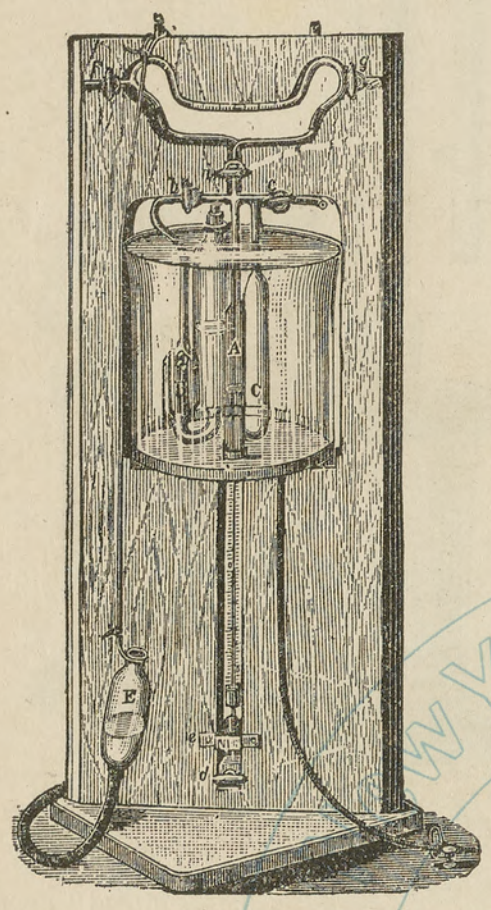
2001. **Gall's Acidimeter**, for determining the quantity of Acid in Wine; a graduated burette, pipette and flask. In polished case, with directions..... 3.00

2002. **Otto's Acetometer,** for determining the percentage of Acetic Acid in Vinegar; on wooden base, with directions..... .80

2003. **Twitchell's Acidimeter,** for determining the strength of all kinds of Vinegar and Wines, being easily handled and correct. Directions with each instrument..... 16.00

See also Part I.—Hydrometers.
" II.—Carbonic Acid Apparatus.
and Specific Gravity Apparatus.

RICHARDS & CO LTD. Newark. Hamburg.



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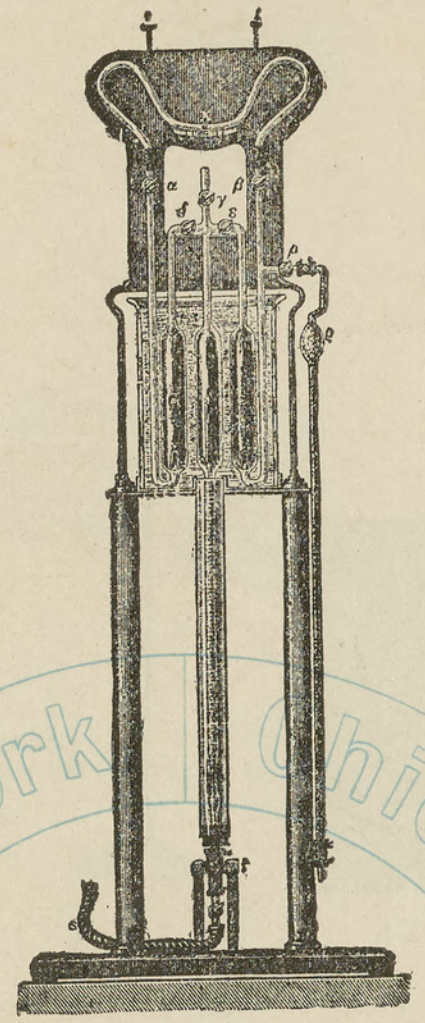

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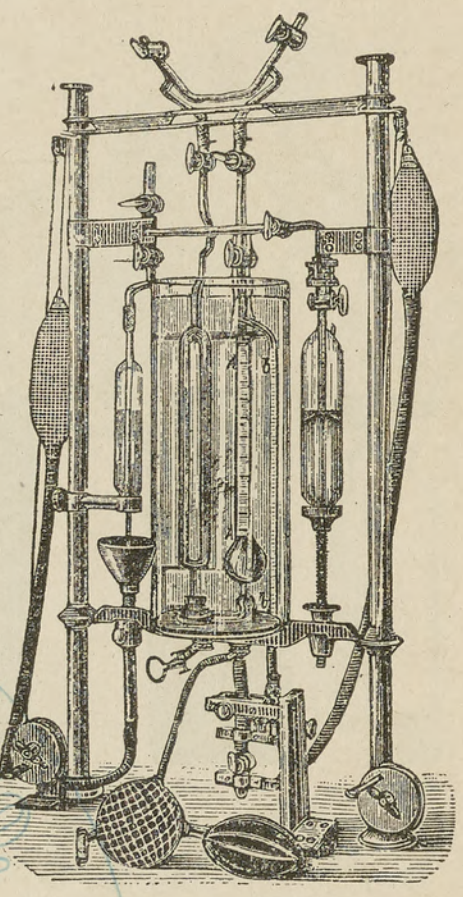


2009

RICHARDS & CO. LTD.
New York Chicago
Newark Hamburg

2. APPARATUS FOR AIR ANALYSIS.

No.

2004. **Lunge's Minimetrical Apparatus** for determining the percentage of CO_2, with tables and directions..... $2.00

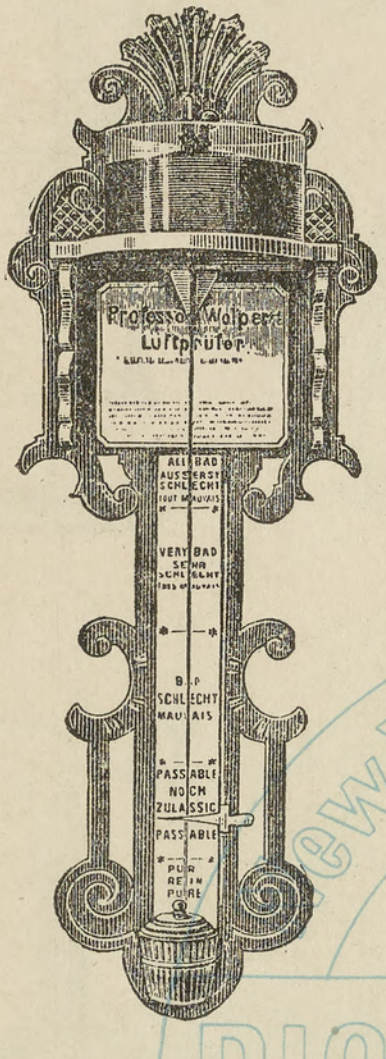
2005. **Ostersetzer's Apparatus** for CO_2 analysis in Air (See No. 2031.)..... 4.00

2006. **Petterson & Palmquist's Apparatus** for Air analysis, in polished case, portable on support, with tables and directions (Ber. d. Deutsch Chem. Ges. 20, P. 2129.)..... 48.00

2007. **Petterson's Apparatus** for determining the amount of CO_2, and also the atmospheric moisture; on supports, with tables and directions..... 100.00
(Jl. of Anal. Chem. 1887, P. 216 and Fres. Zeits., 1887, P. 757.)

2008. **Petterson and Hogland's Apparatus** for determining the percentage of CO_2 and O separately. The best apparatus for hygienic analysis, with tables and directions..... 160.00
(Ber. d. Deutsch Chem. Ges. 1889, P. 3324b.)

2009. **Klas-Sonden's Universal Apparatus** for a general analysis, permitting quick and accurate work, and very simple to operate..... 160.00



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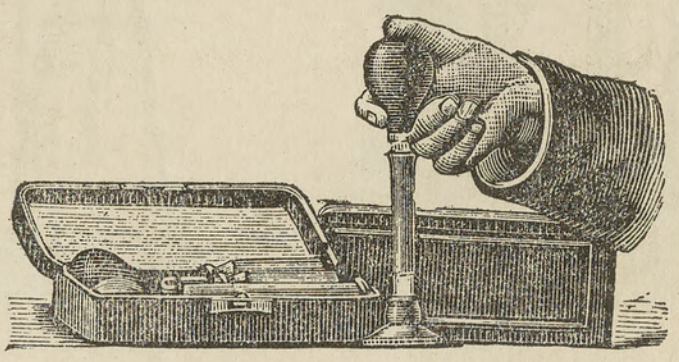

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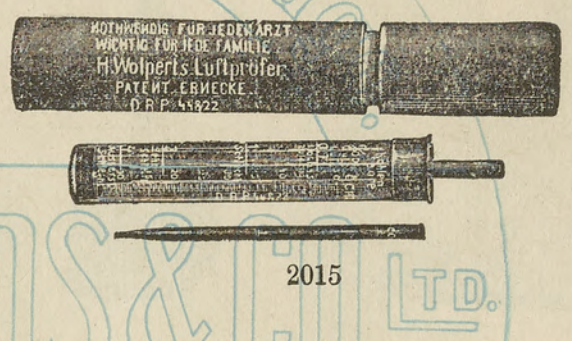


2015

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

No.

2010. **Schaffer's Apparatus** for determining CO_2 in air, with directions..... **$2.40**

2011. **Van Nuy's Apparatus** for determining CO_2 in air, complete with supports..... **22.50**

(See Anal. Chem. Jl., Vol. VIII, No. 3, and Chem. Zeitg. 1885, No. 6.)

2012n. **Wolpert's Automatic Air Tester,** for ascertaining the amount of CO_2 in rooms, etc., complete with thermometer, in case with directions..... **15.00**

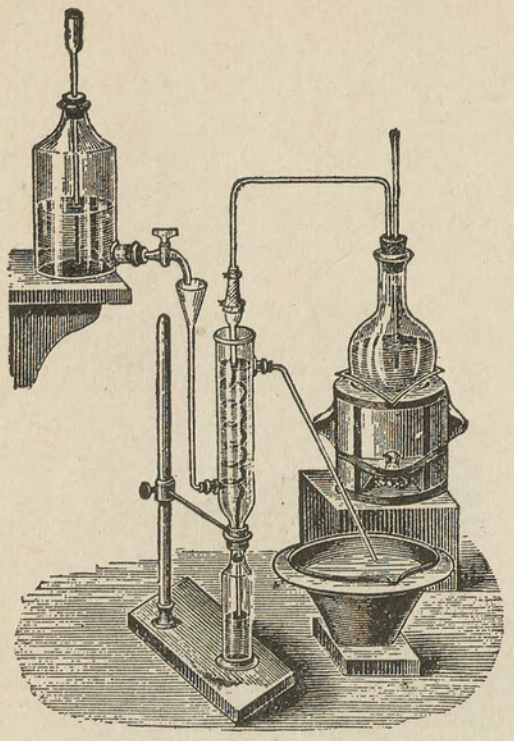
2013. **Wolpert's Air Tester,** small pocket instrument, complete with directions..... **3.00**

2014. —— larger size, complete with directions..... **9.00**

2015. **Wolpert-Ernecke's Air Tester,** a very perfect instrument, complete with test tablets, directions, etc. **7.25**

2016. —— Same as above for an examination of air after some time, even months have elapsed; more complete than No. 2015, and with 15 tables and 3 colored diagrams..... **12.00**

See also Part II. Gas Analysis Apparatus.
And Carbonic Acid Apparatus.



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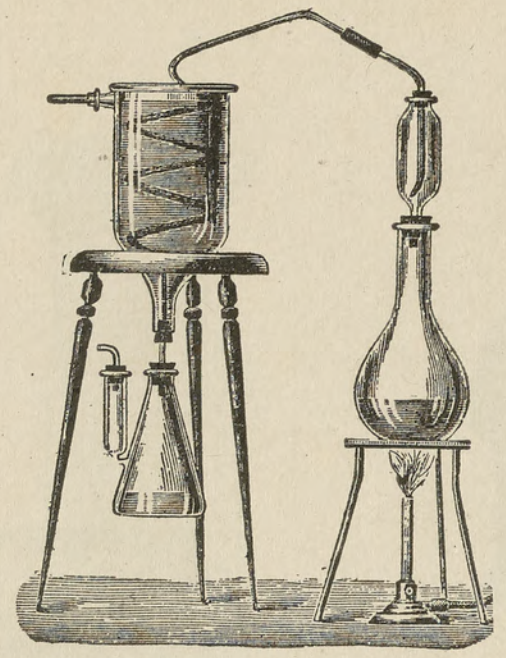

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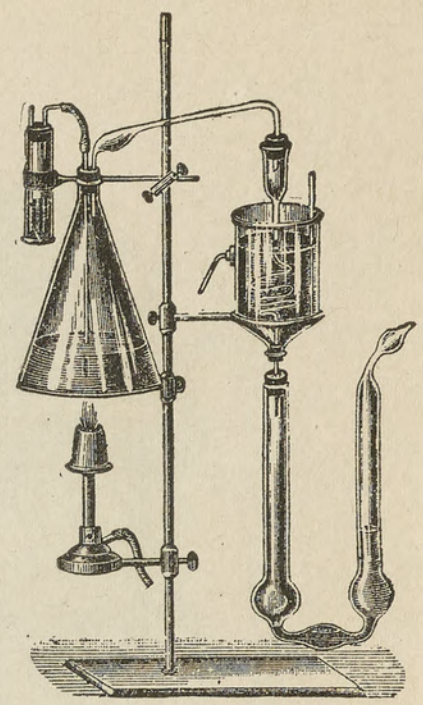

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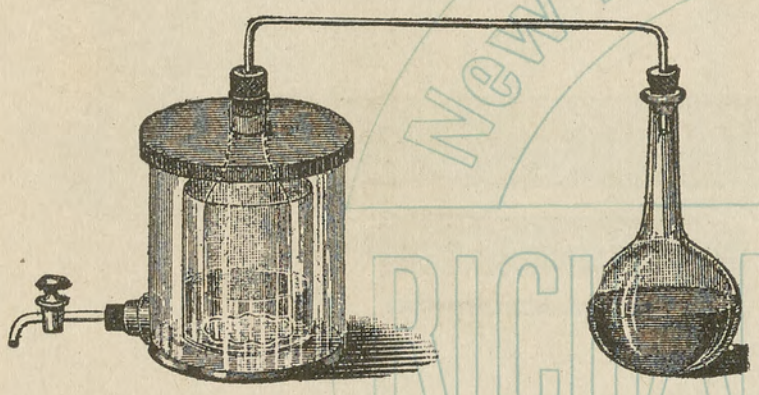

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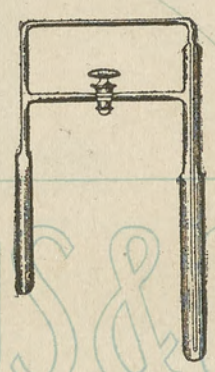

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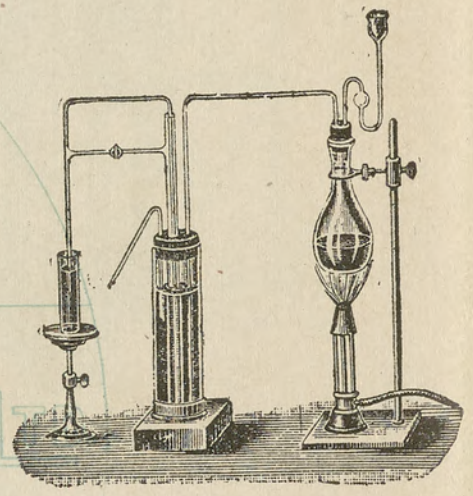

2019

3. APPARATUS FOR AMMONIA DETERMINATION.

No.

2017. **Bousingault's Apparatus** for condensation and determination of Ammonia ; without aspirator bottle, furnace, basin and support..... $5.00

2018. **Knublauch's Apparatus,** for determining Ammonia by means of distillation..... 6.00
(Fres. Zeits. 1882, P. 161.)

2019. **F. C. G. Mueller's Apparatus,** condensing the Gas and demonstrating, at the same time, the principle of Carre's Ice Machine. Complete..... 10.00

2019a. The Glass Tube with stopcock only..... 2.50

2020. **Stein & Schwartz' Apparatus,** for determination of Ammonia by means of caustic potash or soda ; without support, burner and tripod..... 6.00
(Fres. Zeits. 1889, P. 319, and Jl. Anal. Chem. 1889, P. 137.)

2021. **Apparatus** for determining Ammonia in plants and vegetable extracts, all glass parts complete, (without support and burner.) (Fres. Zeits. 1883, P. 330)..... 7.50

See also Part II. Apparatus for Nitrogen Determination, and Colorimeter "Hehner's."

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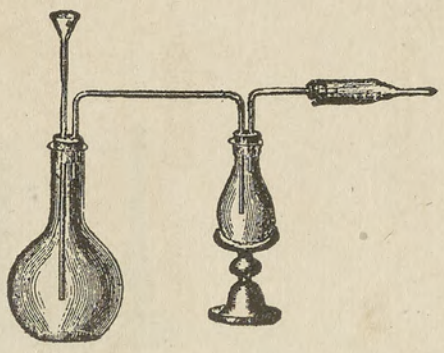

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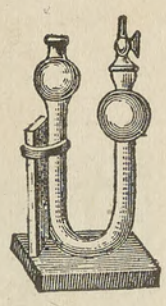

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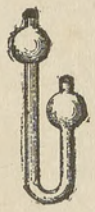

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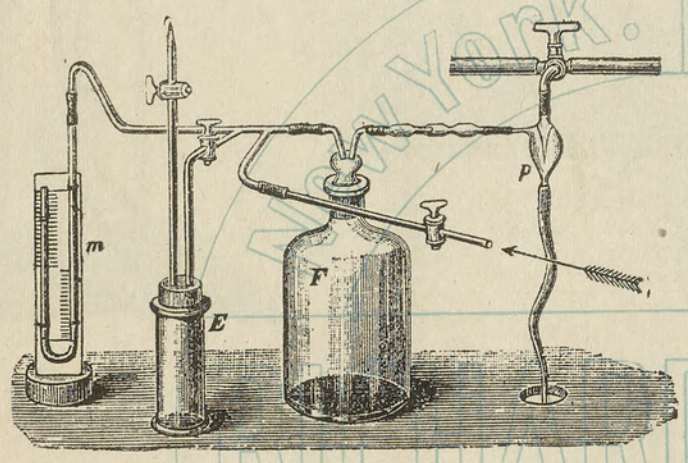

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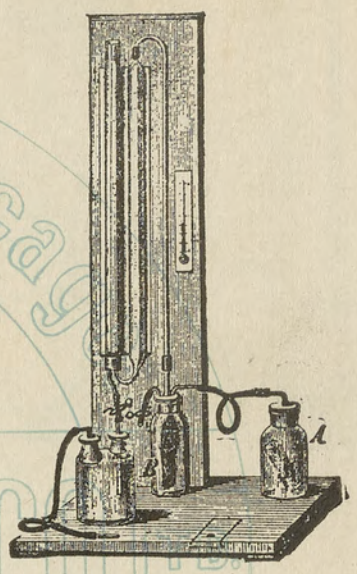


2025

4. APPARATUS FOR ARSENIC DETERMINATION.

No.

2022. **Fresenius' Apparatus,** complete with support..... $1.50

2023. **Marsh' Apparatus,** with glass stopcock, on polished wooden support..... 2.20

2023a. The plain **U Tube** only..... .40

See also Part I—Porcelain Plates for Arsenic test
and Tubes: Reduction for Arsenic test.

5. APPARATUS FOR BOILING POINT DETERMINATION.

2024. **Krafft & Noerdlinger's** for determinations under diminished pressure, complete 8.50

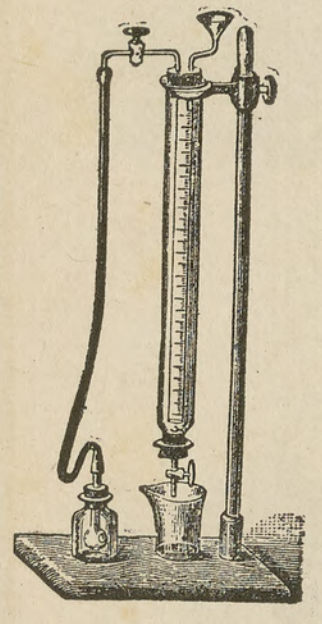
(Fres. Zeits. 1889, P. 316, and Berichte d. Deutsch Chem. Ges. 1888, P. 816.)

6. APPARATUS FOR BONEBLACK ANALYSIS.

2025. **Scheibler's Apparatus** for estimation of Calcium Carbonate in Boneblack, with latest improvements.... 25.00

APPARATUS FOR CARBON DETERMINATION.

See Part II. Apparatus for Iron and Steel Analysis.



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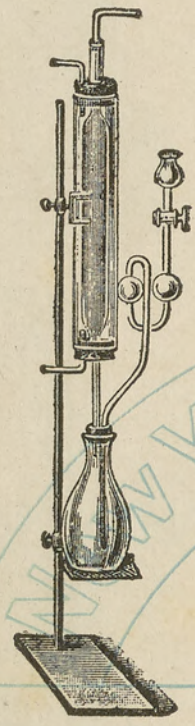

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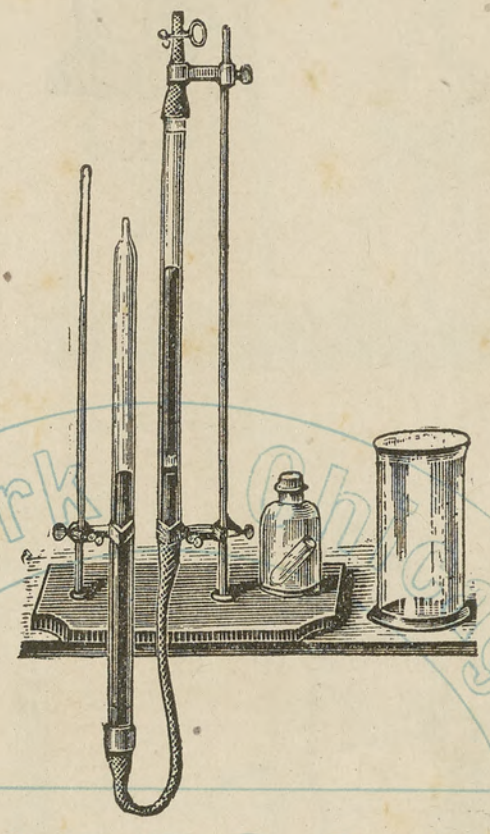

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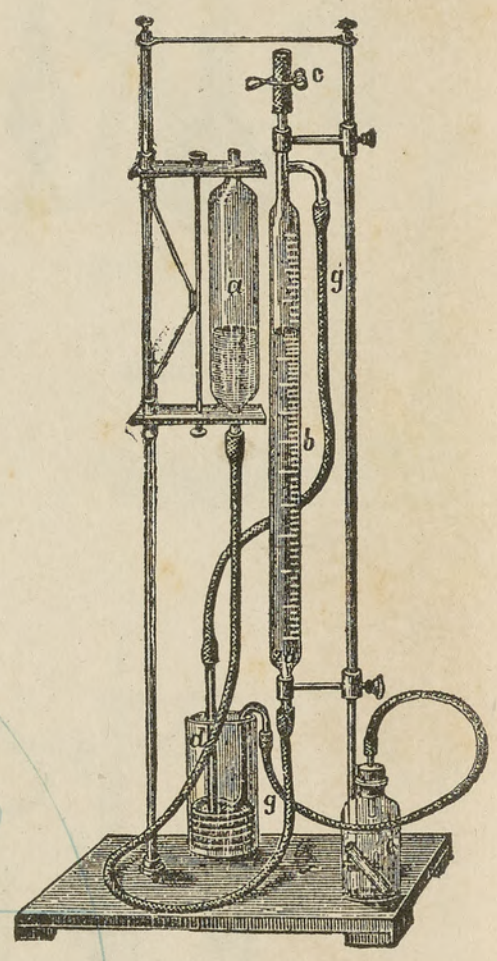


2029

New York. Chicago. Newark. Hamburg. RICHARDS & CO. LTD.

7. APPARATUS FOR CARBONIC ACID DETERMINATION.

No.

2026. **Baur's Apparatus** for rapid and exact determination of carbonic acid and its combinations ; to be used in laboratories, bleaching establishments, sugar refineries, soap and vinegar factories, etc., with directions $15.00

(Fres. Zeits. 1884, P. 371 ; Jl. Anal. Chem., P. 396 and Post 1890, I. P. 8.)

2027. **Classen's Apparatus,** consisting of flask-condenser and safety funnel with stopcock, fitted with rubber stoppers, complete 4.00

2027a. Support extra 2.00

(Fres. Zeits. 1876, 285.)

2028. **Diedrich's Apparatus** for Carbonic Acid determination in salts, glass parts only 6.00

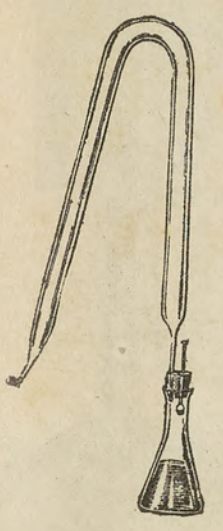
2028a. Support extra 3.00

2029. **Diedrich-Fruehling's Apparatus** for volumetric determination of Carbonic Acid in Marl, etc.; gas-measuring tube 200 cc. in $\frac{1}{2}^{0}$, complete 40.00

Extra parts for above.

2029a. 10 Developing Flasks ..... set 2.00

2029b. 10 Acid Bottles marked ..... " 3.25



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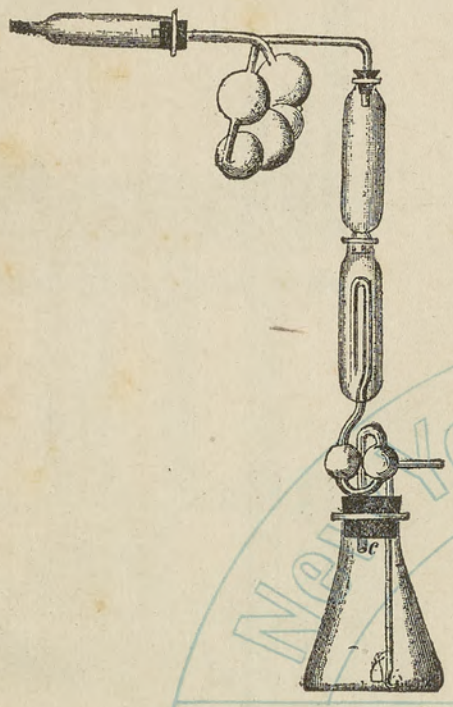

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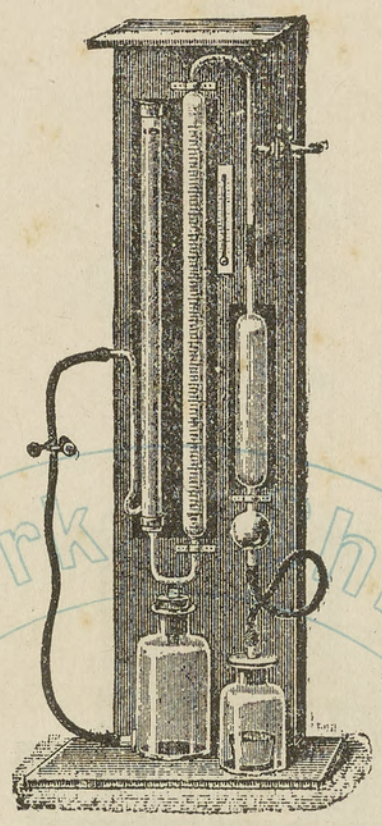

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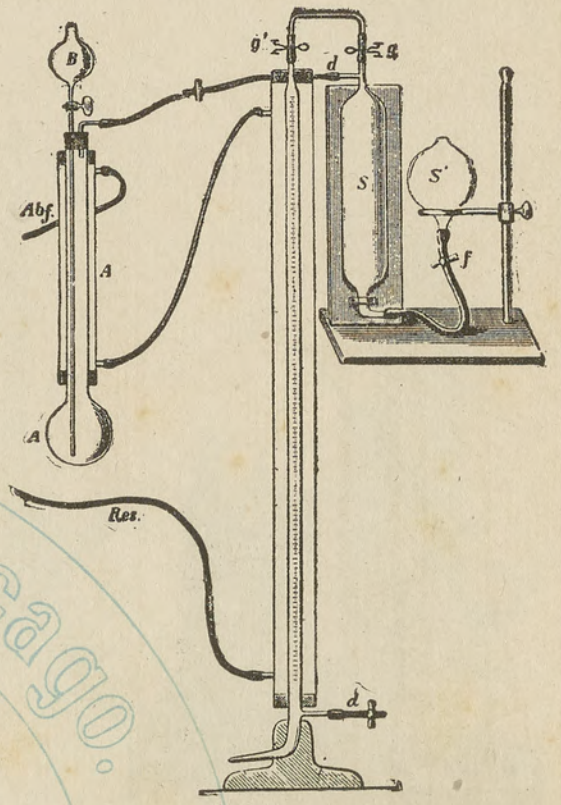


2033

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

No.

2030. **Fuchs' Apparatus** for volumetric analysis of Carbonic Acid..... $2.00

(Chem. Ztg. 1889, No. 53, P. 873.)

2031. **Ostersetzer's Apparatus** for Carbonic Acid determination..... 4.00

(Fres. Zeits. 1888, P. 27 ; Chem. Ztg. 1888, P. 29, and Jl. Anal. Chem. 1890 P. 204.)

2032. **Scheibler-Finkner's Apparatus** for Carbonic Acid determination in limestone and marl..... 22.00

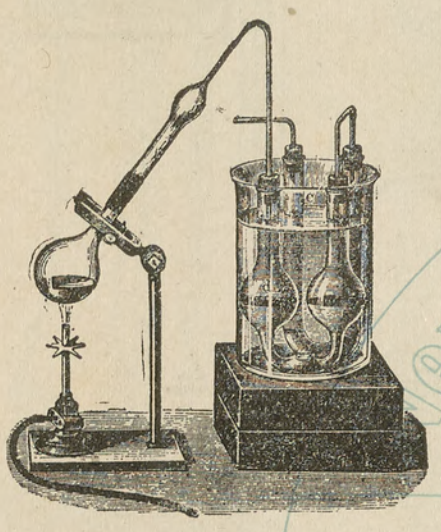
(Post 1890, II. 6.)

2033. **Thoerner's Apparatus** for Carbonic Acid determination, combined or in free state in beer, wine and other liquids..... 12.00

(Fischer's Zeits. 1889, P. 644.)

See also Part I.: Alcalimeters and Potash Bulbs.

Part II.: Apparatus for Air Analysis, Boneblack Analysis, Gas Analysis, Iron and Steel Analysis and Sugar Analysis.



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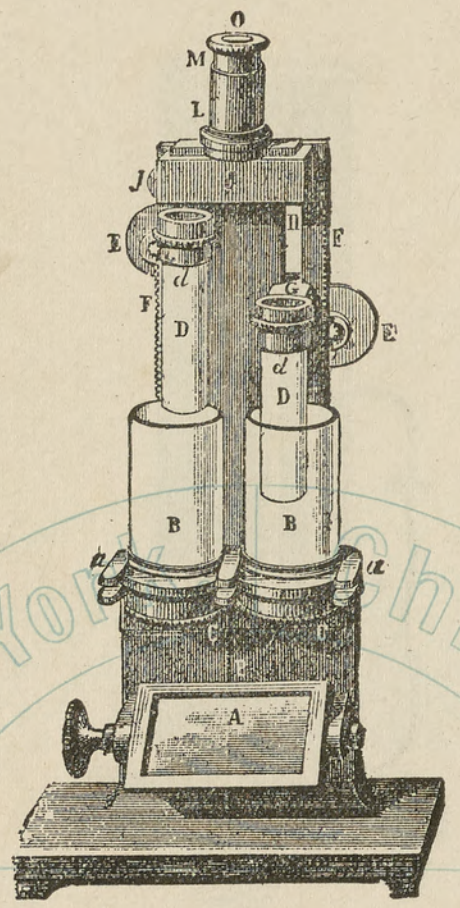

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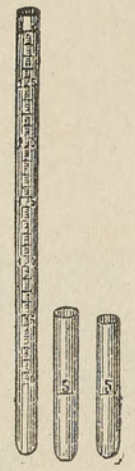

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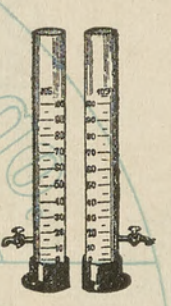

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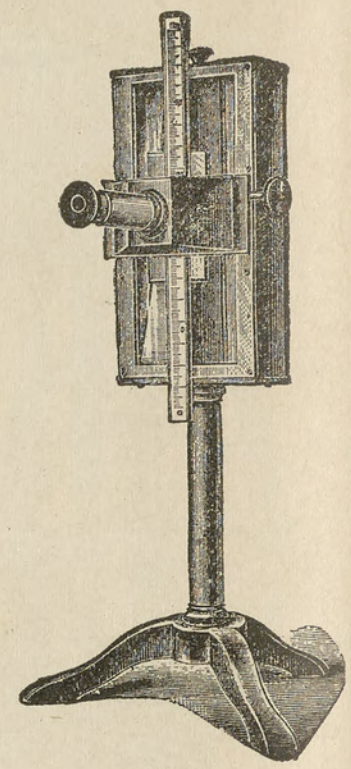


2038

7. APPARATUS FOR CHLORINE DETERMINATION.

No.

2034. **Bunsen's Apparatus** for volumetric determination of chlorine ; glass parts only..... $2.50

2034a. Supports and burner for same..... 2.00

(Fres. Anal. 1873, P. 476.)

8. APPARATUS FOR COLORIMETRIC DETERMINATIONS.

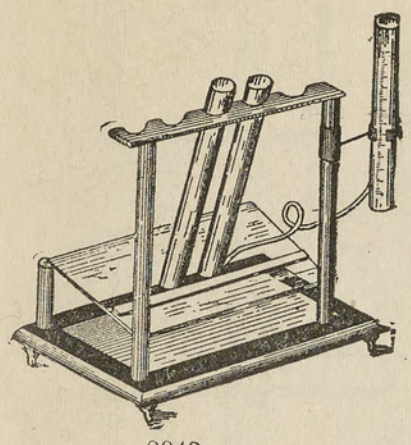
2035n. **Dubosc-Soleil's Colorimeter,** especially used in sugar analysis..... 80.00

2036. **Hehner's Colorimeter,** for estimating ammonia in water, consisting of 2 graduated cylinders with stopcock. 10.00

2037. **Hubber's Colorimeter** for copper test ; consisting of glass cylinder on base, and 2 small test tubes with mark..... 3.00

2038. **Gallenkamp-Heele's Colorimeter** with direct scale of percentage ; especially adapted for sugar factories, dyeing establishments, etc..... 85.00

New York Chicago RICHARDS & CO. LTD. Newark Hamburg



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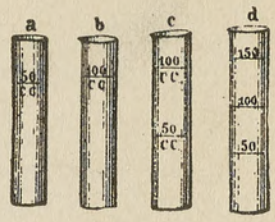

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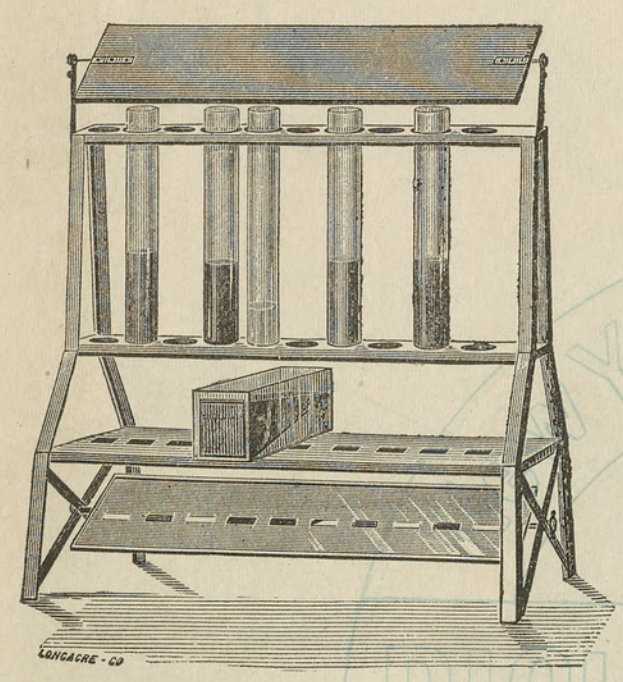

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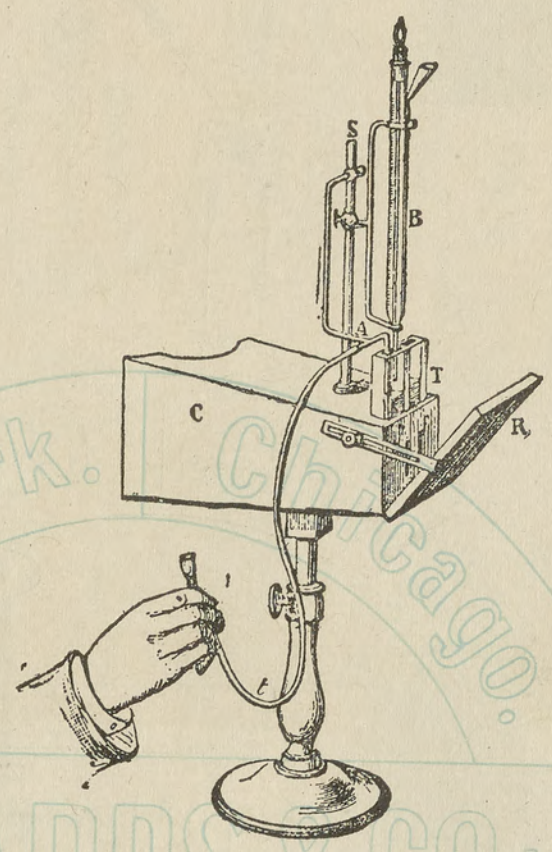

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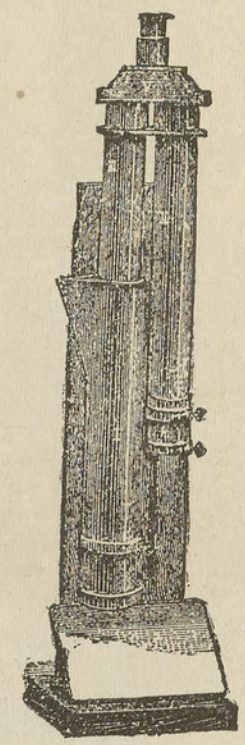


2042

No.

2039. **Leed's Color Comparator,** for quantitative analysis of substances in solutions, by the relative depth of tint of a certain color; with prisms..... $15.00

2039a. One dozen glasses for same..... 2.50

2040a. **Nessler's Jars for Ammonia Test.**

Grad.	50	100	50 and 100	50, 100 and 150 cc.
Each	.50	.60	.75	$1.00

2041n. **Salleron's Colorimeter,** with directions..... 50.00

2042t. **Stammer's Apparatus** for testing color in sugar analysis; latest form..... 60.00

2043. **Stokes' Apparatus** for colorimetric determination..... 15.00

(Jl. Anal. Chem. 1889, P. 66.)

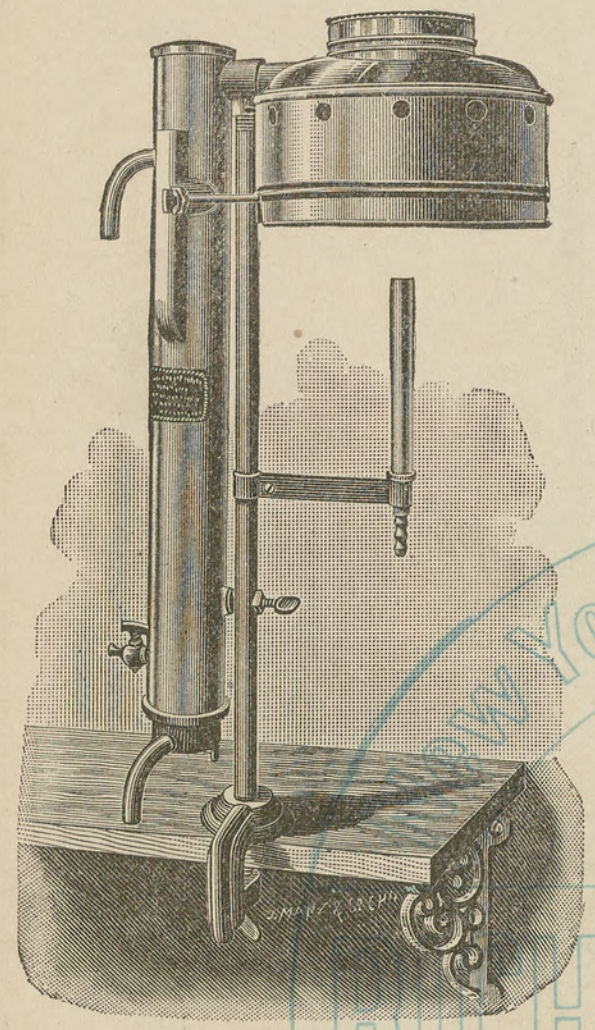
2044. **Wolff's Colorimeter,** in polished walnut case..... 100.00

2045. —— Same, on iron base..... 80.00

NOTE: Both these apparatus serve to determine anilin colors, indigo, dye woods, bone-black, salicylic acid in absorbent cotton, for determination of smallest traces of copper, zinc, lead and chlorine, for determination of ammonia and nitrous acid in water, for making colored normel solutions, etc.

Other Colorimeters see Index.

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



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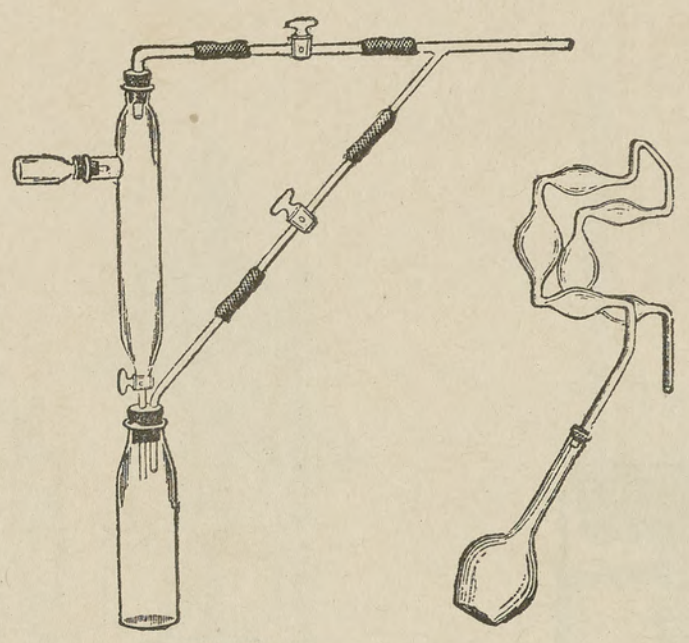

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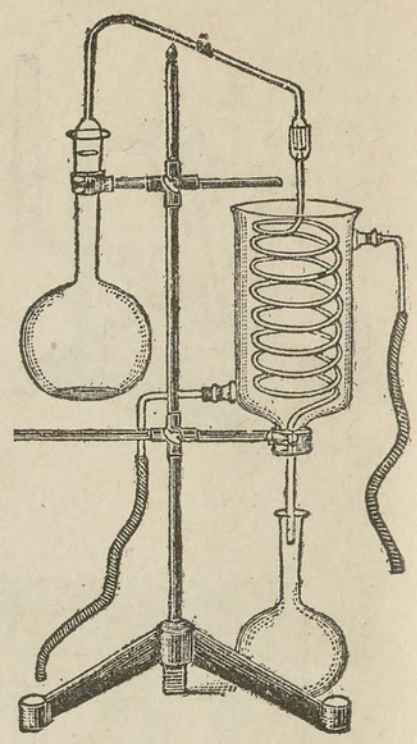
2048a



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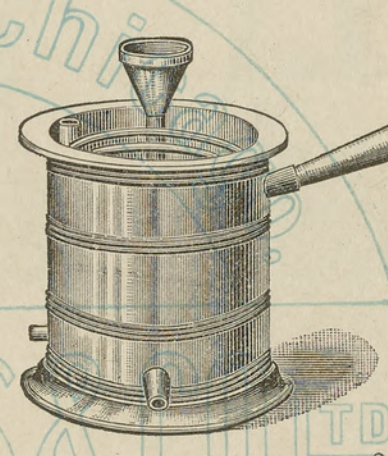

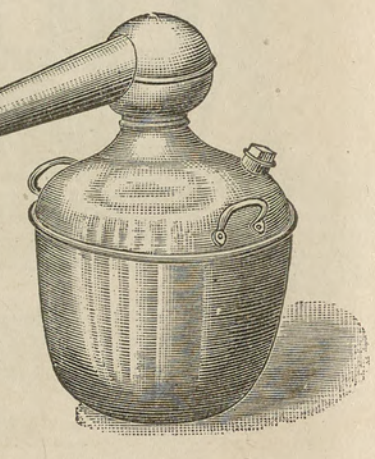

2049

9. APPARATUS FOR DISTILLATION.

No.

2046. **James' Automatic Water Still.** To those using distilled water, James' Automatic Water Still will be found both convenient and economical ; being self-regulating, does not require attention when in use and it also has the advantage of being easily cleaned. The retort has a well fitted cap which can be removed to admit the hand. The water supply pipe to the Retort is provided with a screw cap at the elbow, which allows both tubes to be cleaned. The inner tube of the Condenser can be taken out by unscrewing same, making all parts of the apparatus accessible. The retort and Condenser revolve on the iron support and any scale or deposit may be removed without unfastening the clamp. It is well made of heavy copper, tin-lined throughout. To operate the still connect the stopcock to the water supply by means of rubber tubing. Attach sufficient rubber tubing to the overflow, (upper bent) pipe to conduct the cooling water to a sink or waste pipe. Turn on the water so that it flows out at the overflow tube, sufficient to keep the condenser cool. Gas connection to Bunsen's Burner can be made with rubber tubing. The still is so arranged that the water in the retort is maintained at a constant level, and being small in quantity, is quickly heated to boiling ; the steam is condensed and delivered from the distilled water outlet (lower bent) tube. Quantity produced exceeds one-half gallon per hour. We would be pleased to have those interested call and examine the apparatus in operation..... **$20.00**

2047. **Muencke's Distilling Apparatus,** entirely of glass, with ground joints, capacity of flask 500 cc. complete. **11.00**

(Post 1890, II. 333.)

2048. **Thorne's Apparatus,** for distillation in Vacuo..... **5.00**

(Beilstein Org. Ch., P. 55.)

2048a. **Thorne's Distilling and Drying Apparatus**..... **2.50**

2049t. **Apparatus for distilling water or spirits,** a tin-lined copper retort, with zinc cooler, heavy tin worm, a receiving funnel for cold water, and an outlet for the hot water. All stills being tubulated, of superior make and arranged to be set into a water bath.

Capacity	½	1	2	3	5 gal.
Each	$8.00	10.00	12.50	15.00	18.00

See also Part I. Retorts, Distilling Flasks and Tubes.
Part II. Apparatus for Wine Analysis.

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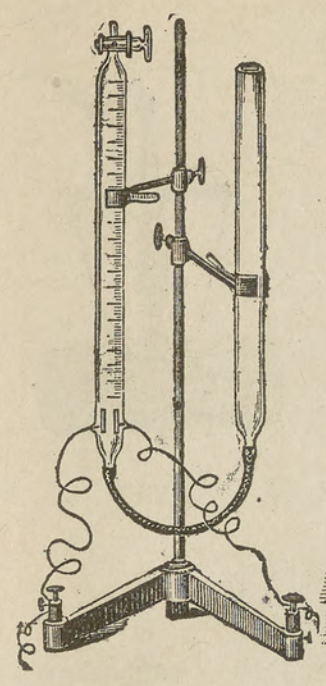

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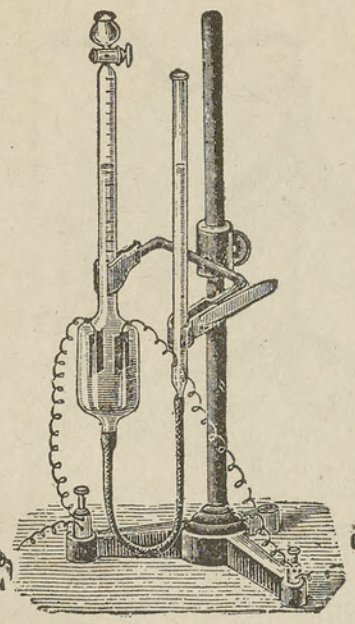

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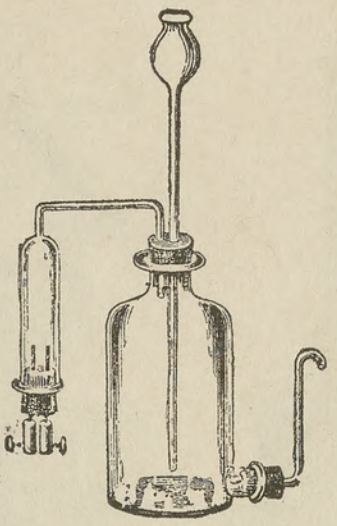

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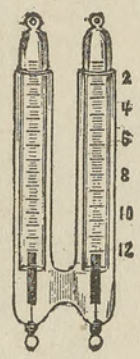

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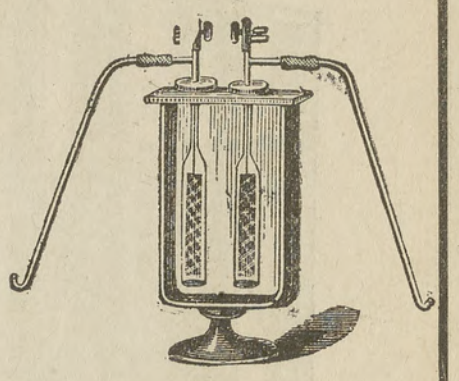

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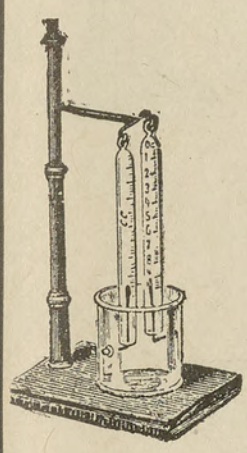

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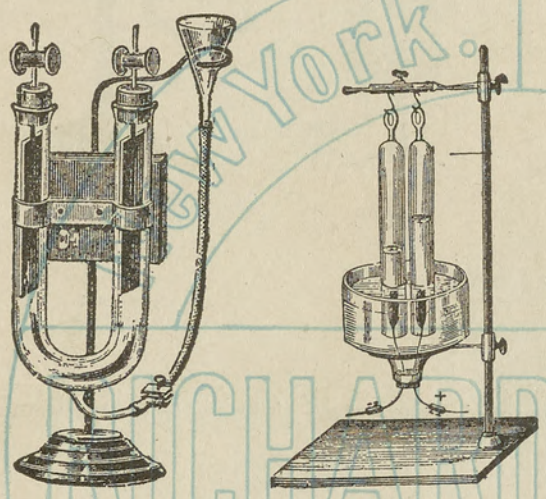

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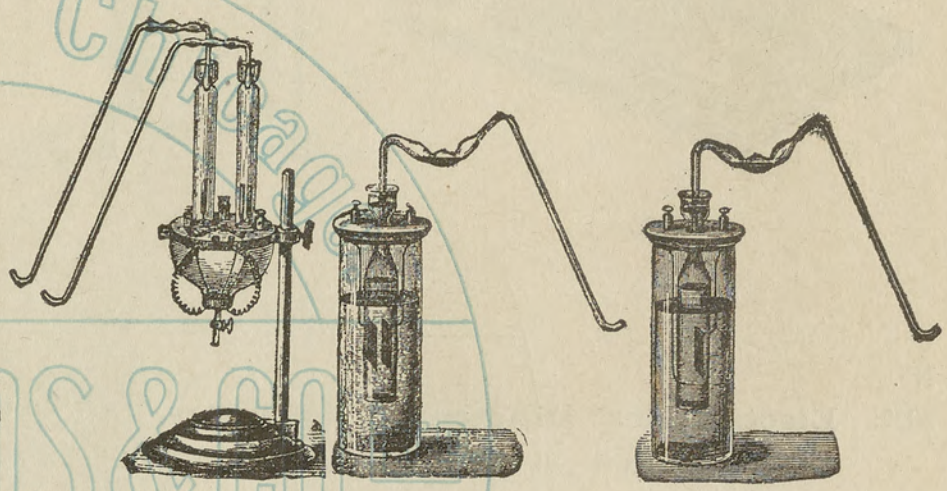

2059 2060

2061

10. ELECTRICAL AND ELECTROLYTICAL APPARATUS.

No.		
2050.	**Voltmeter,** measuring tube 50 cc. in $\frac{1}{2}$ °, with support, as per illustration	$9.00
2051.	**Neumann's Voltmeter for quantitative analysis,** complete (Berichte Deutsch. Ges. 1881, P. 359.)	10.50
2052.	**Mohr's Voltmeter,** with measuring cylinder, rubber stopper, carbon electrodes and clamps (binding screws) complete	4.50
2053.	**Apparatus for electrolytic decomposition of water,** with grad. receiving bells	1.50
2054.	**Apparatus for electrolytic decomposition of water,** consisting of U tube with neck and glass stoppers and sealed tube for fixing to supports	2.00
2055.	**Ludwig's electrolytic decomposition of water,** for a separate collection of two gases	9.00
2056.	**Faraday's electrolytical apparatus,** consisting of receiving bells attached to support and cylinder with sealed in Platinum Electrodes	2.50
2057.	**Werner's electrolytic apparatus for oxy-hydrogen**	7.50
2058.	**Bertram's electrolytic apparatus,** tubes graduated up to 35 cc. $\frac{1}{5}$ °	10.50
2059.	**Ehrenberg's Apparatus,** for the generation of hydrogen, oxygen and oxy-hydrogen	8.00
2060.	**Apparatus for electrolytic generation, of pure hydrogen**	4.25
2061.	**Apparatus for electrolytic generation, of pure oxy-hydrogen**	4.25

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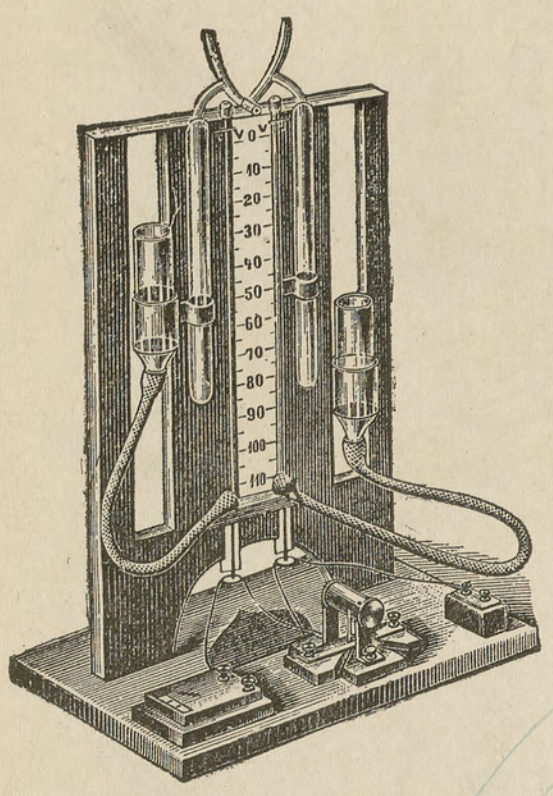

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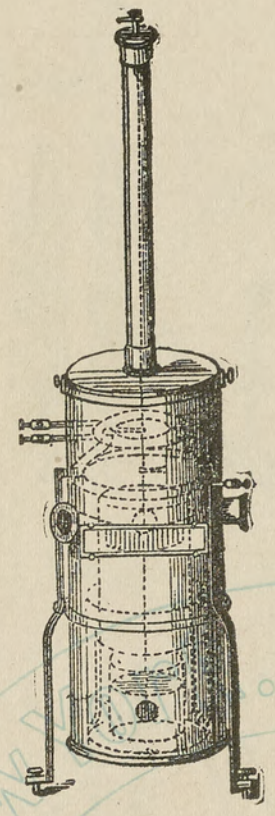

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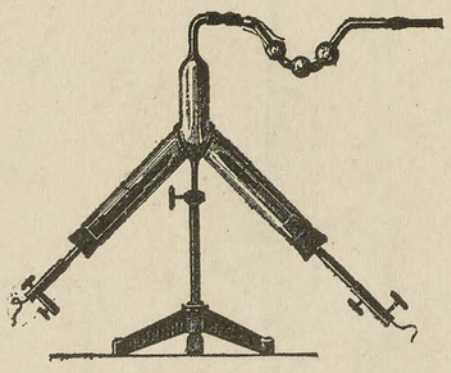

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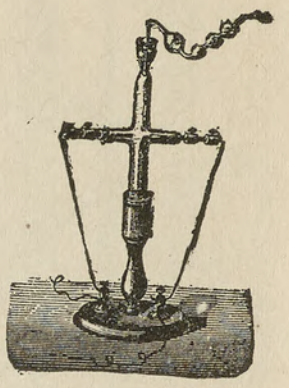

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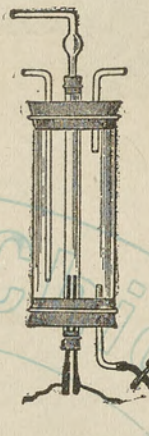

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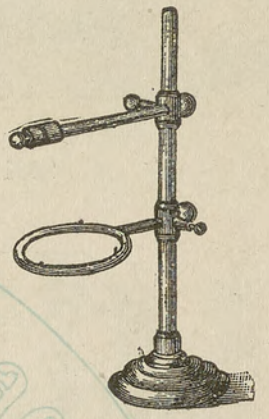

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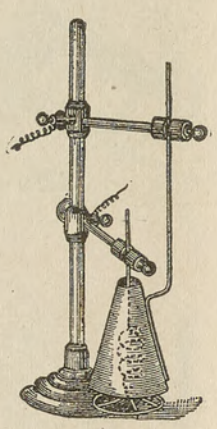

2069

No.

2062. **Electrolytical Differential Voltmeter,** for W. Siemens' Pyrometer, glass parts on wooden support, but without contact connections (Post S. 64 fig. 20) ..... $ 7.50

2063. **Thompson's Electrometer,** for objective demonstration, modified by Kirchhoff, improved by Quincke, nickel plated 90.00

2063a. Transparent scale for same 12.00

2064. **Hawlich's apparatus with carbon electrodes,** for the production of chlorine detonating mixture, with adjustable support 6.00

2065. **Roscoe-Schorlemmer's apparatus with carbon electrodes,** for the production of chlorine detonating mixture, with support 5.00

2066. **Rosenfeld's apparatus with carbon electrodes,** as per illustration, without support 3.00

2067. **Electrolytic apparatus for the estimation of copper,** (Fres. Zeits. 1872, IX.) Platinum Cone 80 mm. high, 60 mm. dia., with Platinum Spiral, weighing from 50 to 60 Grms .....per gramme. .60

2068n. Support with 2 clamps 4.00

2069. **Electrolytic apparatus** after **Classen,** (Quantitative analysis in electrolytical way by Dr. A. Classen 1886).

2069a. Platinum electrodes, according to weight .....per gramme .60

2069b. Platinum dish, dia. 90 mm., weight 35–40 gr..... " .60

2069c.n. Support with glass rod, ring and clamp..... 4.00

2069d.n. " " " " and with 2 clamps..... 4.00

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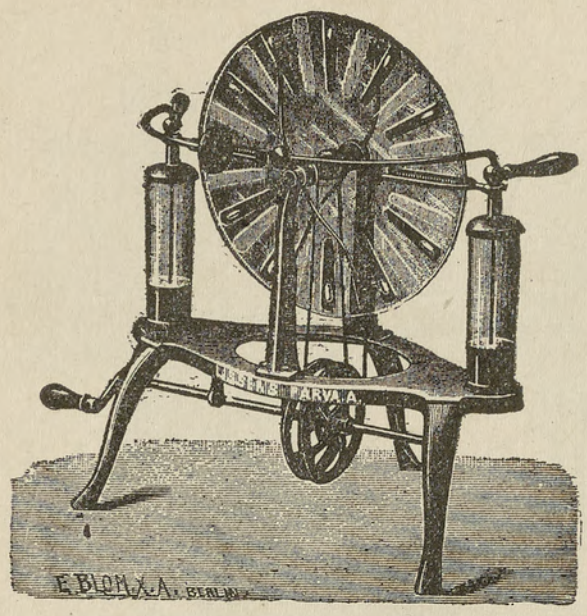

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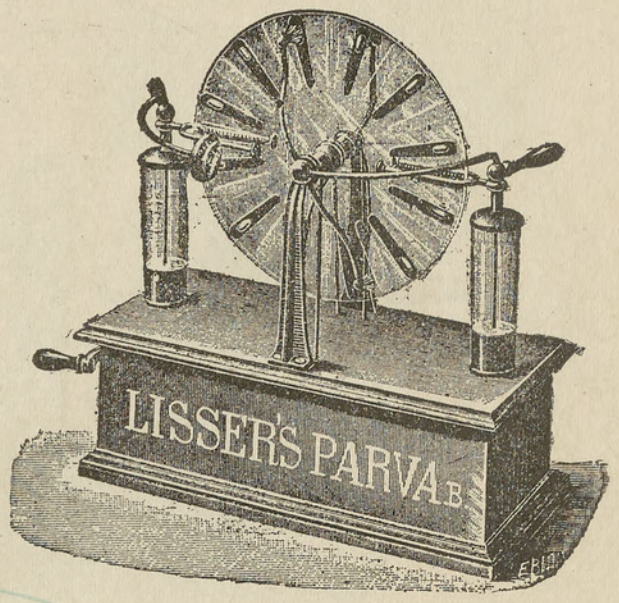

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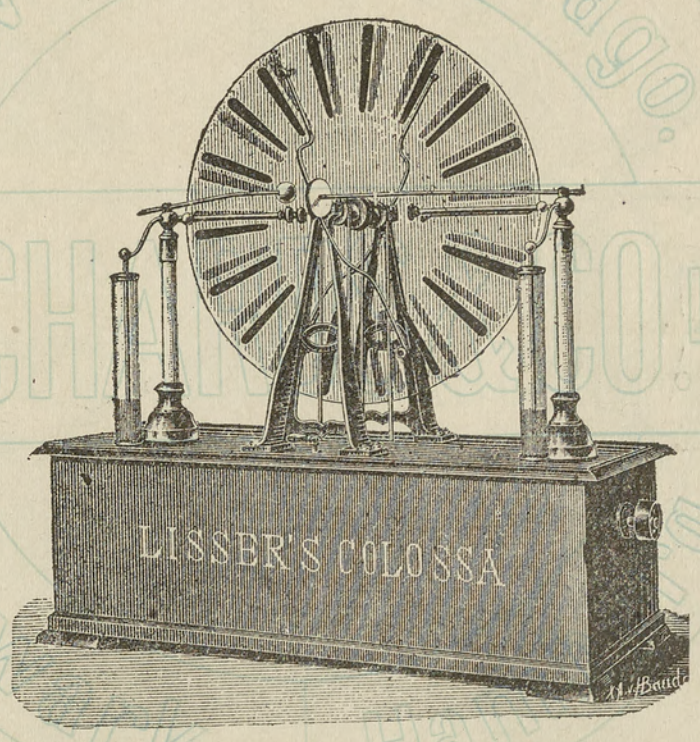

2072

No.

2070. **Lisser's Parva "A" Machine,** mounted on japanned iron base, with two revolving plates 10 in. dia..... **$18.00**

2071. **Lisser's Parva "B" Machine,** mounted on finely polished box, with two revolving plates " " **18.00**

2072. **Lisser's Colossa Machine,** after **Holtz,** mounted on finely polished box.

Dia. of plates	20	40 in.
With 2 revolving plates	$ 80.00	350.00
" 4 " "	150.00	
" 6 " "	200.00	
" 8 " "	300.00	
" 10 " "	325.00	

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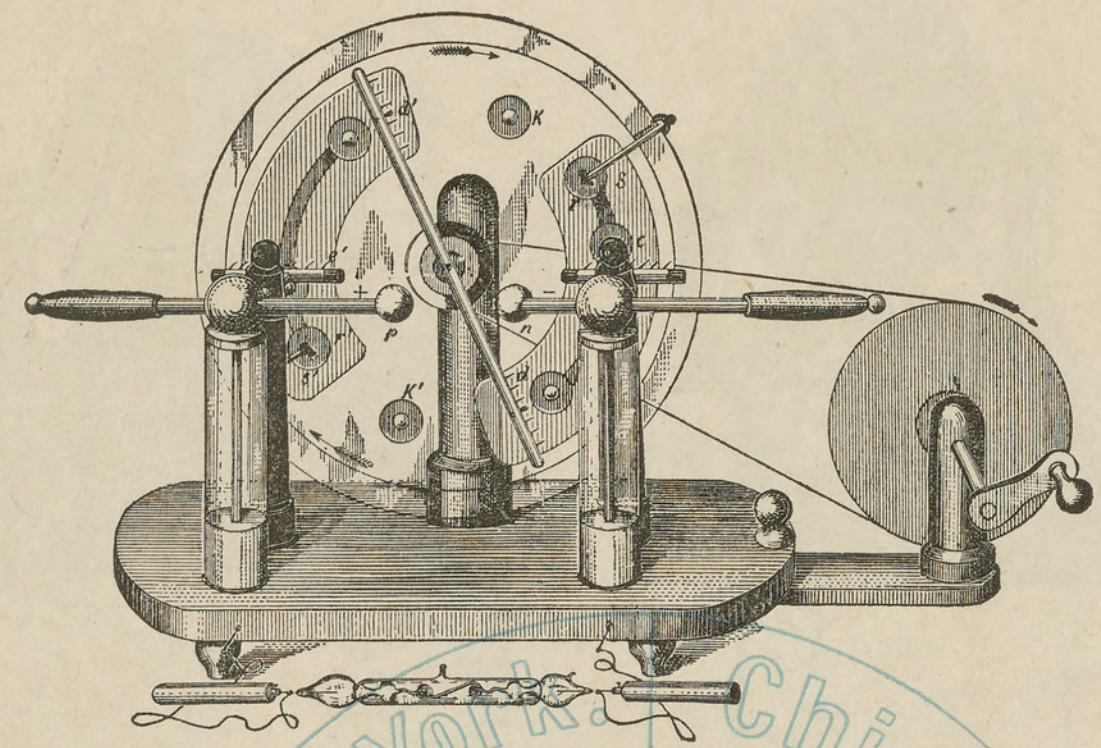

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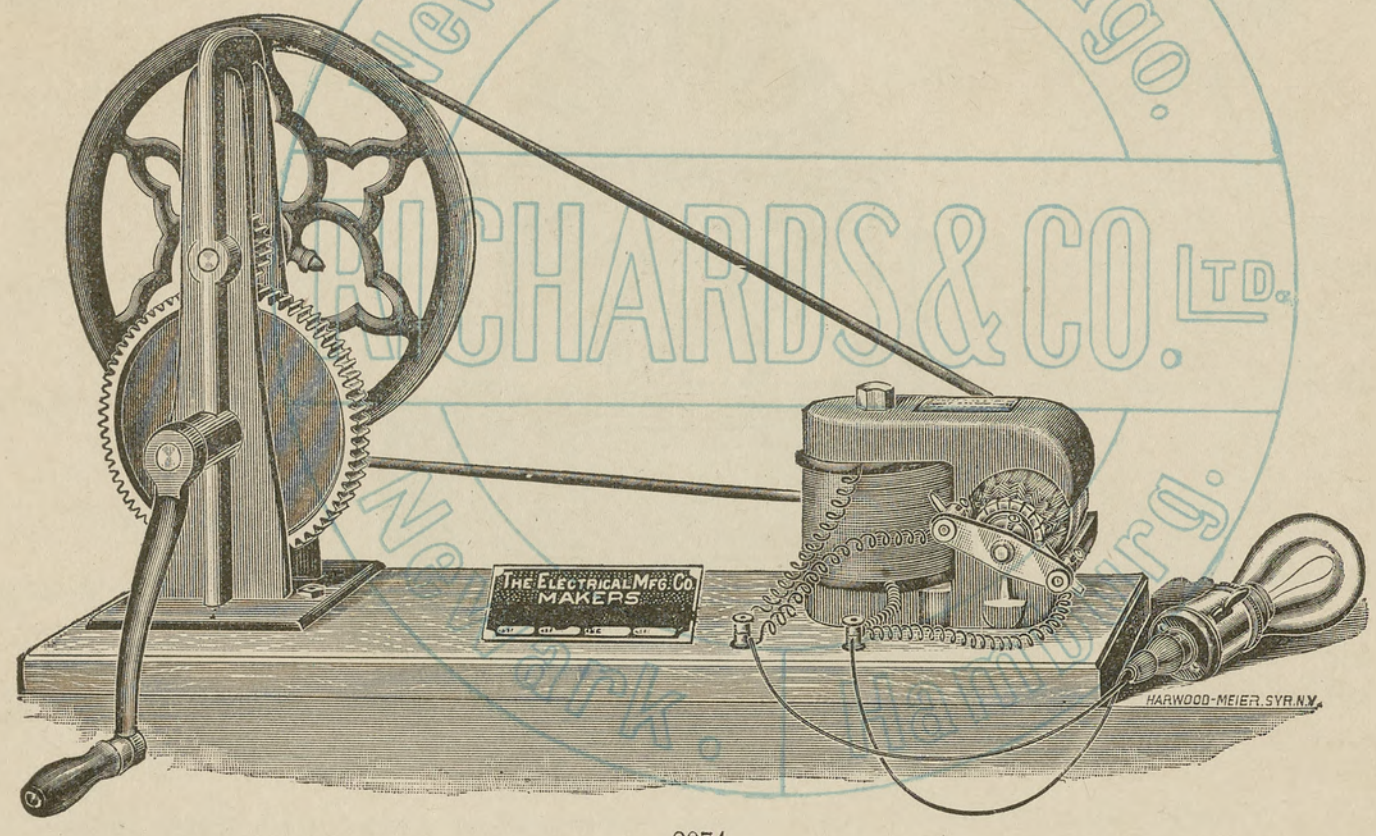

2074

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No.

2073. **Richards' School Machine,** after **Toepler,** with revolving plate, 12½ in. dia **$25.00**

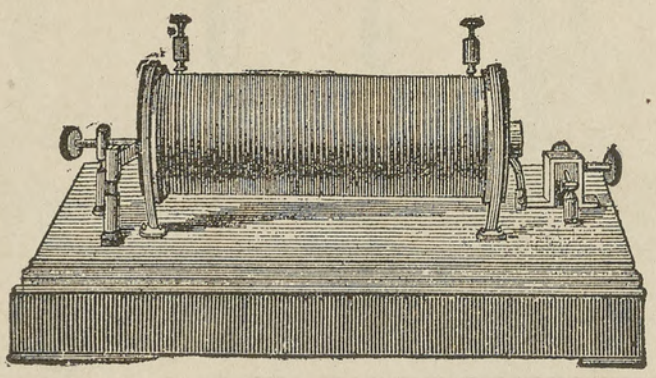
2074. **Improved Model Experimental Dynamo,** of any voltage from 5 to 25, for electroplating, etc.... **20.00**

2074a. Same, with hand power **25.00**

2075n. **Battery, Thermo-electric,** with gas regulator; an improvement on Clamond's system, containing 120 thermo-elements. This so-called Rheomotor, which may be kept in constant operation at a very small expense for gas (0.150 cub. meter per hour), is well adapted as a continual sourse of galvanic current. (See cut page 183.)

a, for electro-metallurgical decomposition; *b*, for electro-gilding, electro-silvering and for galvano-plastic, and *c*, for use in the physical laboratory and on the lecture table **90.00**

2075an. Same with 150 thermo-elements **100.00**



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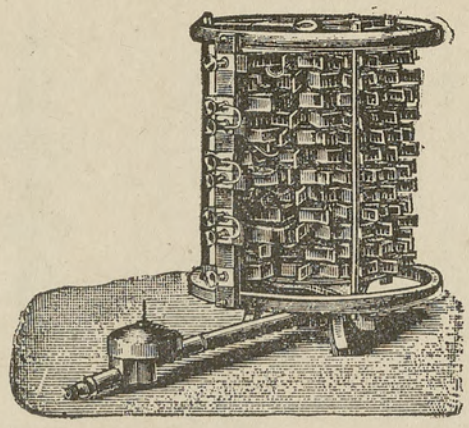

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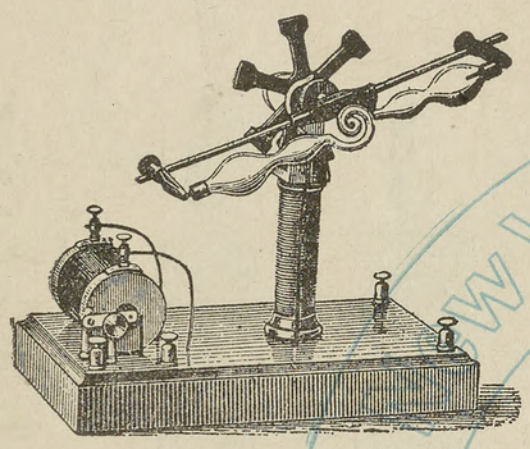

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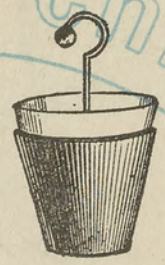
2077



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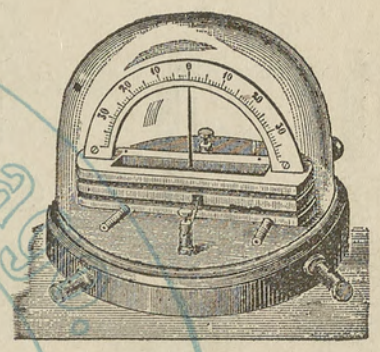

2082

No.

2076t. **Induction** or **Rhumkorff's Coils,** on polished mahogany case.

Length of spark	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{5}{8}$	2	3	4	6 in.
Each	$4.00	7.00	10.00	21.00	32.00	38.00	40.00	60.00	85.00	100.00

NOTE.—Larger sizes imported to order.

2077. **Leyden Jars.**

Size	$\frac{1}{2}$	1 pt.	qt.	$\frac{1}{2}$	1 gal.
Each	$1.00	1.25	1.50	2.00	2.50

2077a. **Leyden Jar,** with movable coating $2.50

2078. **Discharger,** plain 2.00

2078a. —— jointed 3.25

2079. **Handles and wires** for shocking 1.50

2080. **Ammeters.**

Range, 0 to 2, 0 to 5, 0 to 10, 0 to 15, 0 to 25, 0 to 50 amperes ..... each 30.00

" 0 to 50, with shunt increasing reading to 100 " 40.00

" 0 to 50, " " " " " 150 " 45.00

" 0 to 50, " " " " " 200 " 50.00

2081. **Voltmeters.**

Range, 0 to 100, 0 to 120 volts ..... each 40.00

" 0 to 100, with resistance increasing reading to 200 volts 55.00

" 0 to 100, " " " " " 300 " 57.50

" 0 to 100, " " " " " 400 " 60.00

2082. **Galvanometer, vertical detector** 10.00

2082a. —— **Differential.** On mahogany leveling stand, with glass cover, needles suspended by fibre of unspun silk 25.00

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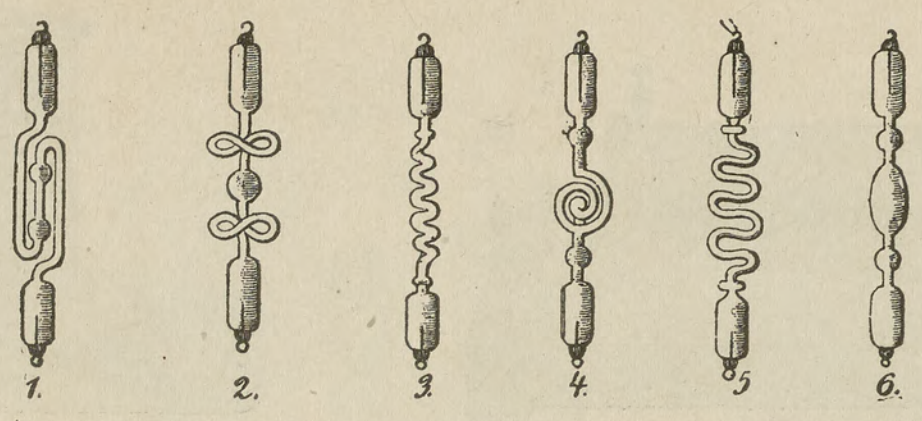

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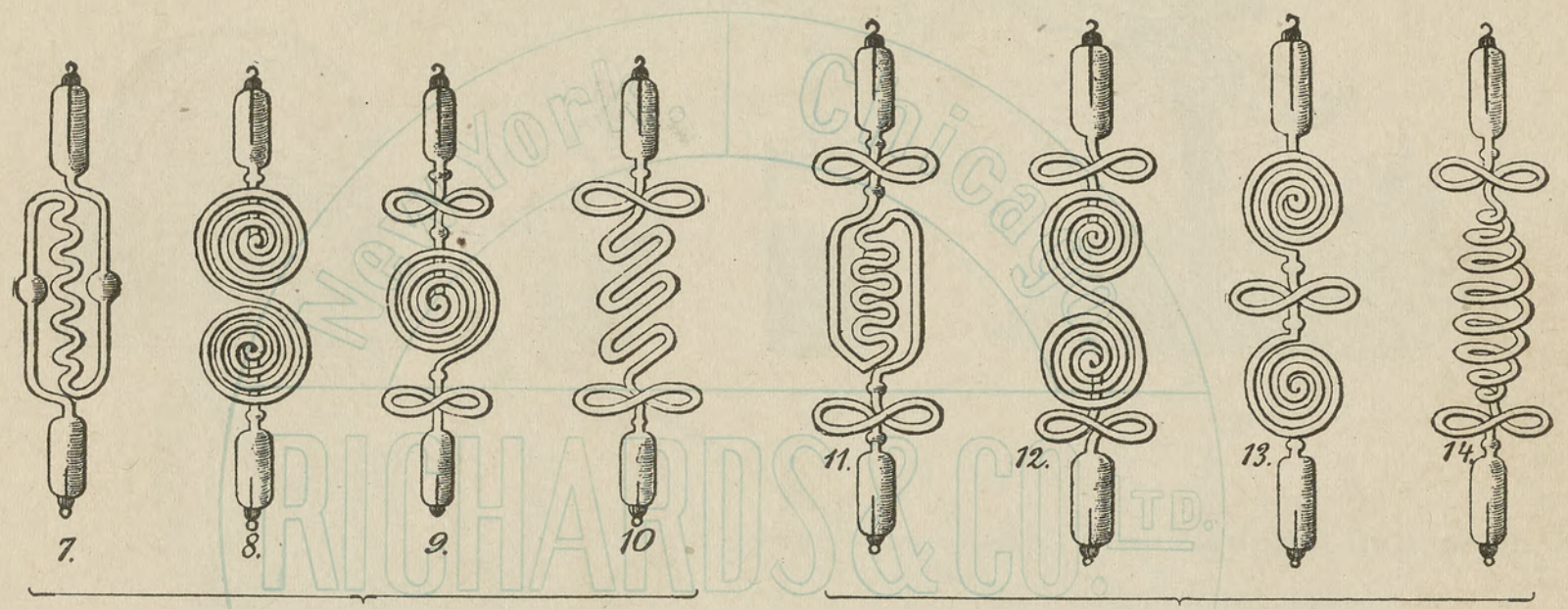

2084b. 2084c.

No.

2083. **Geissler Vacuum Tube Rotator.**

By causing the tubes to rotate with different degrees of velocity, and altering the frequency of the discharge of the current, various optical phenomena are brought out, and a magnificent display is produced. (See cut page 183.)

2083a. For 6 to 9 in. tubes $13.50

2083b. For 7 to 12 in. tubes 35.00

2084. **Geissler Tubes.**

Size	Sml.	Med.	Lge.
Length	6½	8	10 in.
Each	.80	$1.50	2.00

2084a. set of 6, small size ..... per set 4.50

2084b. " 4, medium size ..... " 5.50

2084c. " 4, large size ..... " 7.50

2085. No. 16 ; 16 in., on wooden foot (cut, page 185) ..... each 5.00

2086. " 17 ; 16 " " (" " ") ..... " 7.50

2087. " 19 ; 10 " " (" " ") ..... " 3.50

2088. " 20 ; 20 " " (" " ") ..... " 3.50

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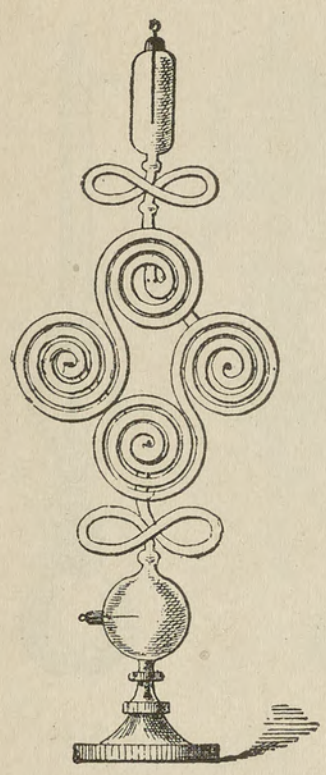

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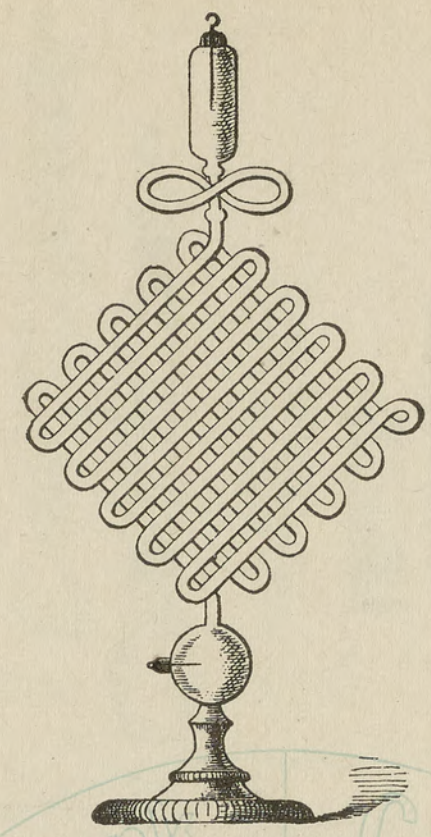

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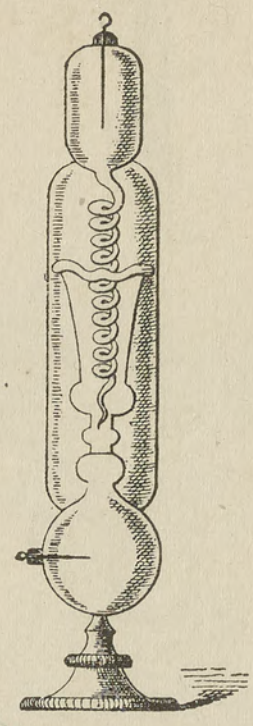

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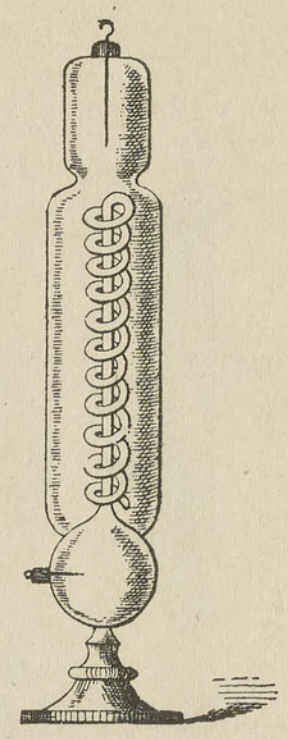

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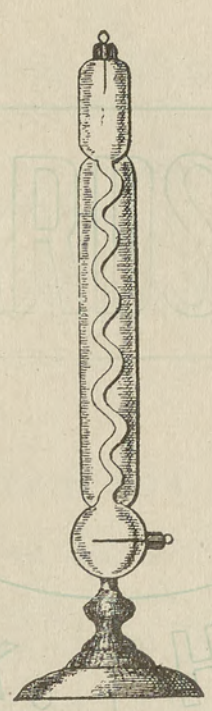
2089



2089d



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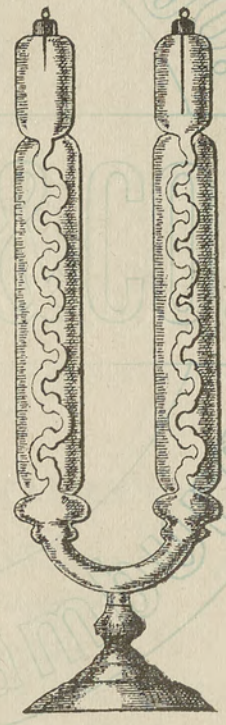


2089g



2090

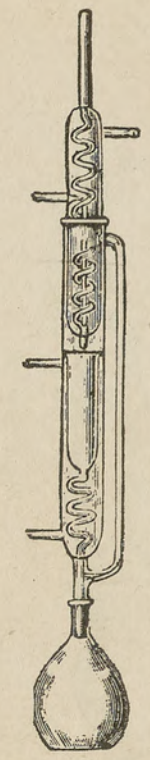
No.

2089. **Fluorescent Tubes.**

2089a.	No. 25 ; 6 in.	$2.00
2089b.	" 25 ; 8 "	2.50
2089c.	" 25 ; 10 "	2.75
2089d.	" 27 ; 16 "	5.00
2089e.	" 36 ; 12 "	3.00
2089f.	' 37 ; 14 " on wooden foot	3.50
2089g.	" 38 ; 14 " "	7.50
2090.	**Phosphorescent Tubes,** No. 45, 10 in.	2.00



2102



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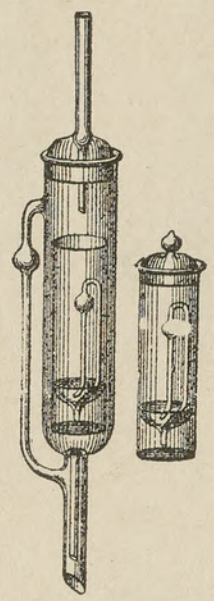

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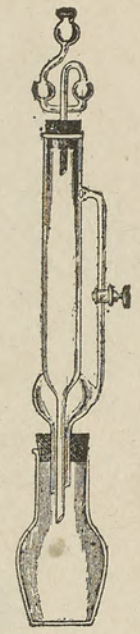

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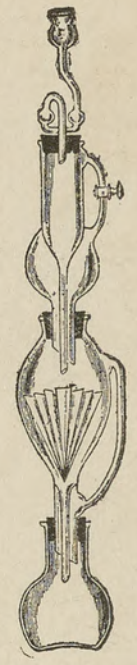

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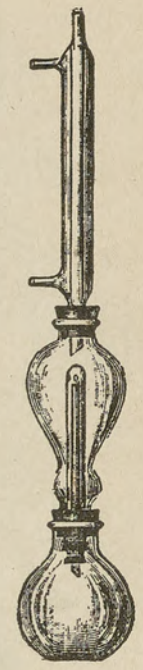

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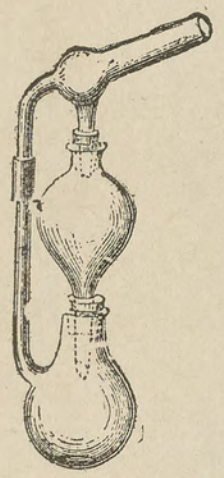

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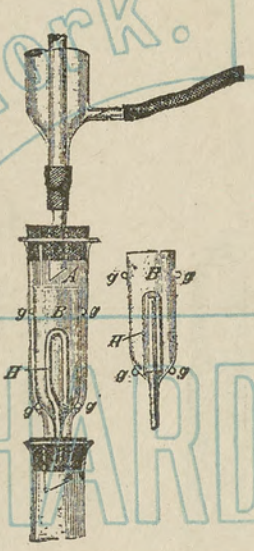

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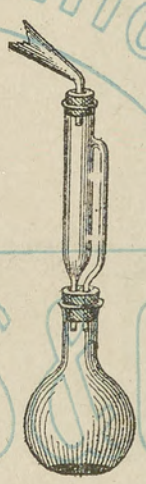

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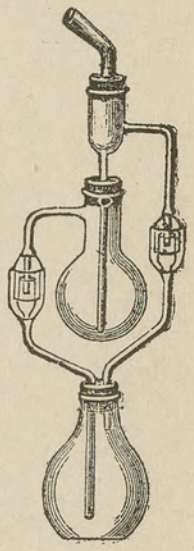


2112

12. APPARATUS FOR EXTRACTIONS.

No.

2100. **Apparatus, Drechsel's,** fitted with corks. (Fres. Zeits. 1884, P. 57.)

	Capacity 4	16 oz.
Each	$1.00	1.50

2101. —— **Drechsel's,** with mercury seal.

	Capacity 4	16 oz.
Each	$1.25	2.90

2102. —— **Flueckiger's,** (Chem. Report 1889, No. 28.) ..... $ 2.00

2103. —— **Foerster's,** all parts ground to fit. (Fres. Zeits. 1888, P. 31 and 174.) 3.50

2104. —— **Fruehling's,** (Zeits. f. angew. Ch. 1889, Vol. IX.) 4.00

2105. —— **Gawalowsky-Wagner's,** for tannin, feed stuffs, oil cakes, etc. (Fres. Zeits. 1883, P. 528.) 3.50

2106. —— **Gawalowsky-Wagner-Drechsel's,** for substances giving a cloudy extract; without filter, . 4.00
(Fres. Zeits. 1883, P. 529.)

2107. —— **Gerber's** 3.00

2108. —— **Knoefler's.** (Fres. 1889, P. 671 and Jl. Anal. Chem. 1890, P. 314) 3.50

2109. —— **Kuehne's,** complete.

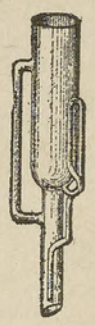
	Capacity 4	16 oz,
Each	$1.50	2.00

2110. —— **Regnault's,** (Dorvault 80, P. 128.) 1.75

2111. —— **Rempel's,** complete 3.00

2112. —— **Schwarz',** (Fres. Zeits. 1884, P. 369.) Capacity 8 oz. 2.75

New York. Chicago. RICHARDS & CO. LTD. Newburgh. Hamburg.



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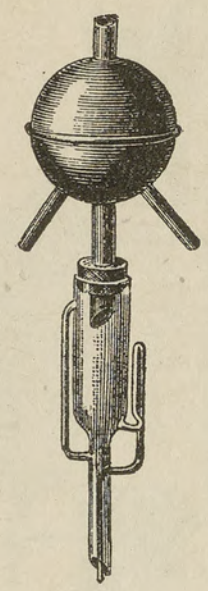

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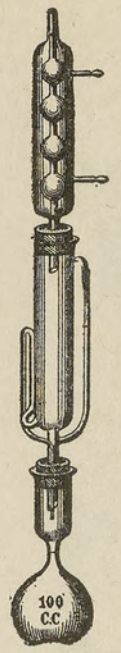

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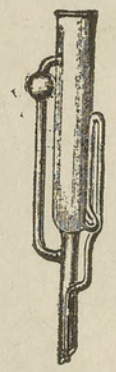

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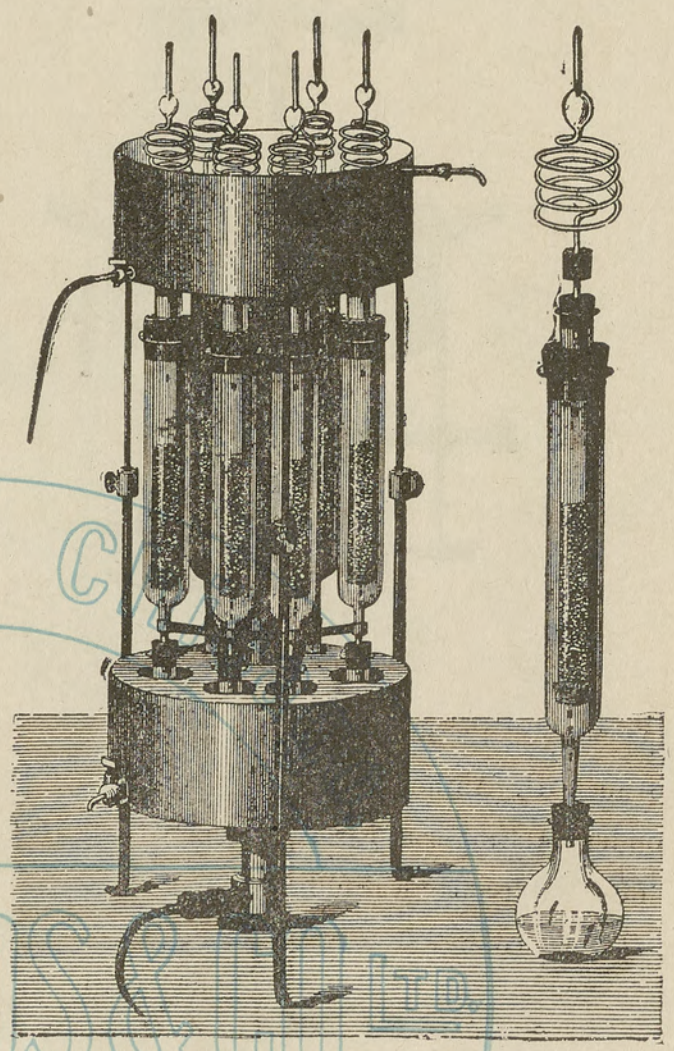

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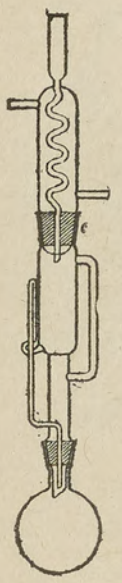

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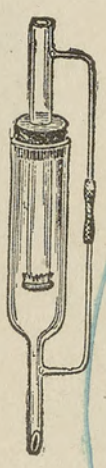

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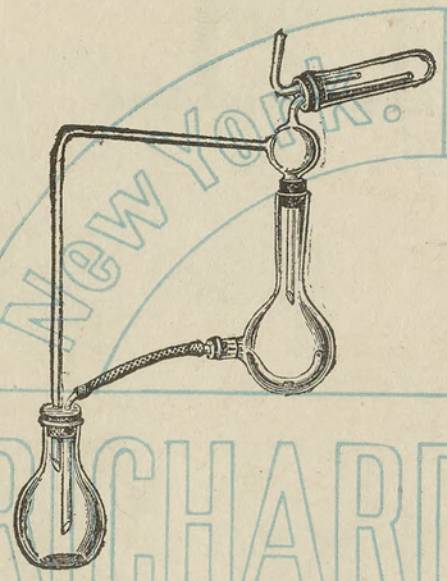


2119

2122

No.

2113. **Apparatus for Extractions, Soxhlet's.**

Capacity	2	4	6 oz.
Each	$1.20	1.50	2.00

2113a. —" " witt ball condenser and rubber connections.

Capacity	2	4	6 oz.
Each	$4.00	5.00	6.00

2114. —" " complete with flask and condenser.

Capacity	2	4	6 oz.
Each	$2.60	3.00	4.00

2115. —" " with bulb in side tube.

Capacity	2	4	6 oz.
Each	$1.40	1.75	2.25

2116. — **Soxhlet-Szombathi's.** (Chem. Centralblatt 1889, P. 209, and Jl. Anal. Chem. 1889, P. 172.) $6.00

2117. — **Thorn's.** (Fres. Zeits. 1882, P. 98.)

Capacity	Sml.	Lge.
Each	$2.00	2.50

2118. — **Tollen's.** (Zeits. f. Anal. Chem. 14, P. 82.) 1.50

2119. — **Weiss',** for tannin. (Fres. Zeits. 1889, P. 114.) 4.00

2120. — **Mohr's** Extraction Apparatus,

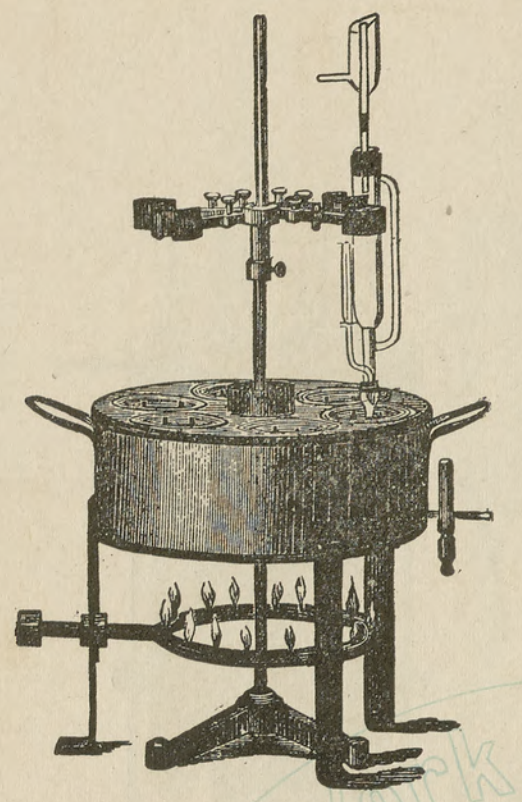
Size	Sml.	Med.	Lge.
Each	.75	$1.00	1.50

2121. —" " Apparatus with condenser and flask.

Size	Sml.	Med.	Lge.
Each	$1.50	2.00	3.00

2122. —" " Extraction Apparatus: 6 pieces in a frame, with water bath of copper 45.00

New York. Hamburg. RICHARDS & CO. Ltd.



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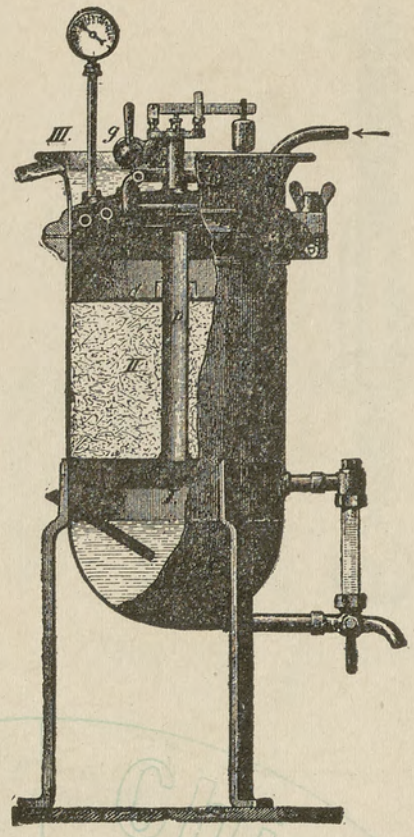

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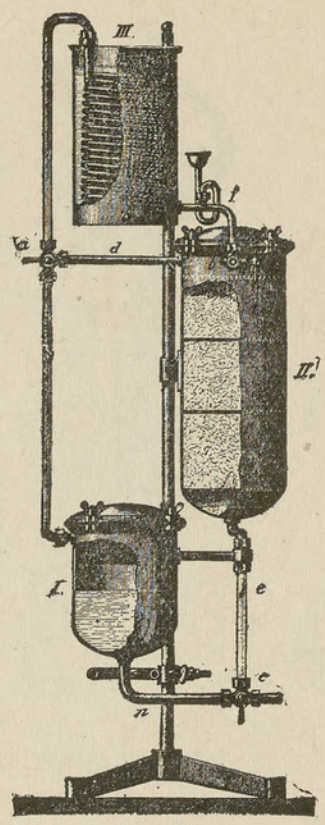

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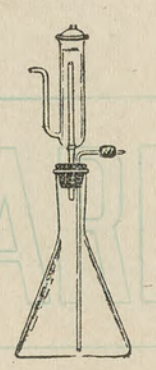

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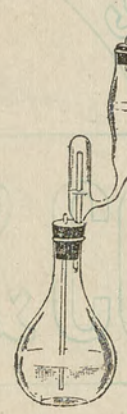


2127

No.

2123n. **Waterbath after Muencke, for Extraction Apparatus;** made of copper, with constant water-level and six set of rings..... $15.00

2123a.n. A six-arm holder and adjustable burner for above..... 15.00

2124. **Extraction Apparatus,** for a continuous cold and warm extraction with water, alcohol, ether, benzine, etc.; under pressure for steam, or gas if desired.

Capacity of liquid contents	5	10	20 liter.
Each	$160.00	240.00	350.00

2125. —— as No. 2124, but with separate cylinders for warm and cold extraction.

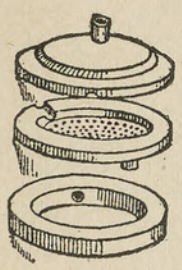
Capacity	5	10	20 liter.
Each	$240.00	350.00	500.00

13. APPARATUS FOR FERMENTATION.

2126. **Bauer's Apparatus** for yeast fermentation, complete with rubber stoppers. (Fres. Zeits. 1888, P. II.)... 1.50

2127. —— for grape sugar; fitted with rubber stoppers. (Post P. 673.)..... 1.50

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



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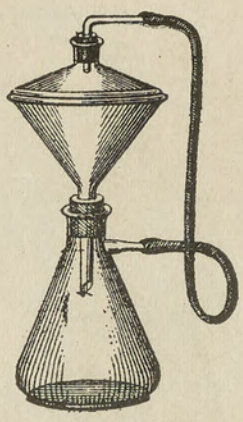

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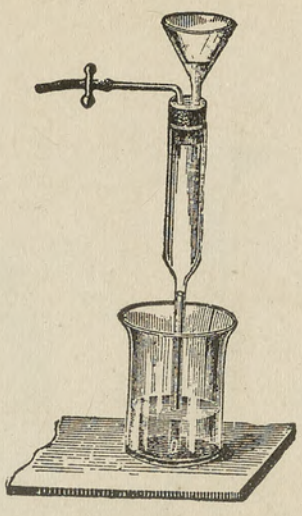

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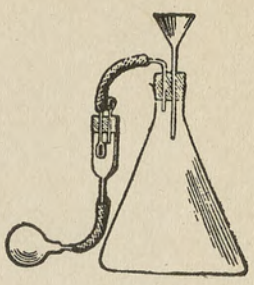

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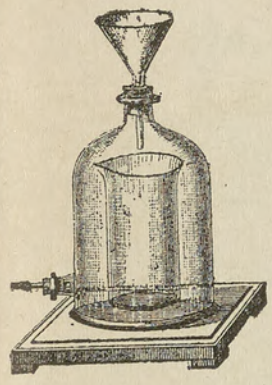

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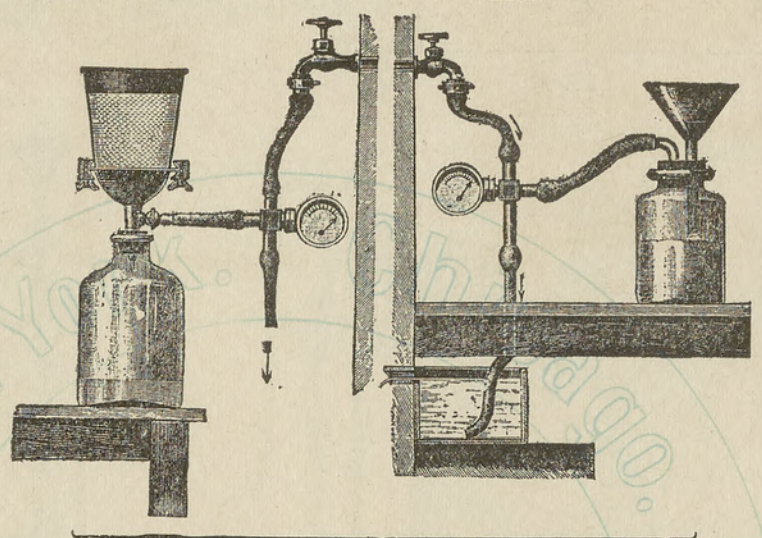

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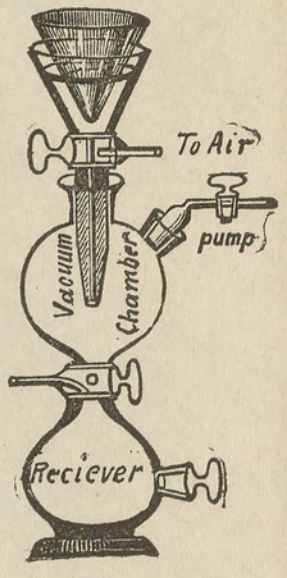


2136

14. FILTERING APPARATUS.

No.

2128. **Filtering arrangement, of Royal Berlin Porcelain,** for use with filter pump, inverse filtration, etc.

Dia.	4	8 in.
Each	$2.00	5.00

2129. **Funnel and curved tube,** for quick filtration.

Dia. of funnel	2	2½	3	3½ in.
Each	.50	.60	.70	.80

2130n. **Filter flask with covered funnel** and connecting tube to filter in uniform gas.

Capacity	16	32 oz.
Each	$1.00	1.50

2131. **Weil's filtering apparatus** ..... $ 1.25

2132. **Fischer's quick filtering apparatus,** filter flask, funnel, platinum cone and rubber bulb, complete 3.00

2133. **Apparatus for filtering in beakers,** by means of water air pump, consisting of aspirator, size 10x6½ in. ground glass plate, funnel and rubber stoppers 4.50

2134. **Filtering apparatus for Oils and Syrups** for use with filter pump.

Capacity of receiver	qt.	½	¾	1	2 gal.
Dia. of funnel	7½	8½	9½	10	11 in.
Each	$2.50	2.75	3.00	3.50	4.50

2135. **Filtering apparatus for water air pump,** of copper, tin lined, filter consists of 2 parts with sieve bottom ; the filtering mass is placed between two plates, using paper, felt, linen, etc., for same.

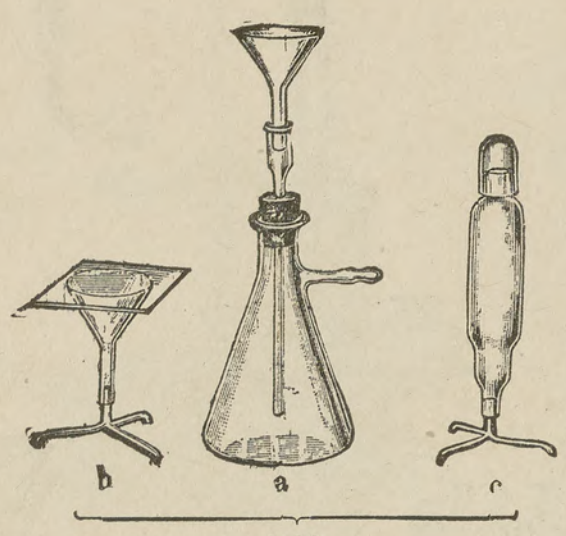
Capacity of filter	2	6	10 liters
Each	$16.00	20.00	30.00

2135a. **Water air pump extra** 12.00

2136. **Geisler's apparatus for constant filtering under pressure** with vacuo chamber ; the filter cone of clay resting on a rubber ring with three way stopcocks.

Size	Sml.	Lge.
Each	$32.00	36.00

New York. Chicago. RICHARDS & CO. LTD. Hamburg.



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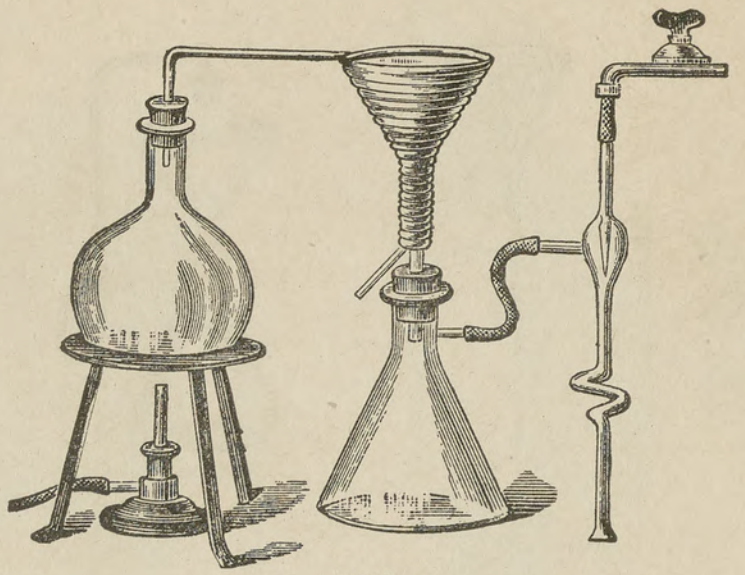

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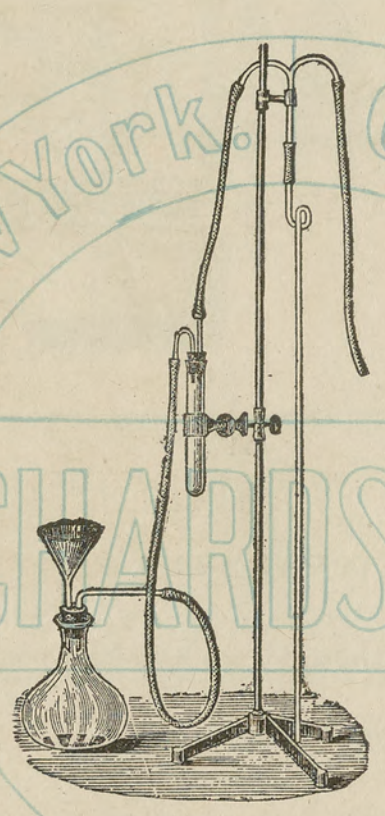

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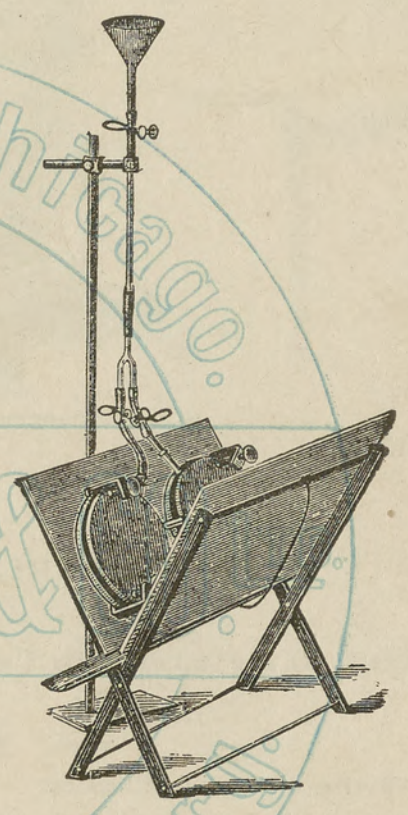


2140

No.

2137. **De Koninck's filtering apparatus** with support, length 1 meter..... **$7.50**

2138. **De Koninck's filtering set** for weighing on tared filters consisting of flask fitted with rubber stopper and tube, funnel 2 in dia., glass plate, glass tripod and cylindrical tubes..... **5.00**

(See Fres. Zeits. 1888. P. 689.)

2139. **Hot filtering apparatus** consisting of hot water funnel 1 lit. flask. Erlenmeyer's flask with side neck, filtering pump and rubber fittings..... **11.00**

2140. **Filter Press, Hempel's,** with two porcelain plates, and two round rubber plates, complete..... **35.00**

(See Berichte d. Deutsch Chem. Ges. XVIII. 93.)

2141t. **Filter Press, Wegelin-Huebner's, with air pump and monte-jus.** This apparatus is used for filtering extracts, essences, alcoholic solutions, as well as liquids in general; besides for separating precipitates from the fluids, in which they are contained to obtain the former in a nearly dry state, while the liquids are gained completely clear filtered. The apparatus is furnished besides with a contrivance for completely edulcorating the obtained nearly dry precipitates. The filter press is supplied with 3 frames of 10, 20 resp. 30 mm. in thickness, which form the thickness of the respective cakes, but one of the frames is placed in the filter press at a time. We supply the apparatus ready for use, incl. filter cloths and the necessary wrenches. (See cut, page 191.)

Class Fa. Filter presses with 400 □ ctm. filtering surface and monte-jus with 16 liters capacity.

2141a.t. Filter press of iron with monte-jus and air pump of iron..... **180.00**

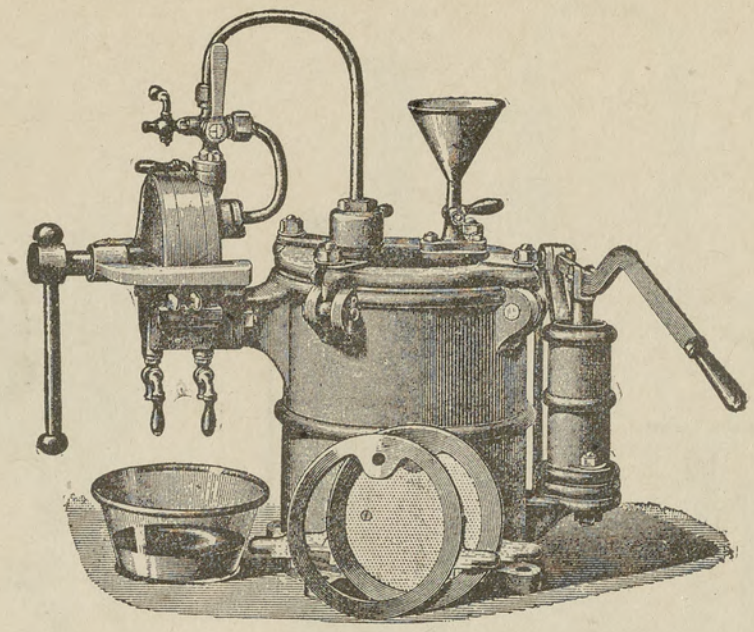
2141b.t. Filter press of bronze with monte-jus and air pump of iron..... **210.00**

Class Fa 1. Filter presses with 800 □ ctm. filtering surface and monte-jus with 16 liters capacity.

2141c.t. Filter press of iron with monte-jus and air pump of iron..... **210.00**

2141d.t. Filter press of bronze with monte-jus and air pump of iron..... **255.00**

New York. Chicago. RICHARDS & CO. Newark, England



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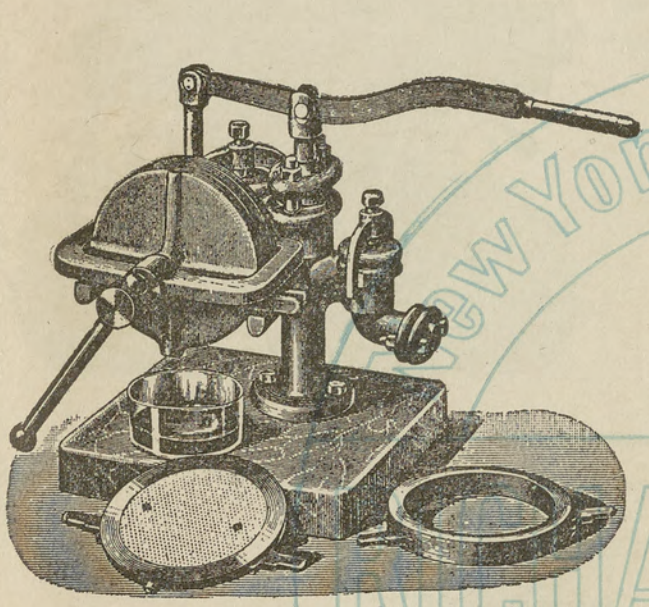

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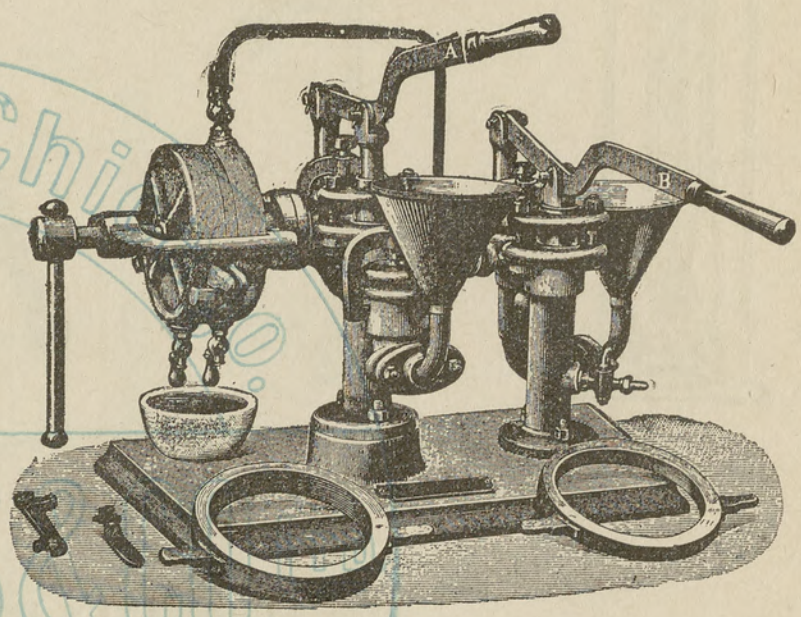


2143

No.

2142t **Experimental Filter Press, Wegelin-Huebner's.** These presses consist of a feed-pump to which the press is fastened by screw. The whole is mounted on a solid iron base. Each press is provided with 3 cells of 10, 20 and 40 mm. breadth, filter-clothes and screw-keys are joined. Extracting arrangement added to each pump.

Class Fb. Experimental filter presses with 400 □ ctm. filtering surface.

2142a.t.	Press and feed pump of iron without edulcorating pump	$ 60.00
2142b.t.	Press and feed pump of bronze without edulcorating pump	90.00

Class Fb. 1. Experimental filter presses with 800 □ ctm. filtering surface.

2142c.t.	Press and feed pump of iron without edulcorating pump	90.00
2142d.t.	Press and feed pump of bronze without edulcorating pump	135.00

2143t. **Experimental filter press, Wegelin-Huebner's, with 2 pumps,** one of which with lever A is destined for pumping the substance to be filterated into the filter press and the other with lever B for pumping in the edulcorating liquid. The filter press is supplied with 3 frames of 10, 20 resp. 30 mm. thickness, which form the respective thickness of the cakes, one of which is placed in the filter press only. The press is provided with an edulcorating contrivance to be able to edulcorate resp. to wash the press-cakes formed in the filter chambers. Our experimental filter presses are furnished with edulcorating pump (as above illustration) or also without it. We forward these presses ready for use incl. filter cloths and the necessary wrenches.

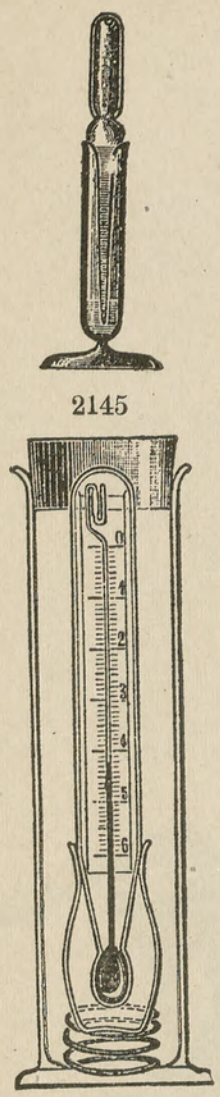
Class Fc. Experimental filter presses with 400 □ ctm. filtering surface.

2143a.t.	Press and feed pump of iron with edulcorating pump of iron	90.00
2143b.t.	Press and feed pump of bronze with edulcorating pump of iron	120.00

Class Fc. 1. Experimental filter presses with 800 □ ctm. filtering surface.

2143c.t.	Press and feed pump of iron with edulcorating pump of iron	120.00
2143d.t.	Press and feed pump of bronze with edulcorating pump of iron	165.00

NOTE.—The above small filter press should not be wanting in any laboratory, because on account of its simple construction and manipulation it proffers very convenient means of assaying the filtrating aptitude of the most different substances resp. their liability of forming solid press-cakes in the interior of the press.



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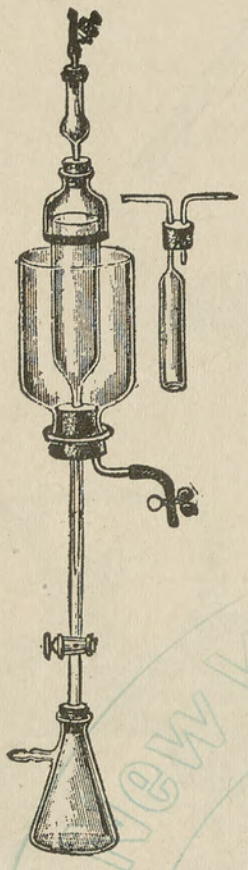
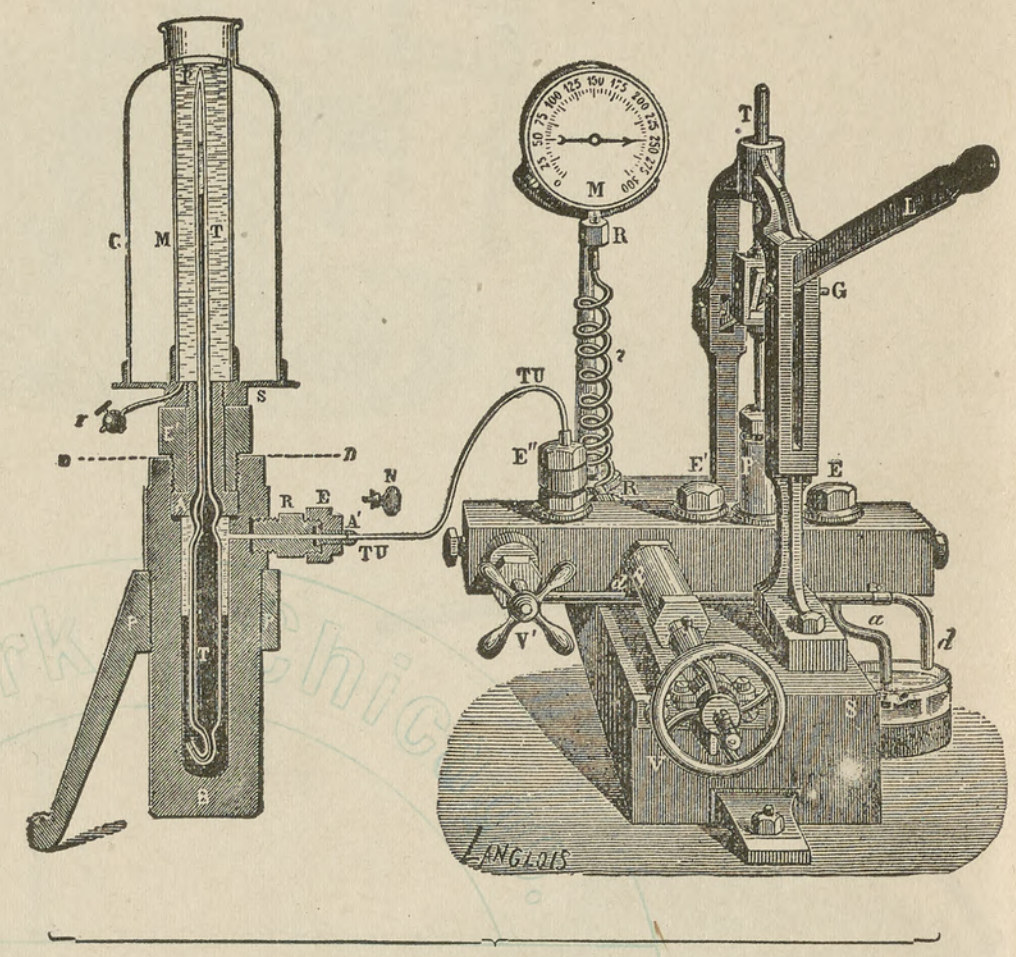




2144 2146 2147

15. APPARATUS FOR FREEZING PURPOSES.

2144. **Eykmann's Apparatus,** for determining the degradation of freezing points..... **$12.00**

(Zeits. f. Physic. Chemie, II., 12, 1888.)

2145a. Test tube with ground in pipette for same..... **1.00**

2146. **Bruehl's Freezing Apparatus,** used for forming crystals in a low temperature and also to saturate liquids with gases for the purpose of separating the crystals from their solutions..... **10.00**

(See Berichte d. Deutsch. Chem., 1889 P. 237.)

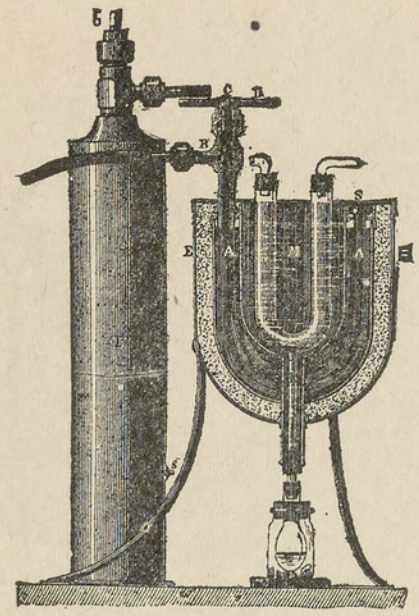
2147. **Cailletet's Apparatus,** for demonstration of the liquefaction of gases, by which can be obtained in a liquid state all gases so far regarded as permanent. It will also easily show the critical point of liquefaction as observed first by Mr. Andrews.

This apparatus reveals with the naked eye all the phases of the liquefaction of the gas. The pressure pump will easily give 300 atmosphere's pressure, being tested for 400 atmospheres..... **375.00**

2148. **Vincent's Frigoriferator,** for obtaining liquified gases and solidified liquids, crystallized Mercury, etc., working with Methylchloride as a freezing agent. It gives a temperature below — 23°, which can be lowered to —50° by making a vacuum above the Methylchloride by opening the stopcock of the apparatus, with instructions for using. (See page 193.)

2148a. Price without cylinder P and tube K..... **110.00**

2148b. Price with cylinder for $\frac{2}{5}$ Kilo Methylchloride, complete..... **175.00**



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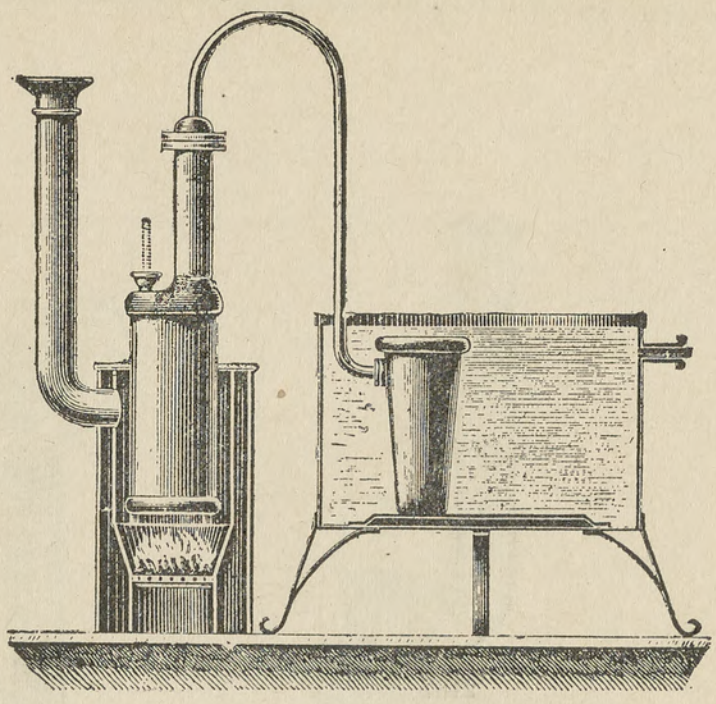

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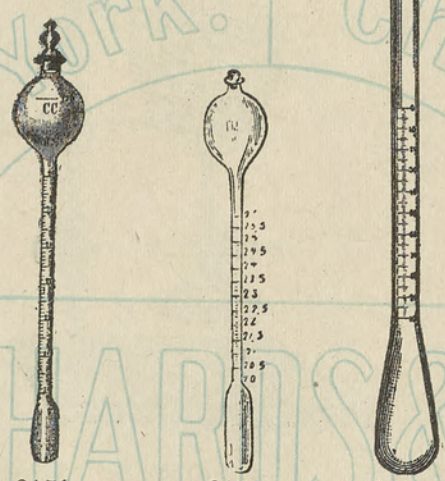

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2154

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

No.

2149t. **Ice Machines,** the best in use now.

The illustration represents the small Ammonia Ice Machine, especially adapted for Chemical Laboratories, Hospitals, etc.

2149a.t.	No. 1, producing 2 lbs. of ice per operation	$122.00
2149b.t.	No. 2, " 4 " " " "	142.00
2149c.t.	No. 3, " 6 " " " "	160.00
2149d.t.	No. 4, " 8 " " " "	187.50

2150t. Without water tank, will cost less:

No.	1	2	3	4
Less	$17.50	15.00	15.00	25.00

16. APPARATUS FOR FUSEL OIL DETERMINATION.

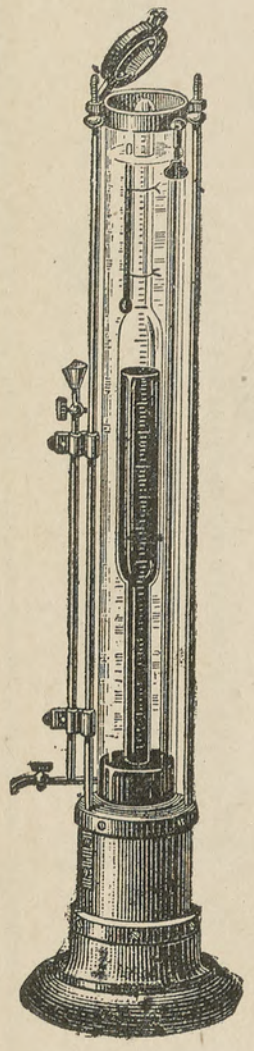
2151. **Roese's Apparatus.** (Report f. anal. Ch. 1886, P. 61) 3.00

2152. **Roese & Herzfeld's Apparatus,** more recent form. (See J. Koenig, P. 494 and Fres. Zeits. 1888.)

	Sml.	Med.	Lge.
Each	$3.00	3.50	4.00

2153. **Stutzer & Reitmair's,** modified by **Roese,** with table and directions 2.00
(Chem. Ztg. 1888, P. 25 and Post 90, P. 440)

2154. **Testing Tube,** of glass, engraved 0 to 100 ..... 3.00



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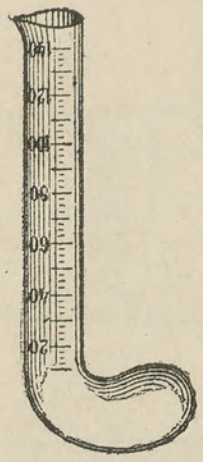

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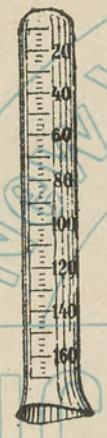

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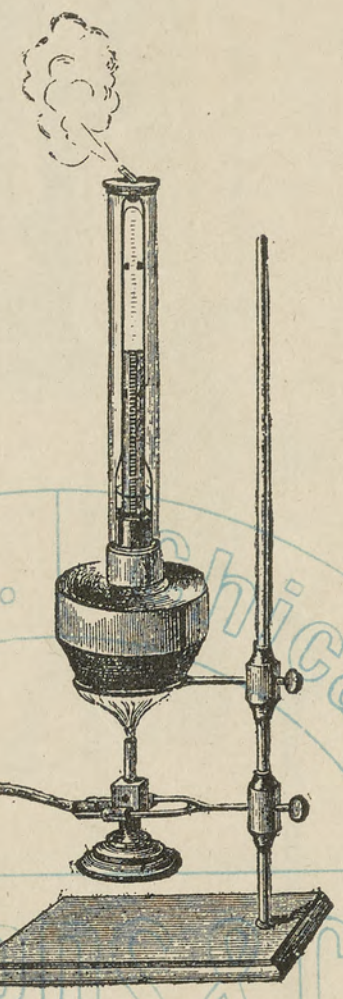

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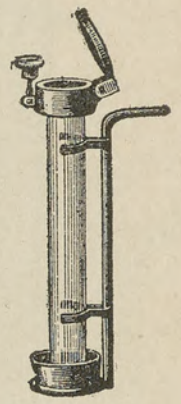

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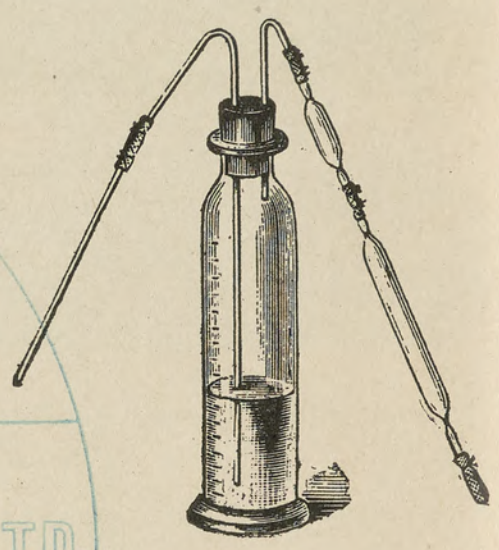


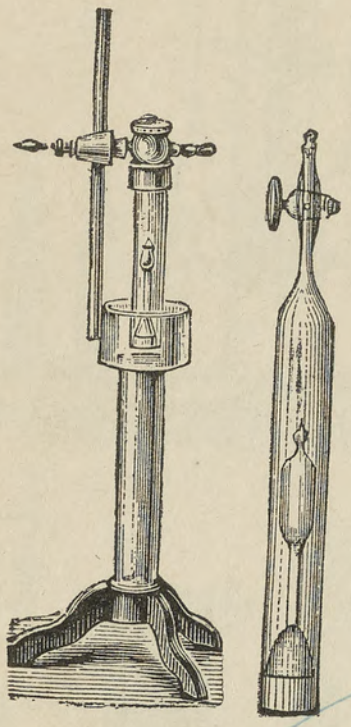
2160

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

17. APPARATUS FOR GAS ANALYSIS.

A, BUNSEN'S APPARATUS FOR GAS ANALYSIS.

No.		
2155n.	**Absorptiometer,** for determining the coefficient of absorption	$ 80.00
2156.	**Absorption Tubes,** with lip, graduated in 250 mm	1.00
2157.	—— with lip and bulb extention, grad. in 250 mm	1.30
2158.	**Apparatus for measuring the water-vapor produced** by combustion in Eudiometers. Complete with support	28.00
2159.	—— for **diffusion of gases**	9.00
2160.	—— for **collecting the mixture of gases** and hot vapors, complete	3.50
2161.	—— for **preparing oxyhydrogen** gas by electrolysis	4.25



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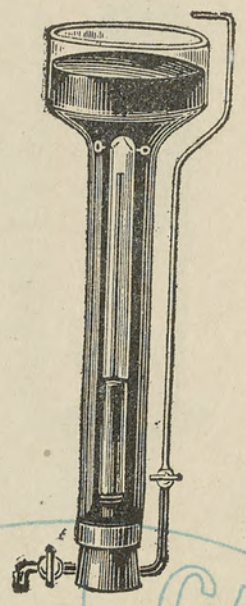

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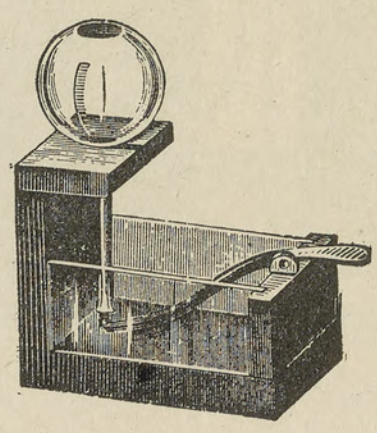

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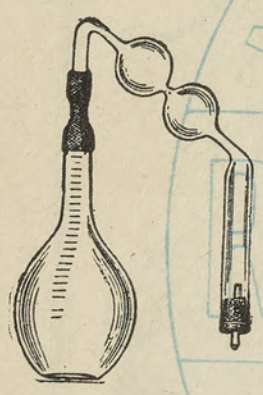

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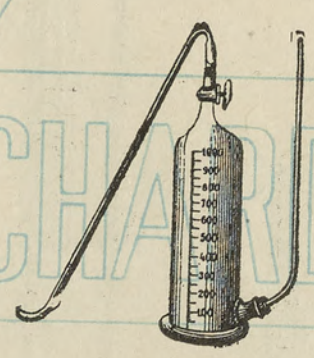

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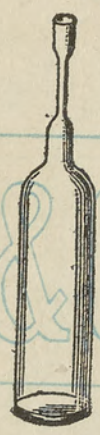

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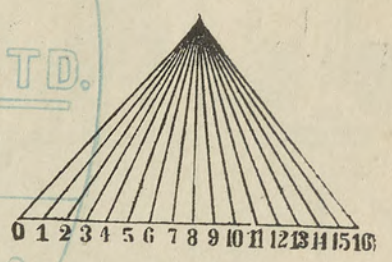

2169

No.

2162. **Apparatus** for **determining the specific gravity** of gases by the rapidity of discharge, complete, with support..... $ 22.50

2162a. the apparatus without mercury trough and support..... 4.50

2163. — for **preparing pure hydrogen gas** by electrolysis of water..... 4.25

2164. — for **filling eudiometers,** with mercury trough..... 30.00

2164a. — " " without mercury trough..... 20.00

2165. — for **taking the specific weight** of gases, complete with drying tube..... 2.00

2166. **Mercury Gasometer**..... 7.50

2167. **Apparatus** for **measuring the volume of gases,** with glass stopcock, complete with mercury trough grad. in mm.

Capacity	250	500	700 mm.
Each	$2.75	3.00	3.25

2168. **Bottles for collecting gases.**

Capacity	100	250cc.
Each	.75	$1.00

2169. **System of equidistant lines** converging to a point, edged on glass..... 7.25

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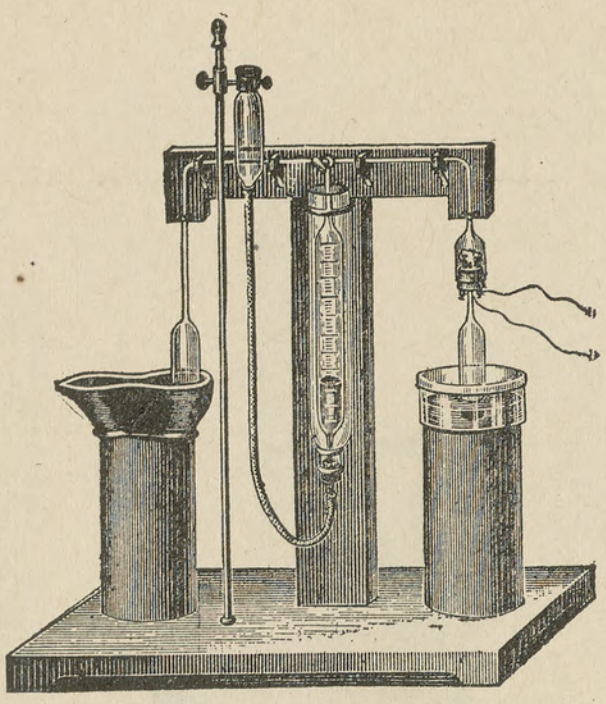

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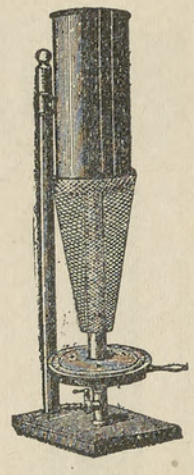

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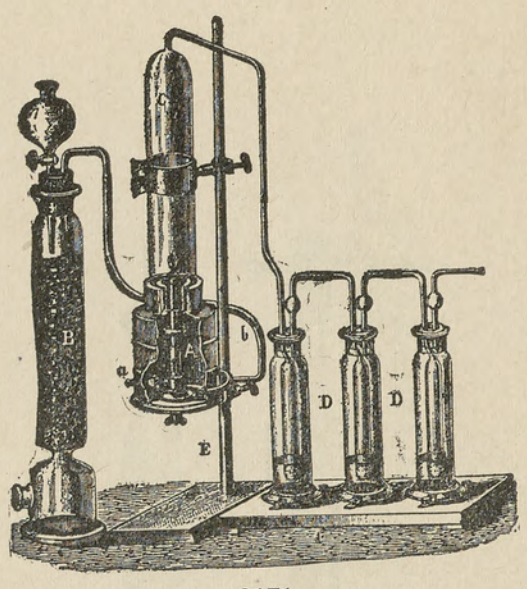

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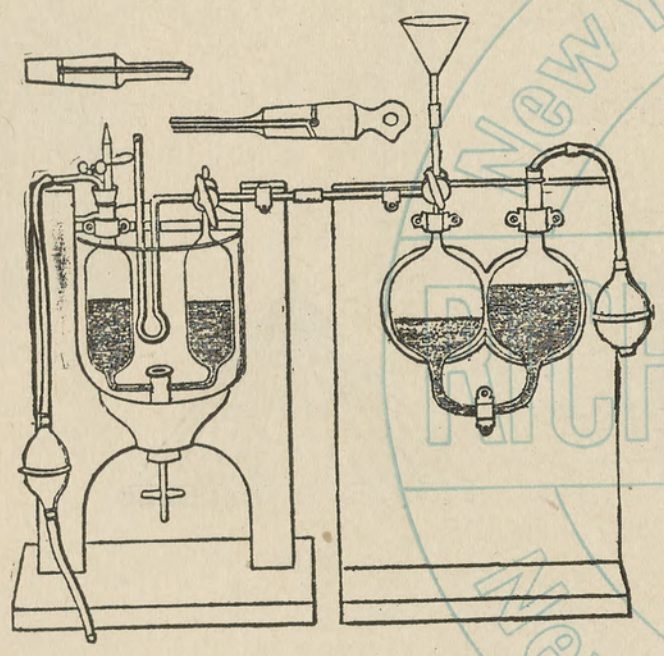

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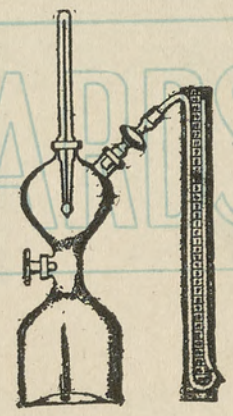

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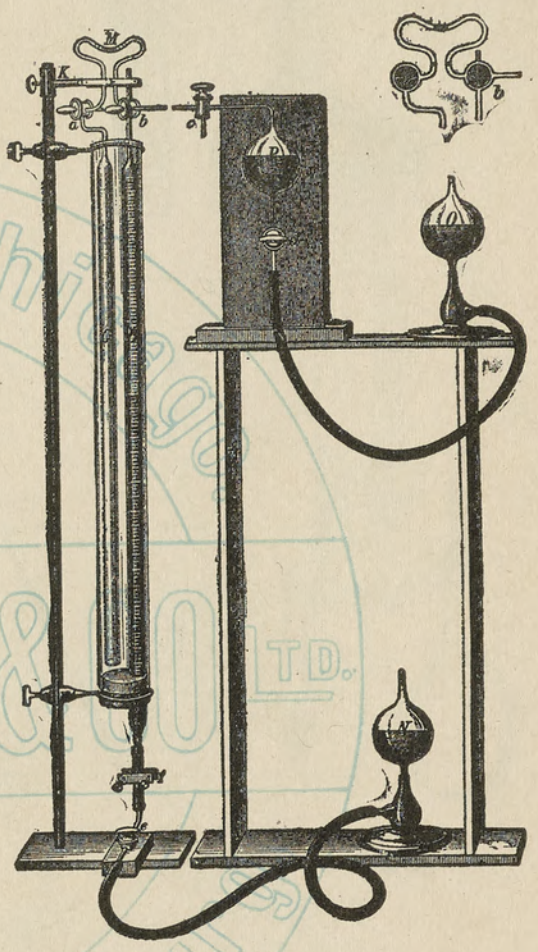

2172

B, APPARATUS FOR SPECIAL GAS ANALYSIS.

No.

2170. **Coquillon's Apparatus** for determination of gas mixture in establishments where mercury can be used... $20.00

2171. **Drehschmidt's Apparatus** for determining the percentage of sulphur in Illuminating Gas, complete in portable wooden case..... 45.00

(Jl. Anal. Chem. 88, P. 181. and Chem. Zeitg. 87, P. 89.)

2171a. The glass parts only, fitted..... 37.50

2172. **Drehschmidt-Peterson's Apparatus** for gas analysis, especially Illuminating Gas, with 4 receiving globes and 4 pipettes, with Geissler's stopcocks, complete with Platinum tube..... 45.00

(Jl. Anal. Chem. 89, P. 345. Berichte d. Deutsch. Chem. Ges. 88, P. 3244.)

2173. **Ehrenberg's Gas Generating Apparatus** for gasometric analysis of oxygen, hydrogen and oxyhydrogen

(Fres. Zeits. 1887, P. 226.)

2174. **Erdmann's Apparatus** for determining the lighting power of gases..... 40.00

2175n. **Keiser's Apparatus** for determining the volume of gases as described in Fres. Zeits. Vol. 27, P. 374 and Jl. Anal. Chem. 1886, Analyst XI., P. 106, or Sutton's Handbook, P. 466. Consisting of A : measuring apparatus, B : absorption pipette, a and b : two glass bulbs of 150 cc. glass tube with 3 ways stopcock, c and f : rubber balls, g : gauge ; complete..... 25.00

2176. **Oechselhaeuser's Apparatus** for determining carbon dioxide in Illuminating Gas and for generator gases, consisting of receiver with glass stopper, glass stopcock and ground in thermometer and two ground in manometers of different dimensions.. ..... 7.50

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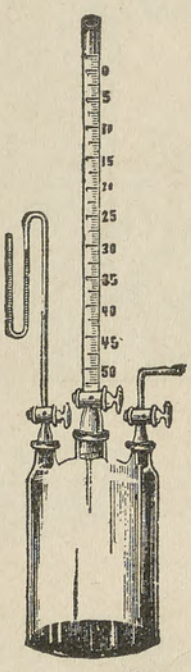

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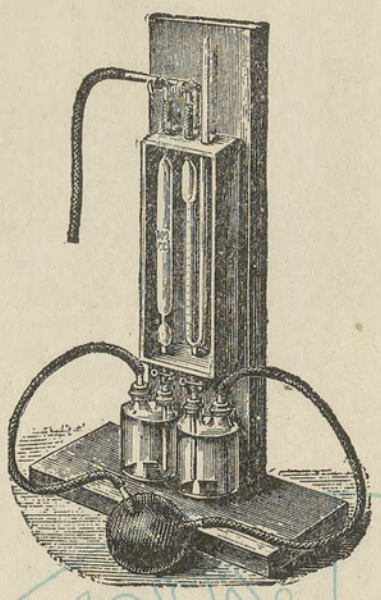

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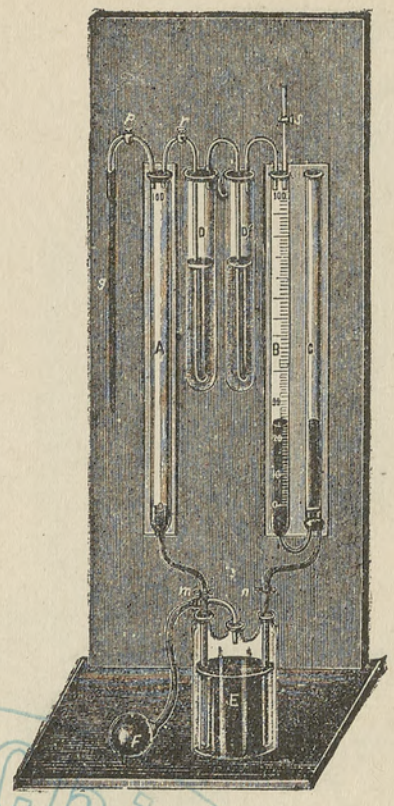

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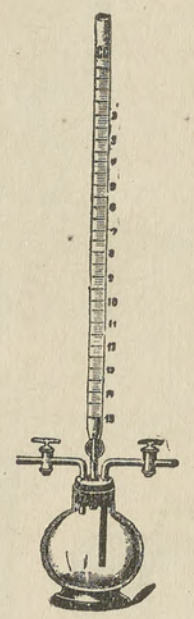

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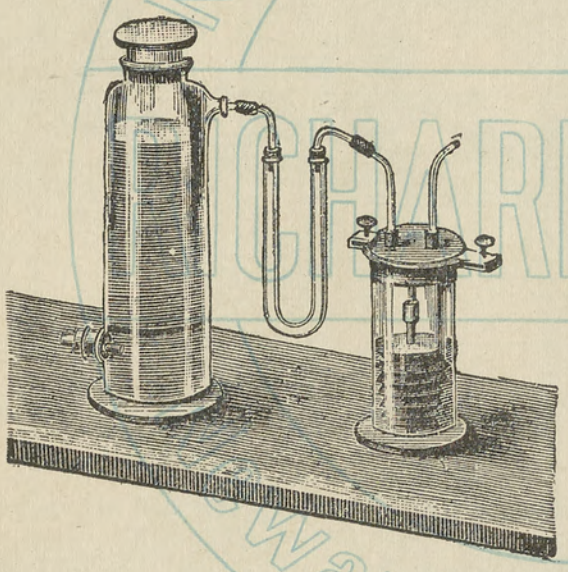

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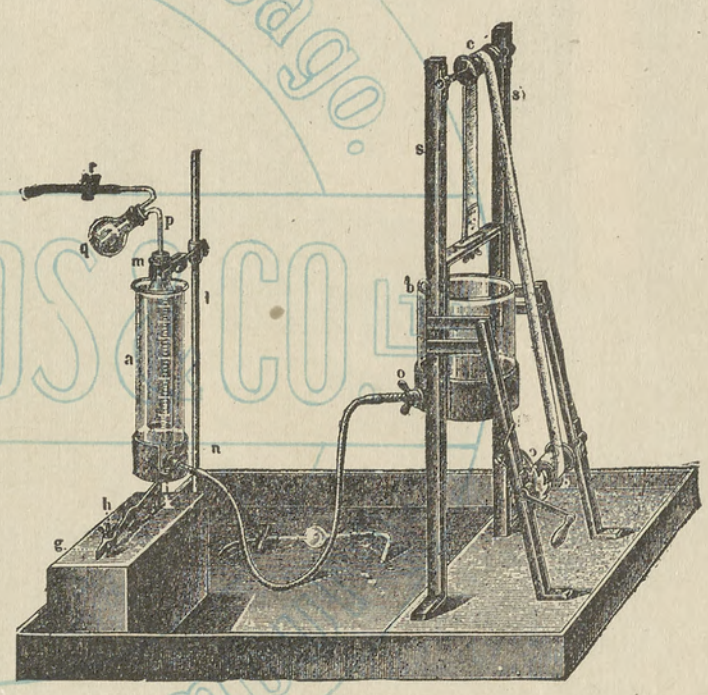


2182

No.

2177. **Ruedorf's Apparatus** for the determination of carbon dioxide in Illuminating Gas..... $ 9.00
(Fres. Zeits. 1880, P. 338.)

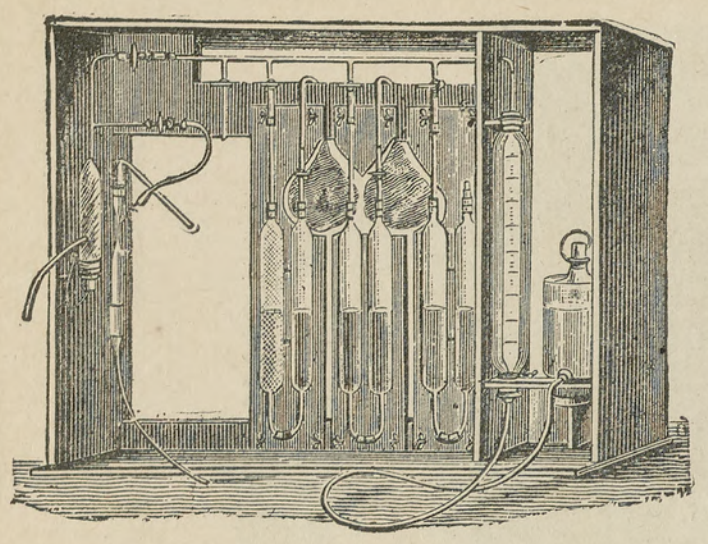
2178. **Scheibler's Apparatus** for determination of carbon dioxide in Saturation Gases..... 35.00

2179. **Sidersky's Apparatus** for determination of carbon dioxide in Saturation Gases, complete in portable wooden case..... 20.00
(Fres. Zeits. 1886, P. 93.)
(The advantage of this is, that the test liquor is kept in the reservoir and does not move up and down, besides the gas volume is measured by a water level which prevents the overflowing of the alcaline solution.)

2180. **Thoerner's Gas Generator** and controlling apparatus for observing rapidity of generation..... 7.50
(Chem. Zeitg. 1890, P. 33.)

2181. **Tieftrunk's Apparatus** for the determination of tar in gas, consisting of stoppered glass cylinder with two tubulatures, cylinder with glass plate ground to fit, glass dishes, U tube and fittings, complete..... 15.00

2182. **Apparatus for determining the quantitative composition** of combustion products..... 50.00



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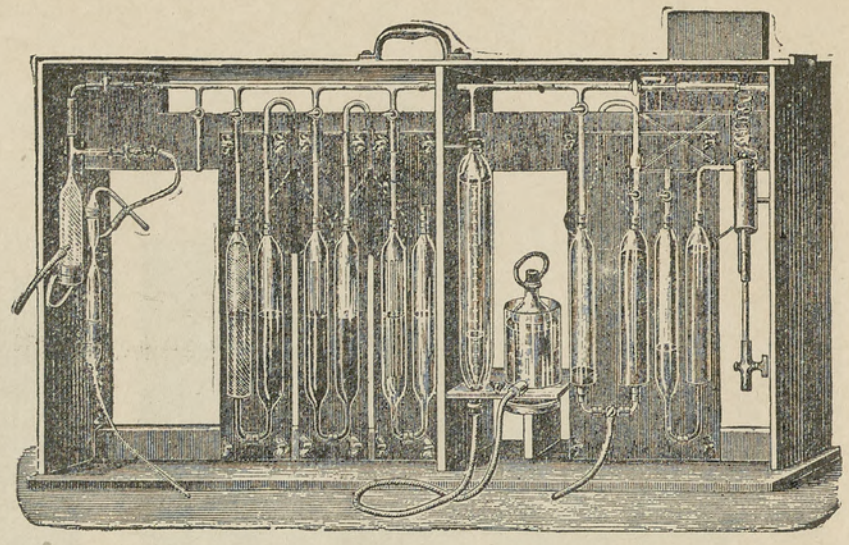

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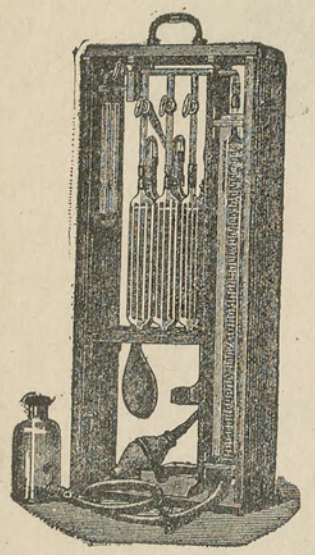

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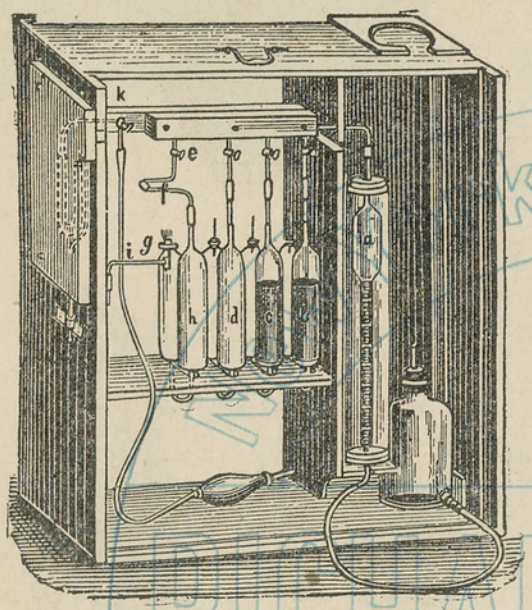

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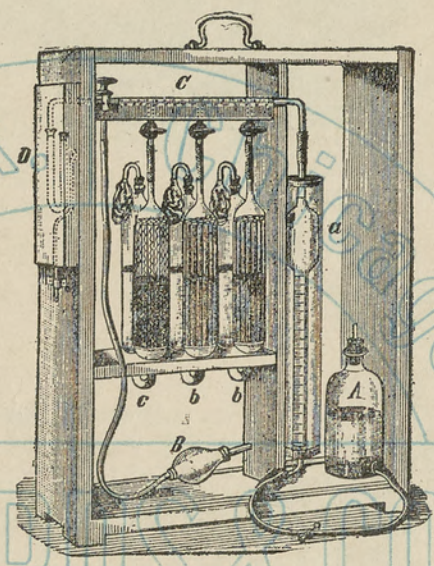

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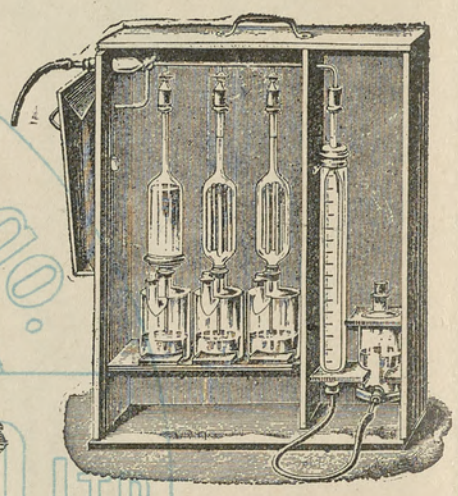


2188

RICHARDS & CO. LTD. Newark, N.J. Hamburg.

C. APPARATUS FOR FLUE AND FURNACE GASES.

No.

2183. **Orsat's Apparatus** for technical gas analysis with 3 absorption tubes for CO_2 CO and O, in portable wooden case..... $ 50.00

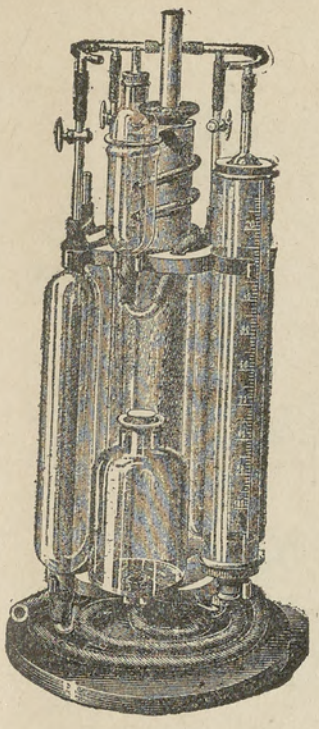
2184. **Orsat's Apparatus** for technical gas analysis, lately improved; also, for hydro-carbon determination with platinum spiral..... 70.00

2185t. **Orsat-Fischer's Apparatus** for analysis of flue and furnace gases, consisting of 3 absorption pipettes, U tube, tube with 4 stopcocks, gas measuring tube, aspirator bottles, etc., complete in portable wooden case..... 20.50

2186. **Orsat-Lunge's Apparatus** for flue and furnace gas analysis with modifications for estimating hydrogen separately, complete in portable wooden case..... 45.00

2187t. **Orsat-Muencke's Apparatus** for analysis of CO_2 CO and O consisting of 3 absorption cylinders with copper spirals, stopcock, tube with 3 way stopcock, etc., complete in portable wooden case..... 25.00

2188t. **Orsat-Salleron's Apparatus** for the estimation of gases over mercury and determination of hydrogen and hydrocarbon in gases which are rich in carbon oxide, improved form, in portable wooden case... 30.00



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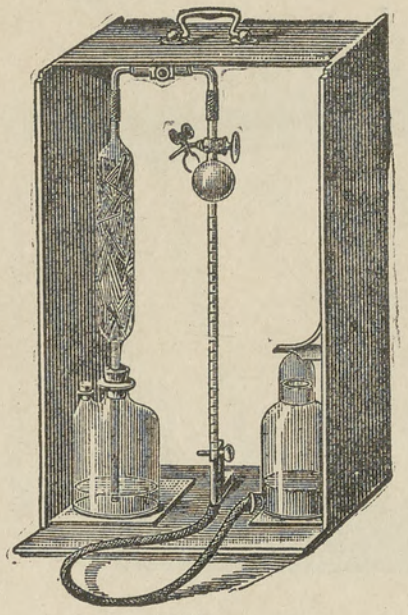

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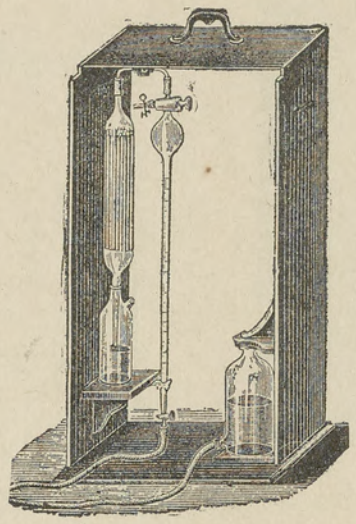

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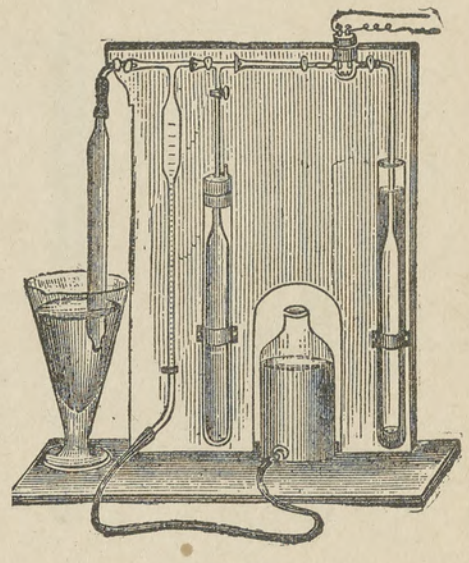

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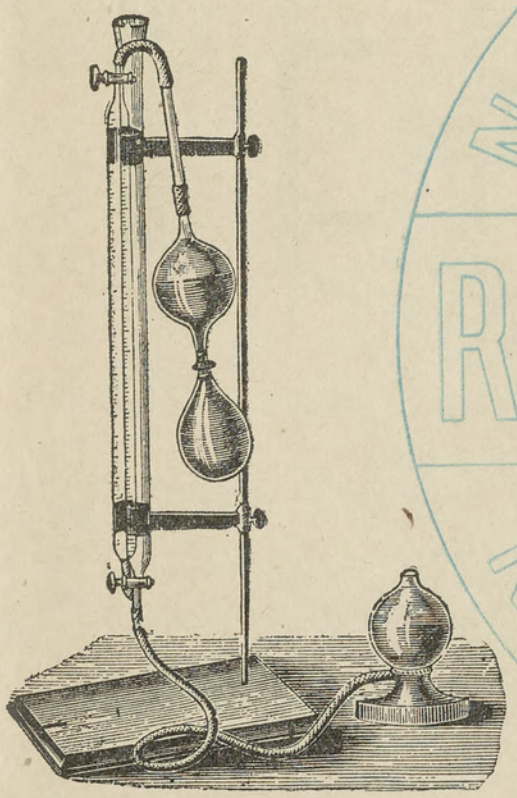

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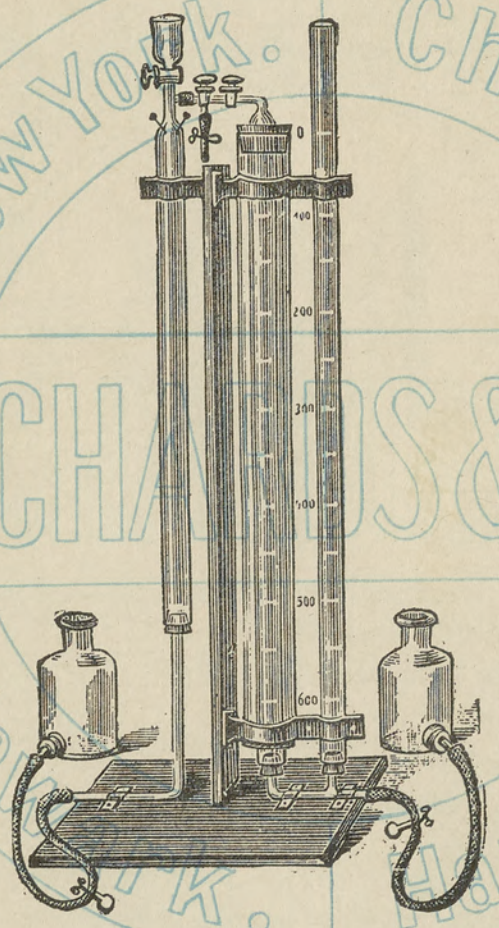

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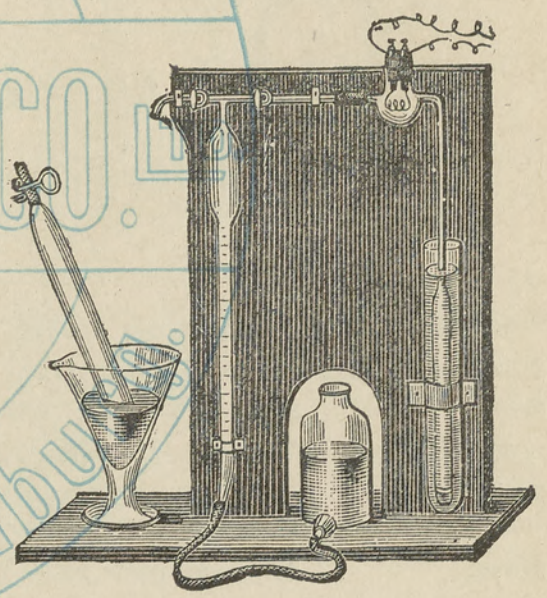


2195

No.

2189. **Kasalowsky's Apparatus** for furnace gas estimation with 3 absorption tubes and draft measuring tube. $ 45.00

2190. **Lindemann-Winkler's Apparatus** for estimating oxygen without phosphorous charge, in wooden case. 22.50

2191. **Fischer's Apparatus** for the analysis of generator gas in the presence of CO_2 COH and Methan, complete with support 25.00

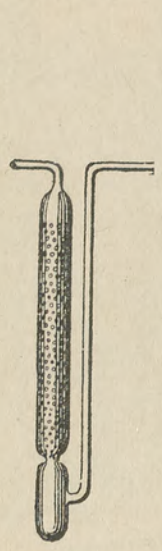
2191a. The glass parts only. (Fres. Zeits. 1888, p. 367) 18.00

2192. **Schellhammer's Apparatus** for furnace gases with draft measuring tube and 4 absorption pipettes with support 20.00

2193. **Winkler's Apparatus** for estimating CO_2 in gases containing relatively small quantities of same, for mines, etc., complete in wooden case 20.00

2194. **Coquillon's Carburometer,** for determination of generator and combustion gas 30.00

2195. **Coquillon's Grisoumeter,** for determination of generator gas in mines, consisting of measuring tube, aspirator bottle, test glass, palladium spiral, etc., on wooden board 25.00



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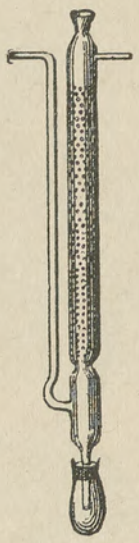

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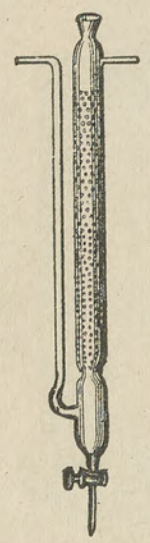

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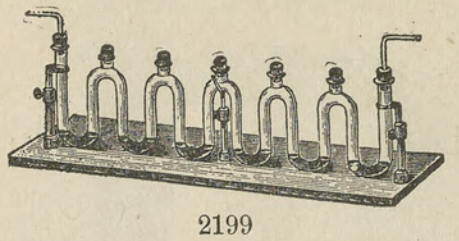
2198



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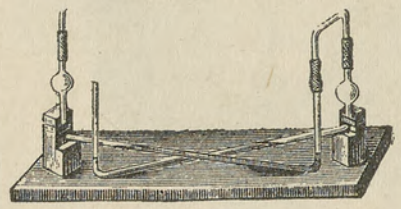

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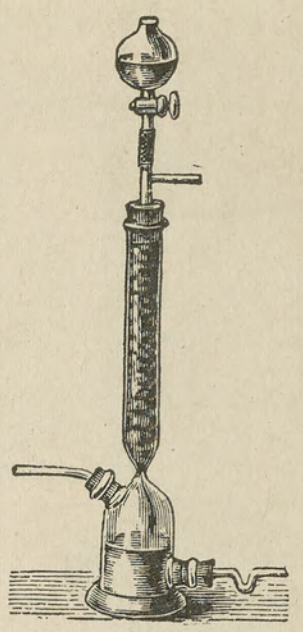

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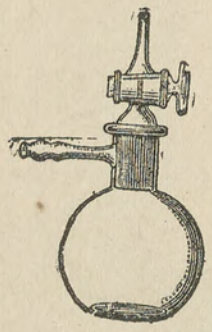

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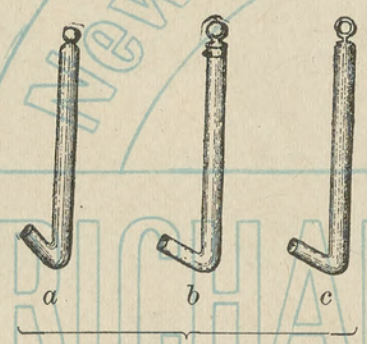

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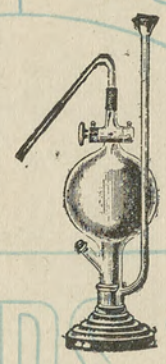

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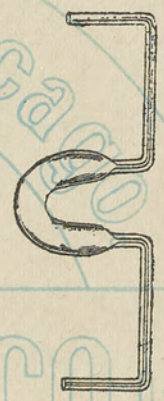

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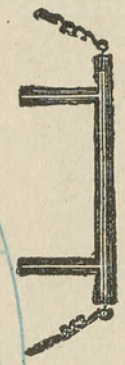

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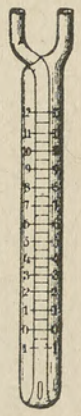


2206

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

No.

D. APPARATUS FOR GENERAL GAS ANALYSIS.

2196. **Babo's Absorption Tube,** filled with glass beads $1.25

2197. **Emmerling's Absorption Tube,** filled with glass beads 1.50

2197a. Same as No. 2197, with stop-cock 2.75

2198. **Sohxlet-Winkler's Absorption Tube** ..... .50

2199. **Gore's Absorption Apparatus,** consisting of long U shaped bent glass tube with openings on top, complete with support 7.50

2199a. The glass parts only, fitted 4.50

2200. **Richter's Absorption Apparatus,** length 10 in., bore $\frac{3}{5}$ in., complete 3.00

2200a. The glass parts only 1.50

2201. **Tieftrunk's Absorption Apparatus,** for absorbing large quantities of gases, consisting of cylinder with 2 tubulatures, T tube, separatory funnel and fittings 5.00

2202. **Chancel's Bottle,** for determining the density of gases; capacity 200 cc. (Fres. Zeits. 1884, P. 149) 4.00

2203. **Cooper's Gas Collecting Tubes.**

Style	A	B	C
Each	.25	.50	.35

2204. **Ehrenberg's Ball Gasometer,** for holding and transfering gases with Miescher's stop-cock and Mercury scale.

Capacity	200	500	2000 cc
Each	$6.00	7.50	12.00

2205. **Hempel's Palladium Tube,** for absorption, filled with Palladium 6.00

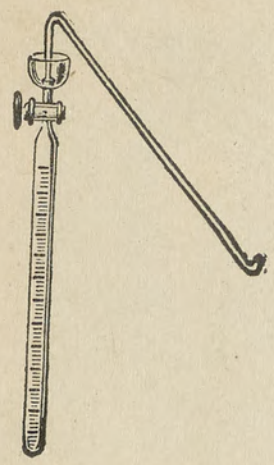
2205a. —— " " with sealed in wire, according to weight of wire ..... 2.50 to 9.00

2206. **Manometer,** after **Schiele,** as used in gas works.

Length	$12\frac{1}{2}$	17 in.
Plain, each	$1.00	1.25
Grad. in mm.	$2.00	2.25

2206a.

2206b.



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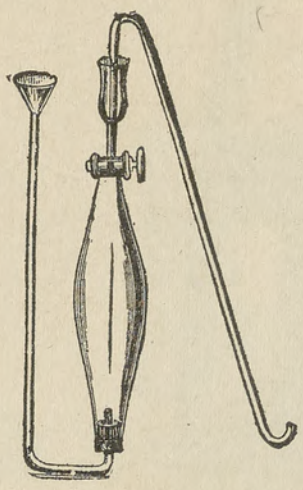

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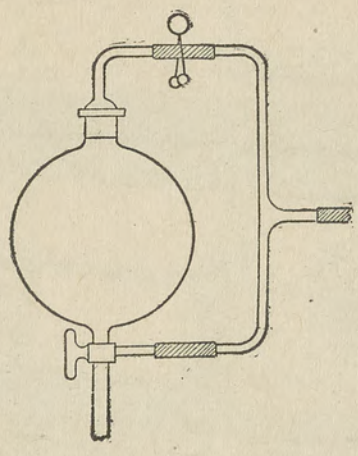

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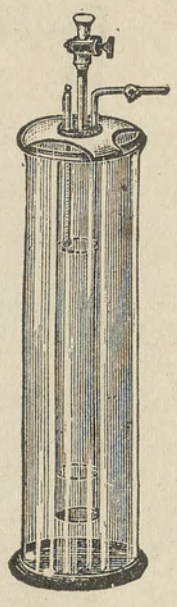

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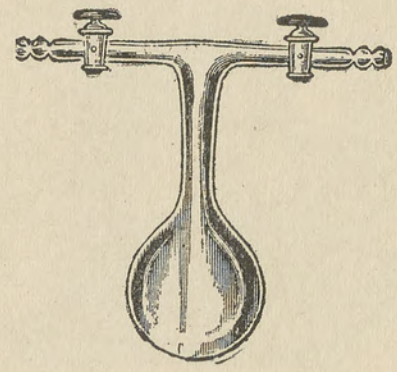

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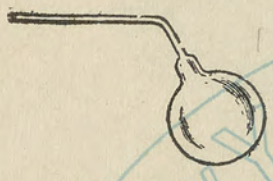

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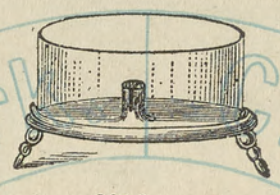

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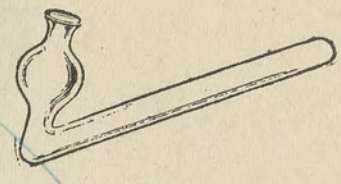

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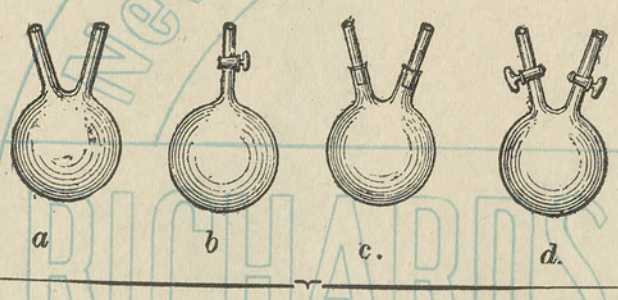

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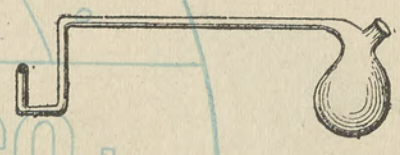


2217

No.

2207. **Huepfner's Apparatus,** for transfering gases, consisting of measuring tube with stop-cock and extension.. $4.00

2208. —— " for transfering, consisting of funnel tube connected with gas holder by rubber stopper..... 5.00

2209. **Neumann's Dropping Funnel,** for distillations conducted in a current of gas. (Jl. Anal. Chem. 89, P. 64)..... 3.50

2210. **Schilling's Apparatus,** for determining the specific gravity of illuminating gas. (Post P. 104)..... 18.00

2211. **Slaby's Flask,** for taking specific weight of gases..... 3.50

2212. **Thoerner's Apparatus,** for collecting and holding gas samples.

Capacity	150 to 250 cc.	300 to 500 cc.
Each	$3.00	4.50

2213. **Balloons of glass,** for determining the specific gravity of gases.

Capacity	30	50	100	150 cc.
Each	.40	.50	.60	.75

2214. **Bulbs of very thin glass,** for weighing gases.

Form	A	B	C	D
Each	$1.00	1.50	1.50	2.50

2215. **Gas collecting Tubes, Schroetter's**..... .50

2216. **Gas Pipettes,** Bulb form of very thin glass.

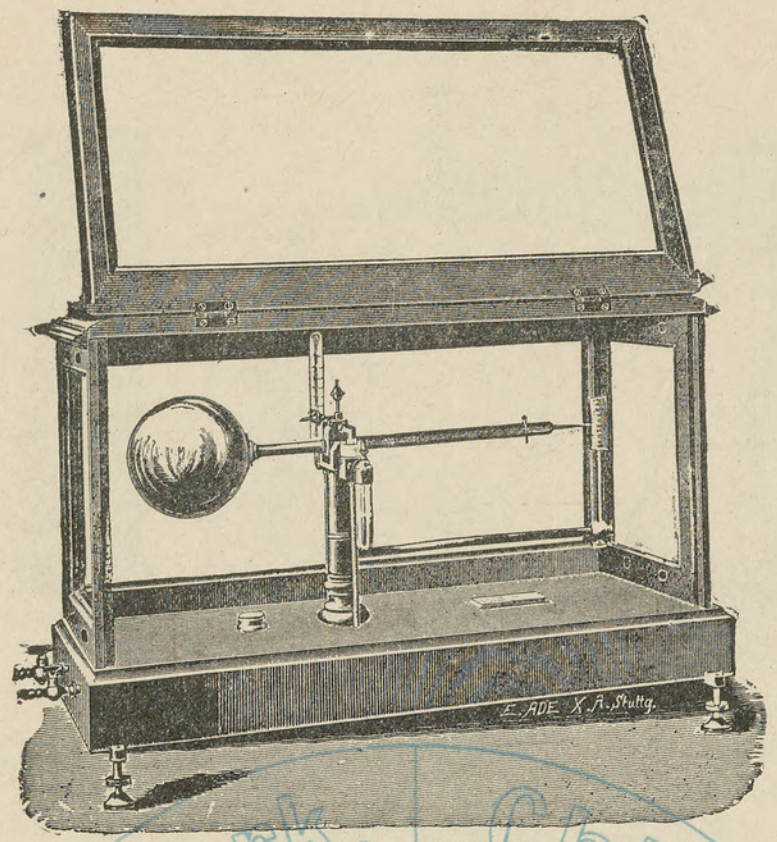
Dia.	2	$2\frac{1}{2}$	$3\frac{1}{4}$ in.
Each	.30	.40	.50

2217. **Gas retorts,** with tubulature.

Capacity	4	8 oz.
Each	.40	.60

2218. **Troughs with tubulature,** for holding gas measuring tubes..... 2.50

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



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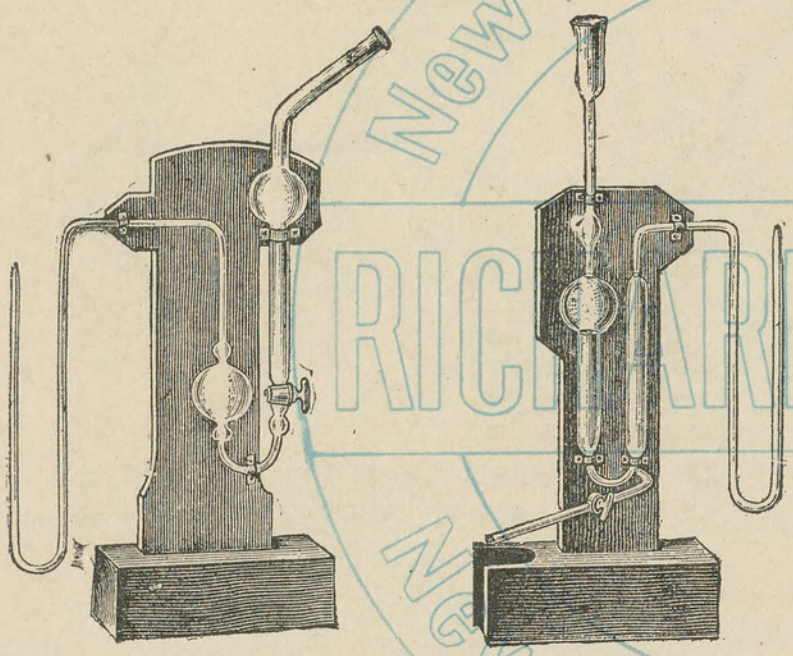
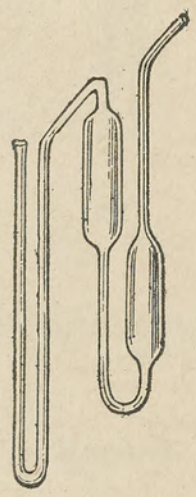


2220 2221 2222



2223

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

No.

2219. **Balance for weighing gases**, after Lux, latest improved pattern; in glass case with leveling screws and spirit level..... $80.00

E. GAS PIPETTES.

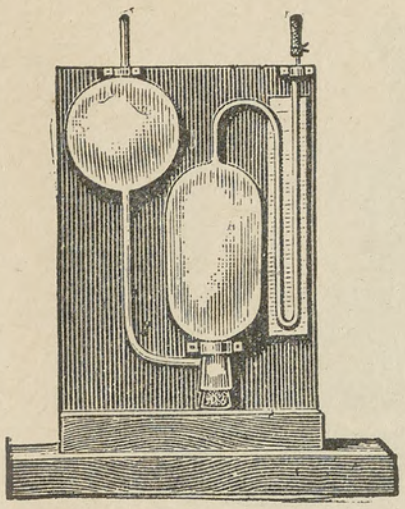
2220. **Bertholet's Gas Pipette,** for absorption, mounted, complete..... 5.00

2221. **Doyer's Gas Pipette,** for absorption, mounted, with Deville's stop-cock..... 5.00

2222a. Same, **without stopcock,** the glass parts without graduation..... 2.75

2222b. Same, Glass parts with graduation..... 3.25

2223. **Ettling's Gas Pipette,** for absorption.	Length	15	25 in.
	Each	.65	.75



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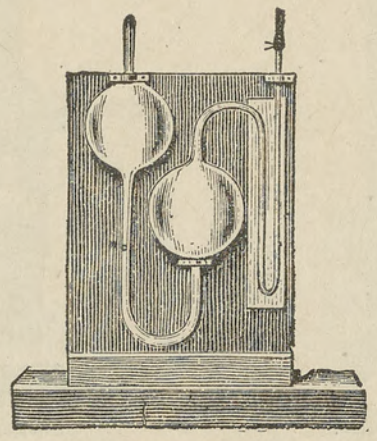

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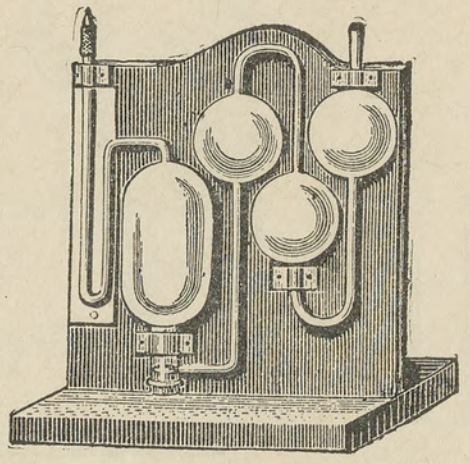

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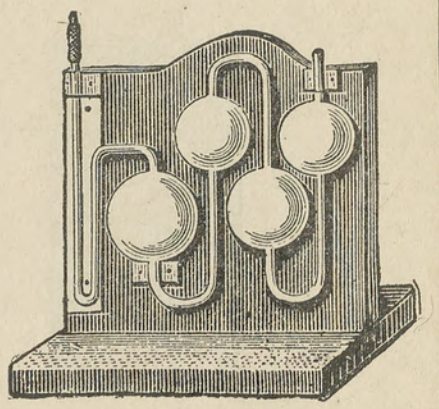

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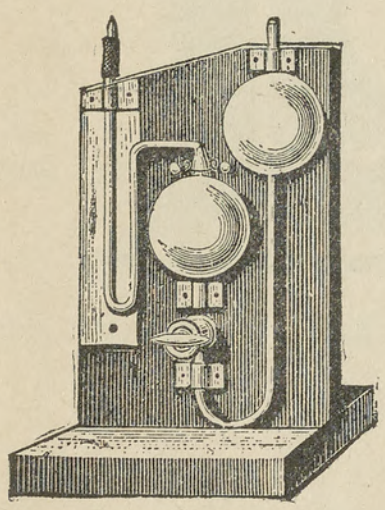

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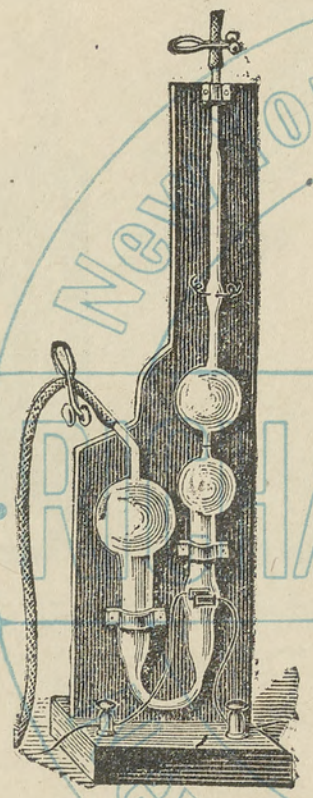

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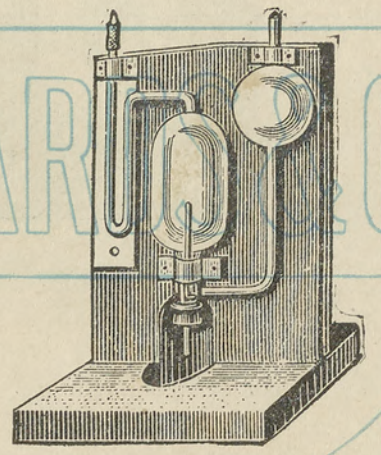

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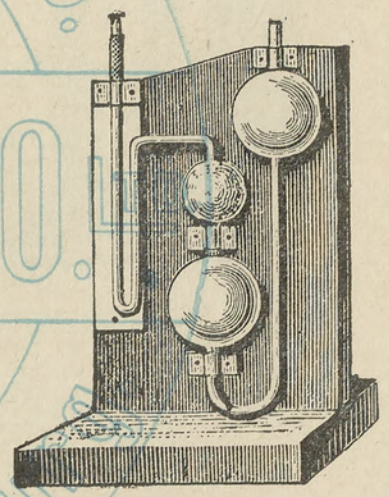


2228

New York. Chicago. RICHARD KÖHLER & CO. Newark. Hamburg

No.

2224. **Hempel's Gas Pipette,** for absorption, simple form for Solids, mounted..... $3.00

2224a. for absorption, simple form for Liquids, mounted..... 3.00

2225. — " " compound for Solids, mounted..... 4.25

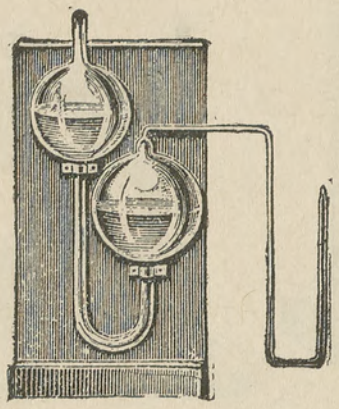
2225a. " " compound for Liquids, mounted..... 4.25

2226. — for explosion, simple with stop-cock aud platinum electrodes, mounted..... 4.25

2226a. " " compound without stop-cock, mounted..... 8.50

2227. — for Hydrogen, simple, mounted..... 4.00

2228. — for Sulphuric Acid and bulb filled with glass beads, mounted..... 3.75



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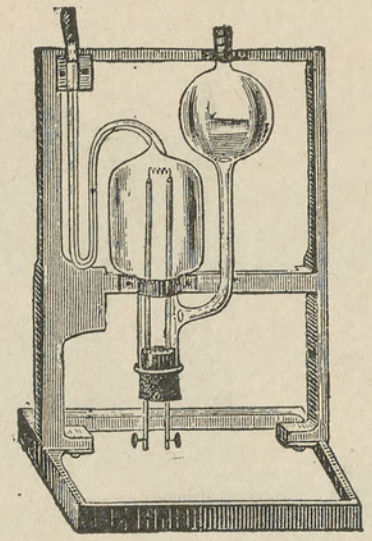

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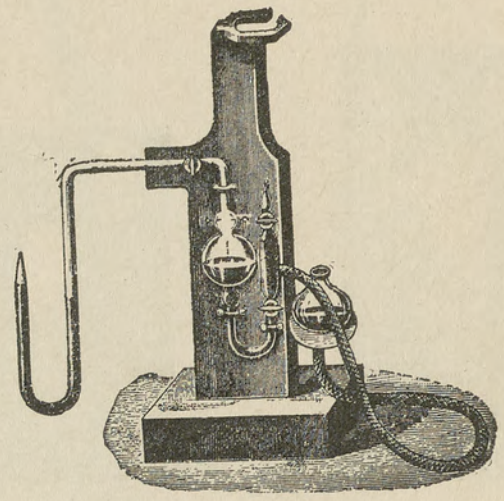

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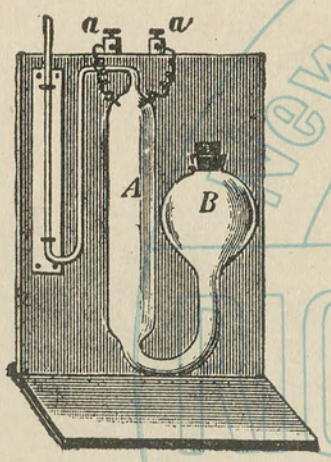

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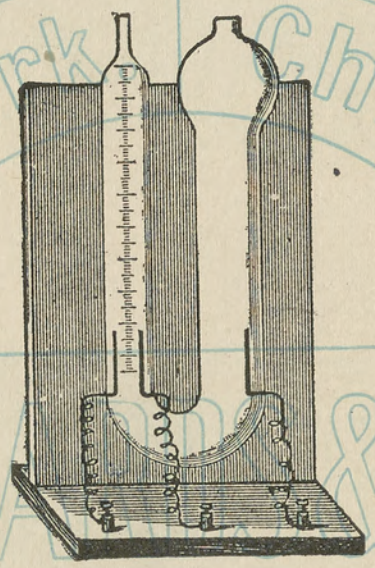

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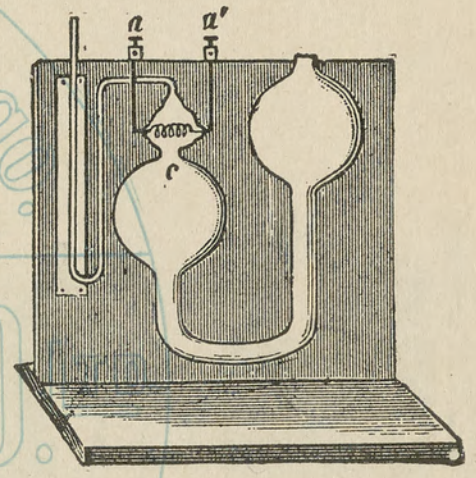


2232b

No.

2229. **Hempel-Ettling's Gas Pipette,** for explosion, mounted ..... $ 2.50

2230. **Hempel-Winkler's Gas Pipette,** for use in Methan determination, mounted 8.00

(Fres. Zeits. 1889, P. 288.)

2231. **Salet's Pipette,** for absorption, after Bunsen's Method, mounted 9.00

(Fres. Zeits. 1889, P. 464.)

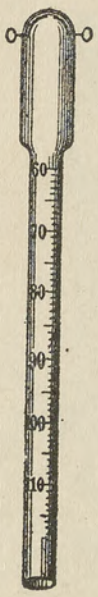
2232t. **Thoerner's Pipette,** for explosion, mounted 4.50

2232at. for electrolytic decomposition, mounted 6.00

2232bt. for ignition or combustion, mounted 5.00


2233


2234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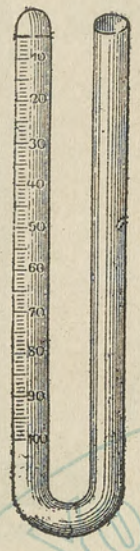
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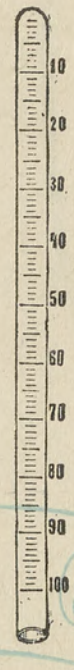
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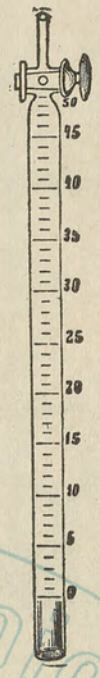
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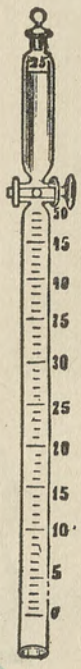
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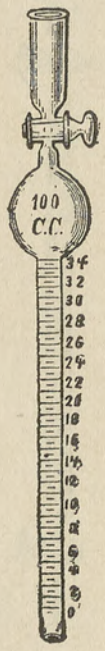


2240

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

F. EUDIOMETERS.

No.

2233. **Bunsen's Eudiometer,** with Platinum Electrodes.

Capacity	300	500	700	800 mm.
Each	$2.50	3.00	3.50	4.00

2234. **Mitscherlich's Eudiometer** with stopcock and Platinum Electrodes.

Capacity	50	100 cc.
Grad.	$\frac{1}{5}$	$\frac{1}{5}$ "
Each	$3.00	3.50

2235. **Seeger's Eudiometer,** with Platinum Electrodes, Grad. to 120 cc..... $4.00

2236. **Ure's Eudiometer,** U form, with Platinum Electrodes..... 2.50

Hofmann's Eudiometer see Hofmann's Lecture Apparatus.

G. GAS MEASURING TUBES

2237. **Bunsen's Gas Measuring Tubes.**

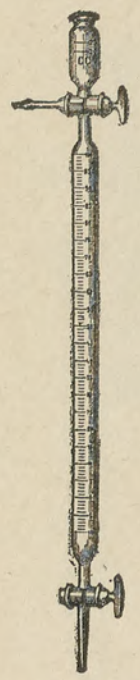
Capacity	25	50	100	200	300 cc.
Grad.	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{2}$	$\frac{1}{1}$	$\frac{1}{1}^{0}$
Each	$1.00	1.35	1.50	2.00	2.75

2238. —— with stopcock.

Capacity	50	100 cc.
Grad.	$\frac{1}{10}$	$\frac{1}{5}$
Each	$2.75	3.00

2239. **Stammer's Gas Measuring Tubes,** with stopcock and separatory funnel, tube 50 cc. in $\frac{1}{2}^{0}$..... 3.00

2240. **Gas Measuring Tubes,** with bulb of 100 cc. capacity; tube divided to 34 cc. in $\frac{1}{2}$; separatory funnel connected to bulb..... .4.00



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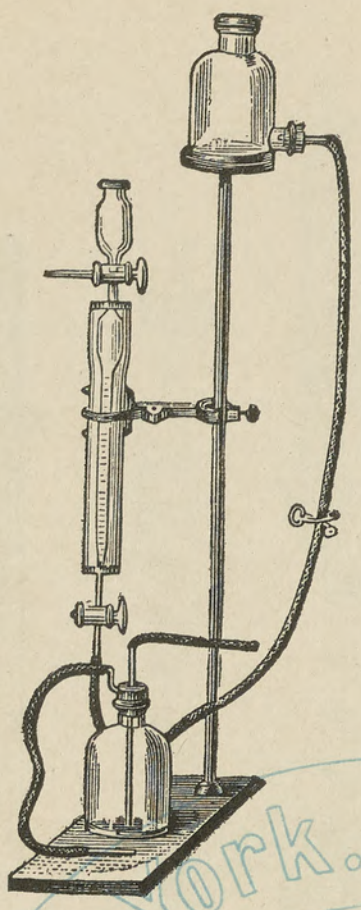

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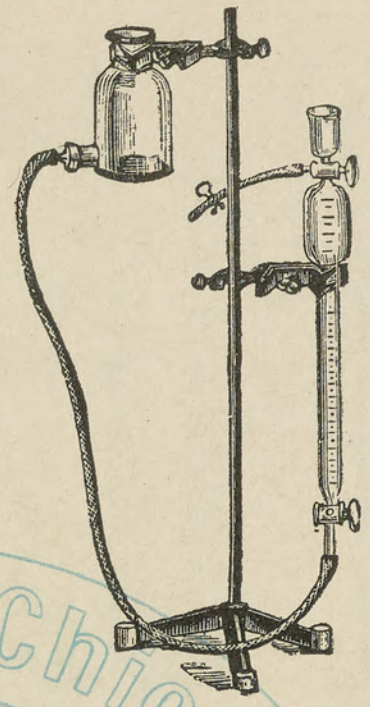

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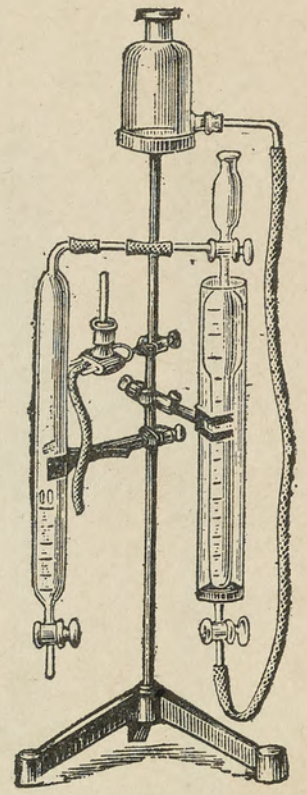

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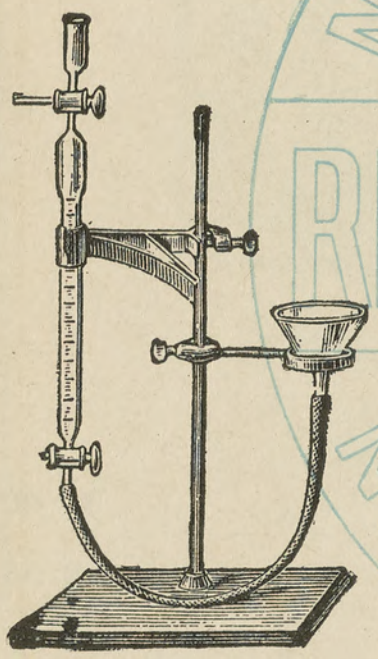

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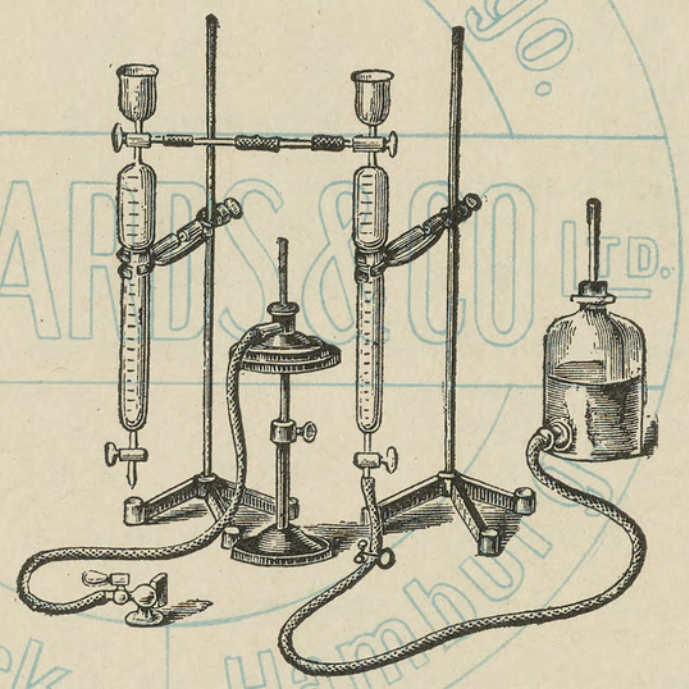

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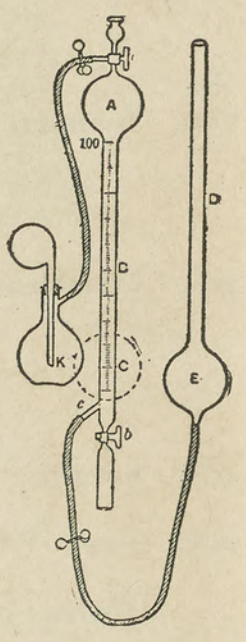

2246

H. GAS MEASURING BURETTES.

No.		
2241.	**Bunte's Gas Burette,** graduated with 2 stopcocks	$6.75
2241a.	—— " " " " " " and water jacket	7.75
2241b.	—— " " " complete with support and aspirator bottle	9.50
2242.	—— " " complete with two stopcocks, aspirator and woulff bottle fitted complete with support	16.50
2243.	**Bunte's Gas Burette,** complete with funnel fittings and support	12.00
2243a.	Same, the glass parts only	5.00
2244.	**Bunte's Gas Burette** for Volumetric Analysis of Hydrogen, with 2 Iron Supports, Bunsen Burner with Support, Aspirator Bottle, fittings and 6 inches of Palladium Wire, complete	27.00
2245.	**Bunte-Juepner's Gas Burette** with water jacket, stoppered pipette, aspirator bottle, support and fittings, complete	27.00
2246.	**Bunte-Neumann's Gas Burette** as described in: Jl. Anal. Chem. 1889, P. 64	8.00

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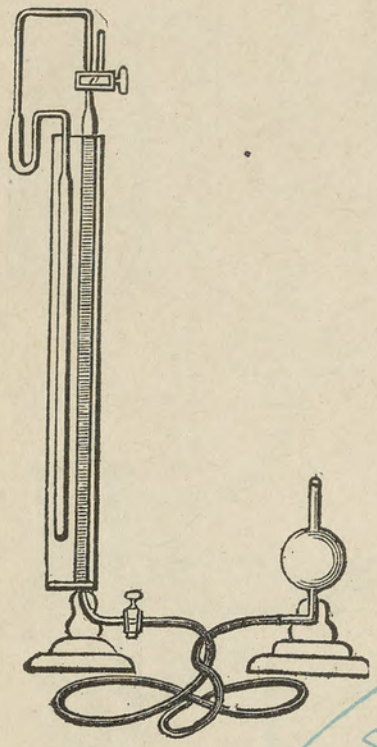

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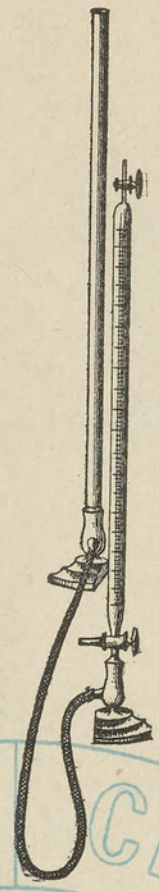

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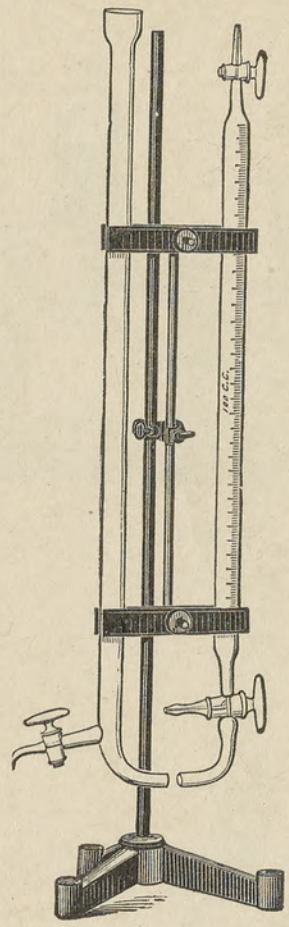

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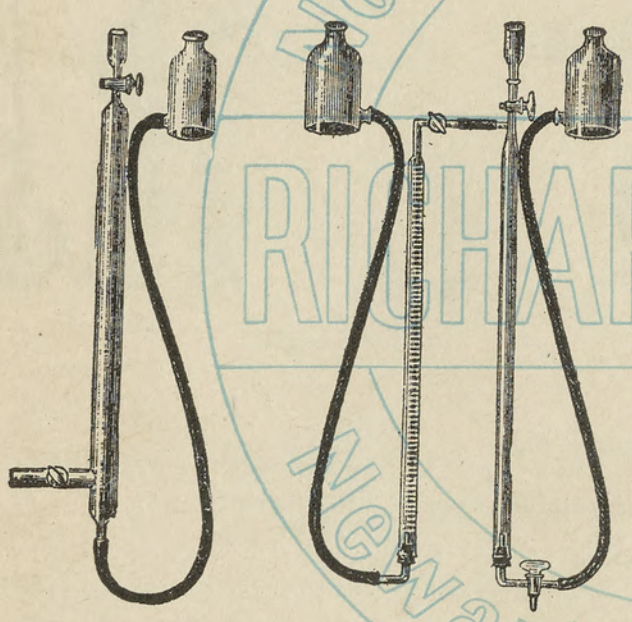

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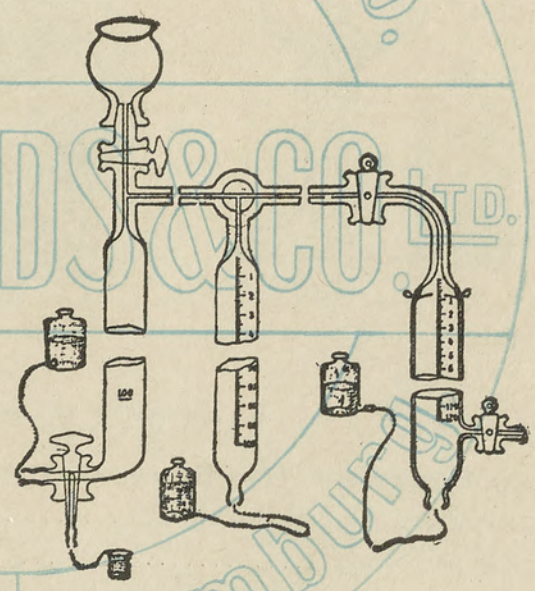

2251



2252

No.

2247. **Elliot-Mackintosh' Gas Burette,** glass parts only..... $16.00

2248. **Elliot's Gas Burette** for furnace and illuminating gases complete as per illustration..... 15.00

2248a. The two Burette parts only..... 13.00

2248b. The Explosion Burette only..... 8.00

2249. **Hempel—Winkler's Gas Burettes,** set of two complete as per illustration on lead charged base..... 7.50

2250. **Hempel—Peterson's Gas Burette,** which can be used independently of variations in temperature or atmospheric pressure..... 19.00

(Jl. Anal. Chem. 1888, p. 84.)

2251. **Mackintosh's new apparatus** for general volumetric Gas Analysis, the glass parts only..... 21.00

(Jl. Anal. Chem. 1887, P. 404.)

2252. **Thoerner's Gas Burette,** for collecting and direct analysis of gases dissolved in water, without base.... 5.50

2253. **Winkler's Gas Burette,** measuring tube divided in $\frac{1}{50}$ and its lower parts in $\frac{1}{20}$, the two filling tubes have stopcocks with fittings and support complete..... 10.70

2253a. The measuring tube and filling tube only..... 8.00

2253b. The measuring tube only..... 6.25

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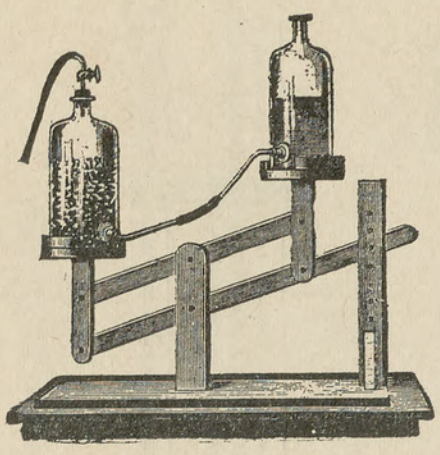

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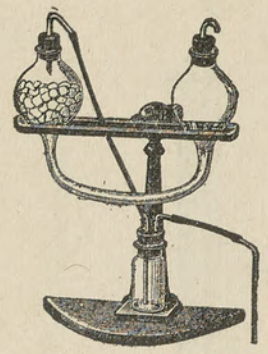

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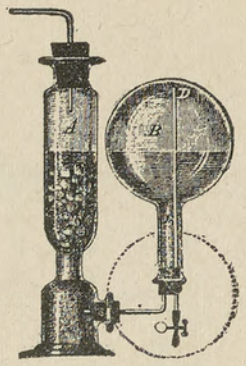

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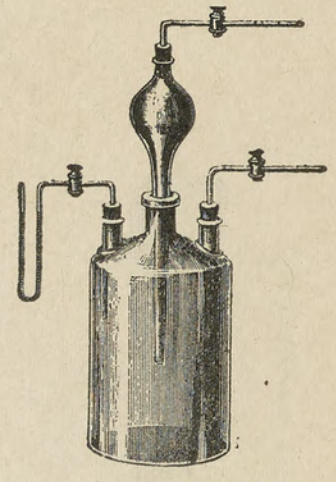

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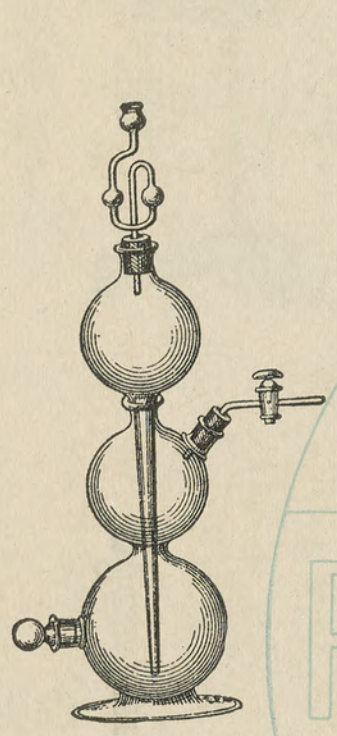

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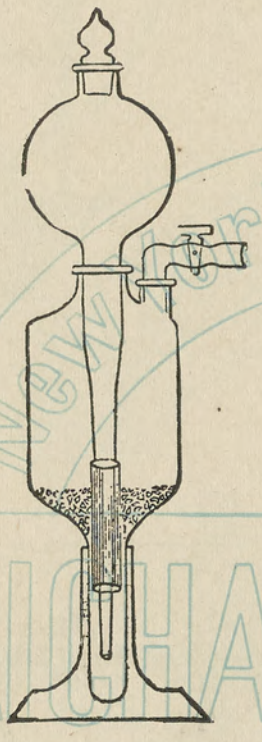

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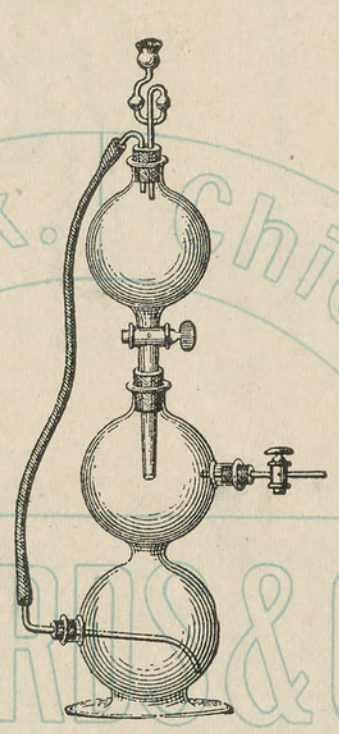

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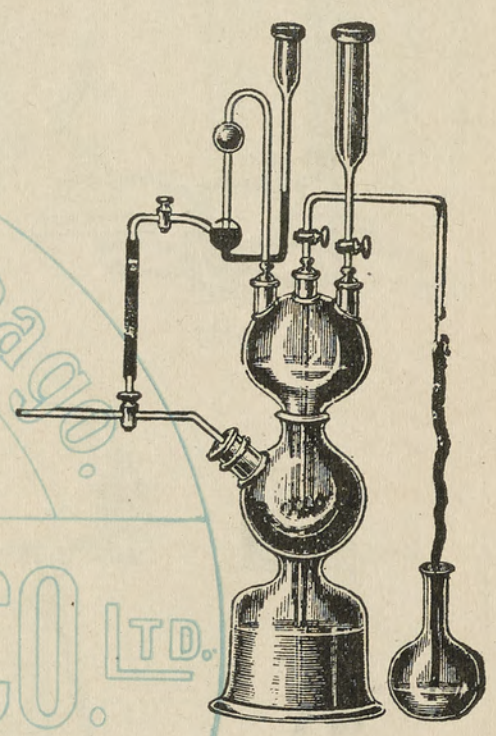

2261

I. APPARATUS FOR GENERATING GAS.

No.

2254. **Abbe Lavaud de Lestrade's Gas Generator,** with adjustable support, 2 lit. capacity..... $8.00

2255. **Babo's Gas Generator,** complete on stand..... 3.25

2255a. the glass parts only..... 1.00

2256. **Chautemille's Gas Generator,** for a continuous supply. (Fres. Zeits. 88, P. 335 and Jl. Anal. Ch. 1888, P. 406)..... 3.00

2257. **Finkner's Apparatus,** consisting of Woulff bottle with 3 necks, ground in funnel, 3 tubes with sealed in stopcocks, grad. manometer and rubber stoppers.

Capacity	1	2	5 liters.
Each	$8.00	10.00	15.00

2258. **Kipp's Gas Generator,** with safety funnel and Geissler's stopcock.

Capacity	½	1 pt.	qt.	½ gal.
Each	$3.50	4.00	5.00	7.00

2259. **Kipp-Kavalier's Gas Generator,** improved form, complete..... 10.00

2260. **Kipp-Wartha's Gas Generator,** latest modification, complete.

Capacity	½	1	2 liters.
Each	$10.00	12.00	15.00

2261. **Muencke's Apparatus** as per illustration, all parts ground in..... 12.00

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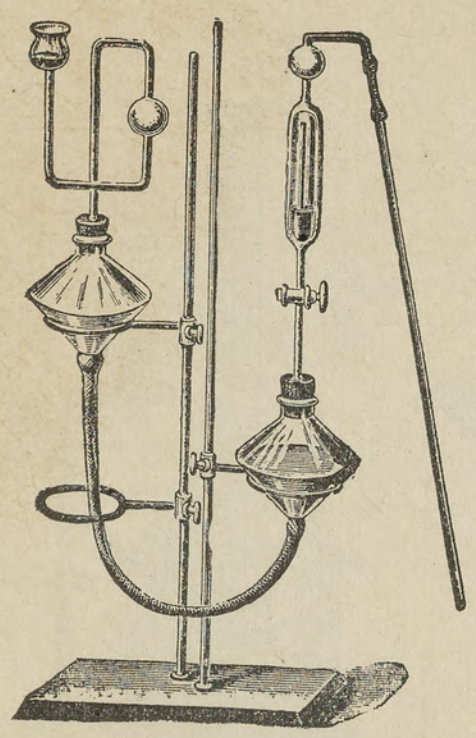

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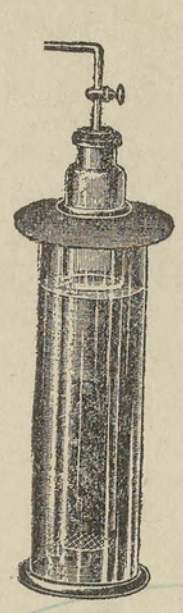

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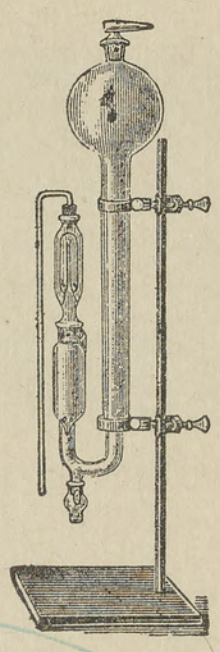

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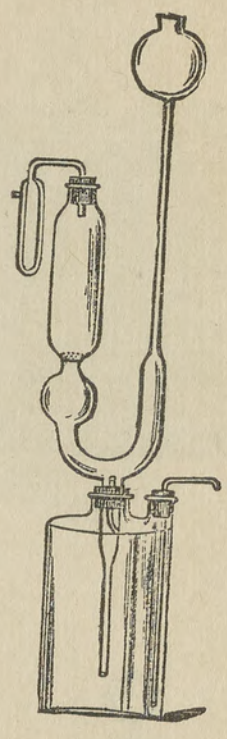

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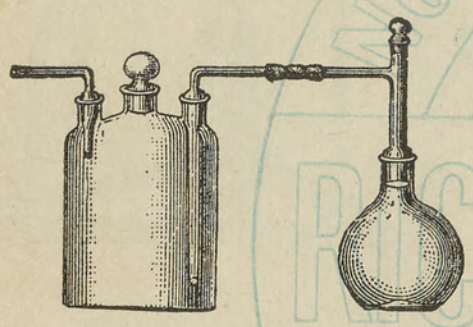

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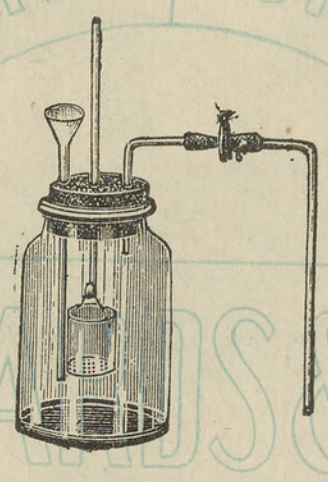

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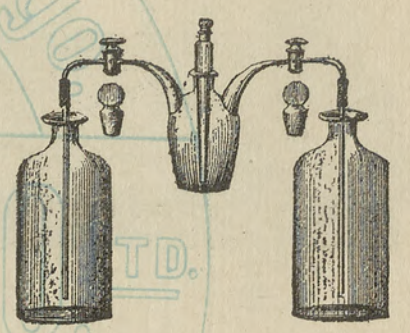

2268

No.

2262. **Kaehler's Apparatus,** for generating chlorine glass parts only..... $6.00

2262a. support for same..... 3.00

2263. **Mirus Apparatus,** with ground in tubes..... 4.00

2264. **Mitcherlich's Apparatus,** consisting of glass cylinder and inside cylinder fitted as per illustration.

Capacity	qt.	½	1	2 gal.
Each	$3.50	4.00	6.00	8.00

2265. **Norblad's Apparatus,** for generation of sulphuretted hydrogen and carbonic acid, glass parts.

Capacity	1	2 liters.
Each	$8.00	12.00

2265a. Support for same..... 4.00

2266. **Pohl's Gas Generator,** capacity 1 quart, complete..... 4.00

2267. **Steenbuch's Apparatus** for constant generating of gases. (Jl. Anal. Chem. 1887, P. 397,)..... 5.50

2268. **Zenetti's Apparatus** for generating chlorine water, complete, viz.: generator with two stopcocks, glass stoppered bottles, and glass tubing..... 9.00

2269. **Fresenius' Gas Generator** for sulphuretted hydrogen.

Capacity	pt.	qt.	½ gal.
Each	$1.50	2.00	2.50

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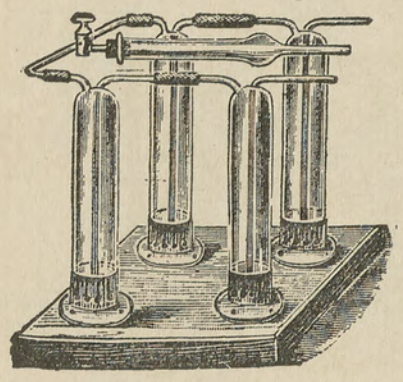

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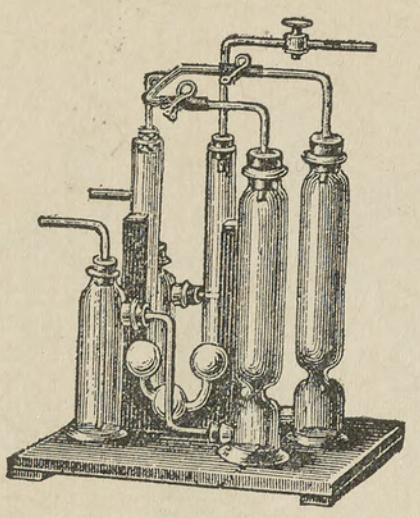

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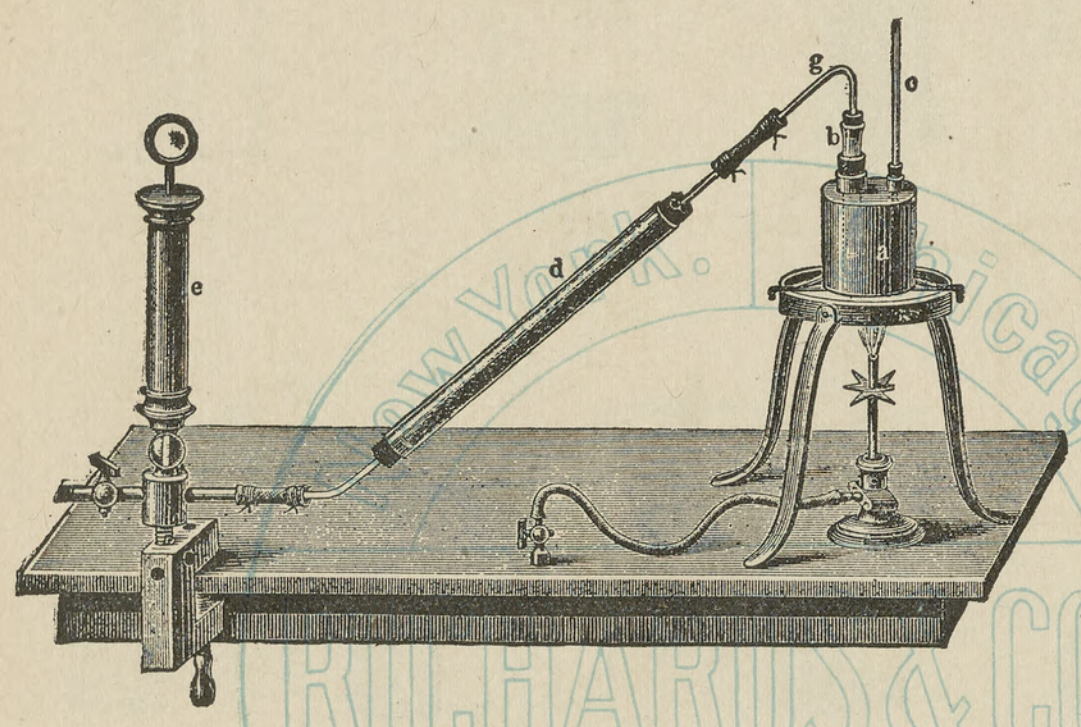

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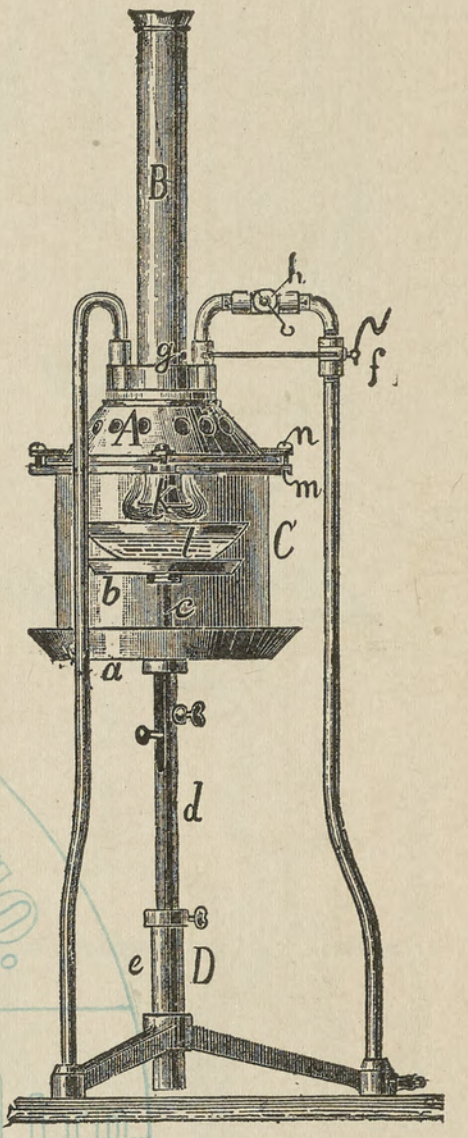


2273

New York. Chicago. RICHARDS & CO. Newark. Hamburg.

K. APPARATUS FOR DRYING, EVAPORATING AND WASHING PURPOSES.

No.

2271. **Bennert's Drying Apparatus for gases,** the cylinders have sealed in tubes and are fixed on a board by brass cups, complete ..... $ 7.50

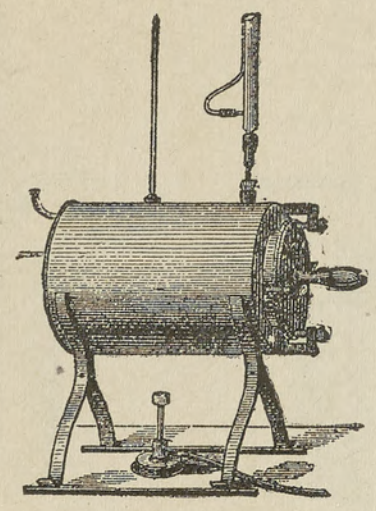
2272. **Glaser's Drying and Washing Apparatus,** for gases, consisting of 2 gas washing bottles, 2 chloride calcium cylinders, U tube with 3 bulbs, glass tube with stopcock, glass and rubber tubing, pinch-cocks and support, complete 9.00

2273. **Hempel's Drying and Evaporating Apparatus,** to be used with Siemens inverted re-generative gasburner. (Berichte. d. Chem. Ges. XXI., P. 900.)

Size	Hourly gas Consumation	Dia. of Evap. Dish	Hourly Evaporation	
No. I	260 Liters	125 mm.	250 ccm	75.00
" II	400 "	270 "	400 "	90.00

NOTE—The flame acts upon the liquid from above, neither bubbling nor spouting of the liquid takes place, thereby a sixfold greater evaporation-capacity is attained than with a water bath.

2274. **Liebig-Mitscherlich's Drying Apparatus** in vacuo, with oil bath, air pump and drying tubes complete 37.50



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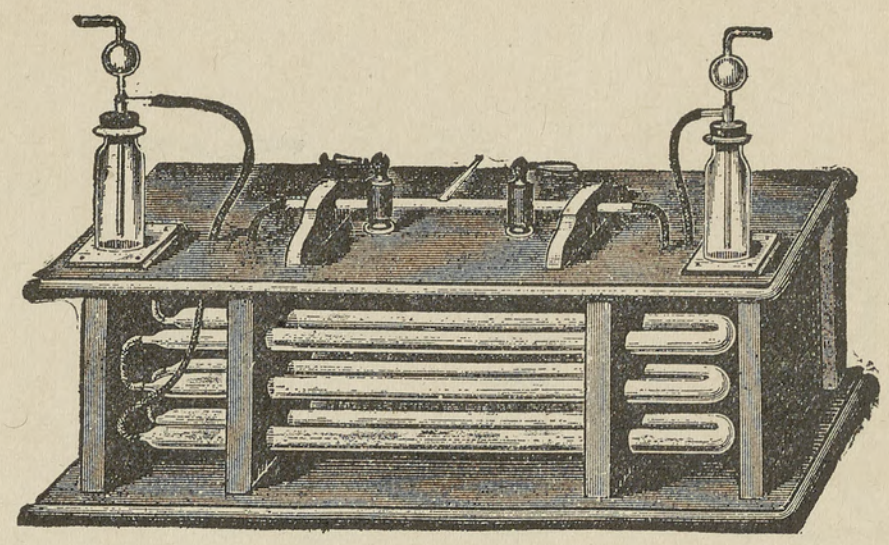

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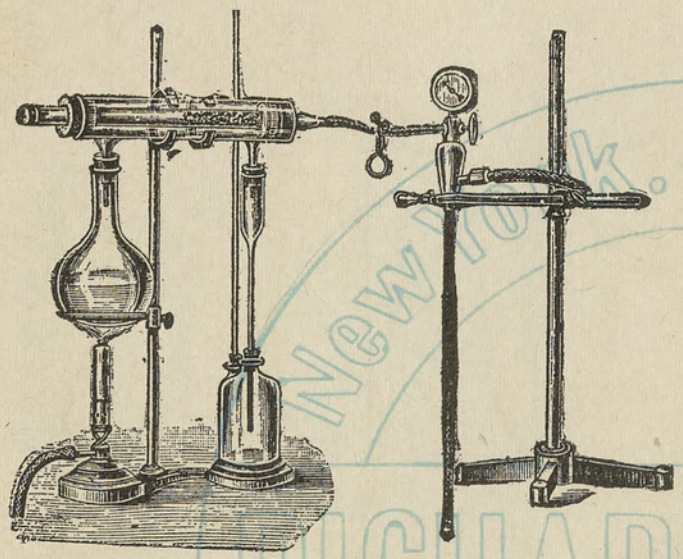

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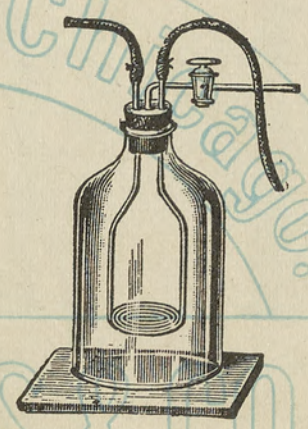

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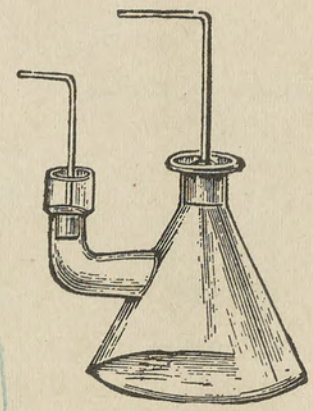

2279

No.

2275. **Apparatus for Drying in Vacuo,** using Arzberger and Zulkowsky's water pump, of heavy copper, tin-lined, perfectly steam and air proof with smooth brass plate. The apparatus measures externally 400x250 mm., the space for vacuum is 150 mm. in diameter, and is provided with two shelves. It is the best apparatus for rapid work as it will dry within 3 hours preparation which generally require 3 days time in dessicator. The apparatus is first heated and after the ring has become correspondingly warm it is covered with Syrian asphalt mixed with paraffine. The plate is then screwed fast to it..... $100.00

2275a. Same apparatus smaller, vacuum being 100 mm. in diameter, with 1 shelf..... 75.00

2276. **Ludewig's Drying Apparatus,** consisting of 2 partitions, each of 3 U formed tubes of 500 mm. length, for soda lime, caustic potash and chloride calcium, 2 gas washing bottles, and stopcocks, after Hlasiwetz; mounted on oakwood box, complete..... 21.00

2277. **Habermann-Zulkowsky's Drying Apparatus** in vacuo, for primary dessication of substances in organic analysis, by means of a filtering pump, and a water, fusel oil, or aniline vapor bath, glass parts only, fitted with corks..... 2.75

(Fres. Zeits. 1881, P. 265.)

2277a. —— **same complete,** with 2 supports and burner without filtering pump..... 5.50

2278. —— **same with extra heating arrangement,** after Anschuetz..... 8.00

(Liebig's Annalen 228, P. 305.)

2279. **Drying and Absorption Apparatus,** consisting of flask with ground in tubes, mercury seal on both necks, height 7 in., capacity 1½ pt..... 1.50

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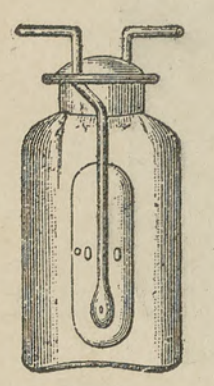

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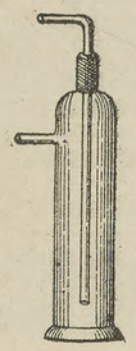

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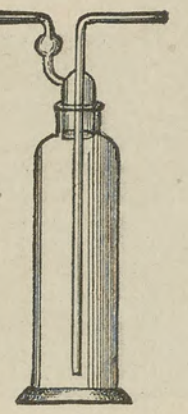

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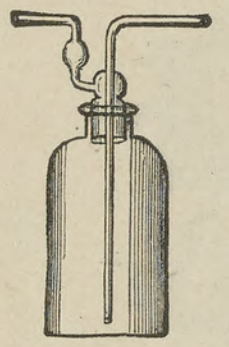

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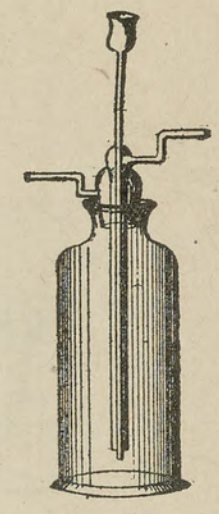

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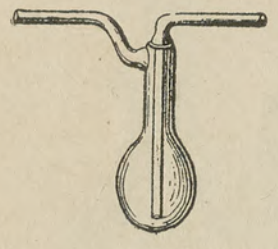

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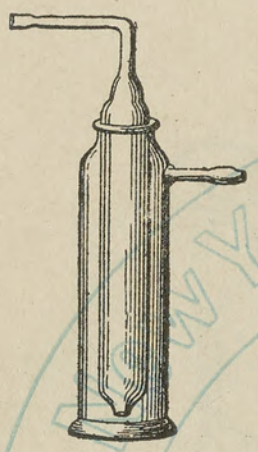

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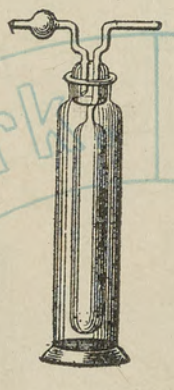

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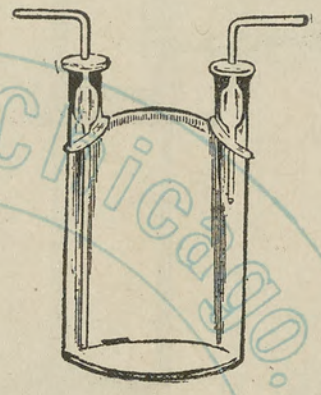

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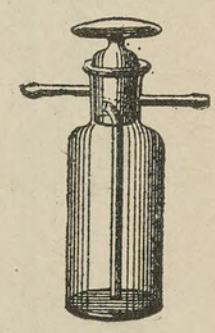


2288

No.

2280. **Gas Washing Bottles, Allihn's.**

Capacity	8	16 oz.
Each	$1.50	1.75

2281. — **Bunsen's,** with tube and rubber connection.

Size	4	8	16 oz.
Each	.40	.50	.60

2282. — **Drechsel's** with **tubes ground into neck,** high or low form, a or b.

Capacity	4	8	16	32 oz.
Each	.75	$1.00	1.25	1.50

2283. — **Drechsel's** with **extra funnel tube.**

Capacity	4	8	16 oz.
Each	$1.25	1.60	2.00

2284. — **Cloez.'**

Capacity	8	16 oz.
Each	$1.00	1.25

2285. — **Habermann's,** capacity 8 oz..... $ 1.50

2286. — **Muencke's.**

Capacity	8	16 oz.
Each	$2.00	2.50

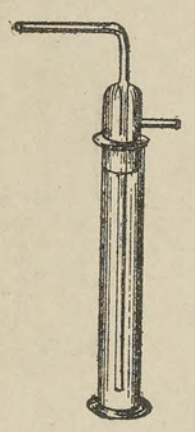
2287. — **Muencke's,** with **mercury seal.**

Capacity	8	16	32 oz.
Each	$1.00	2.00	2.75

(Chem. Zeitg. 1890, P. 234.)

2288. — **Raikow's,** capacity 5 oz..... 2.40

RICHARDS & CO. LTD.



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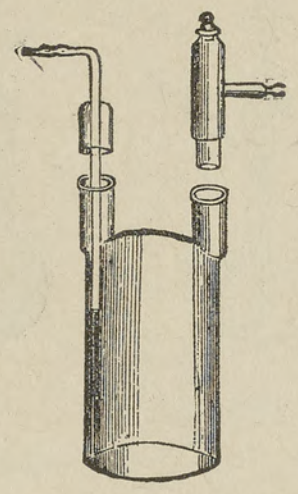

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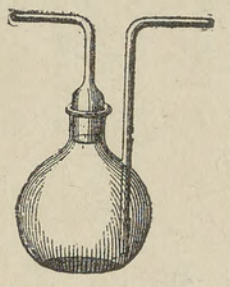

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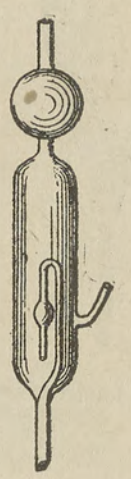

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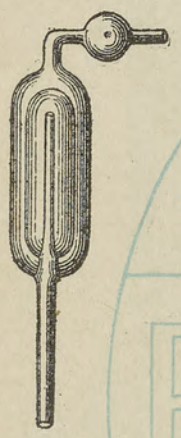

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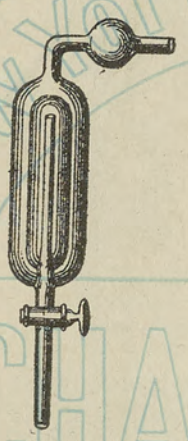

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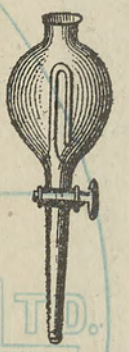

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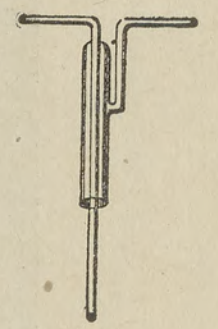


2298

No.

2289. **Gas Washing Bottles, Tieftrunk's,** capacity 16 oz..... $1.20

2290. —— " with sealed in tube, 6 in. high..... 2.00

2291. —— **Voit's,** capacity 4 oz..... 1.10

GAS WASHING TUBES.

2292. **Gas Washing Tube, Kemp's.**

Capacity	100	200 cc.
Each	.60	$1.00

2293. —— **Kjeldahl's**..... 1.50

2294. —— **Muencke's**..... 1.25

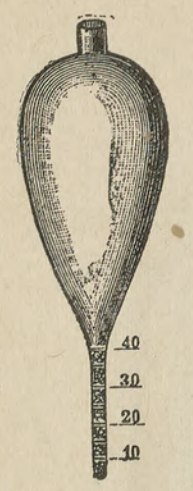
2295. —— " **with stopcock**..... 2.50

2296. —— **Scheibler's**..... 1.00

2297. —— " **with stopcock**..... 2.00

2298. —— **Vogel's**..... .40

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



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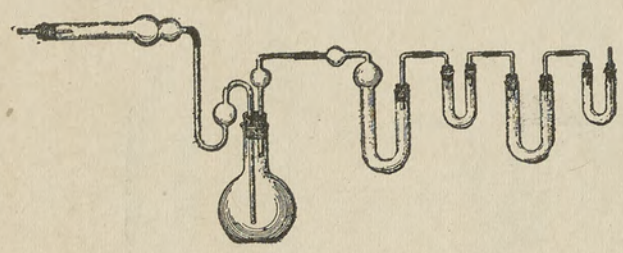

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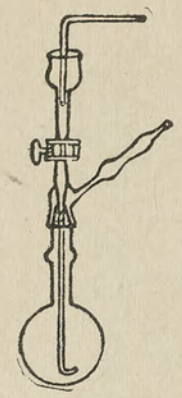

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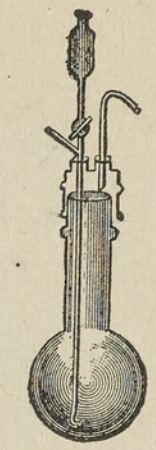

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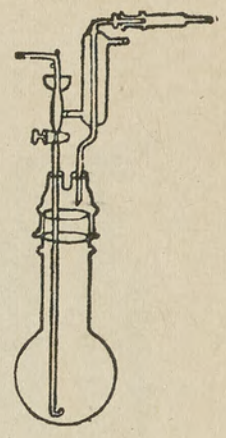

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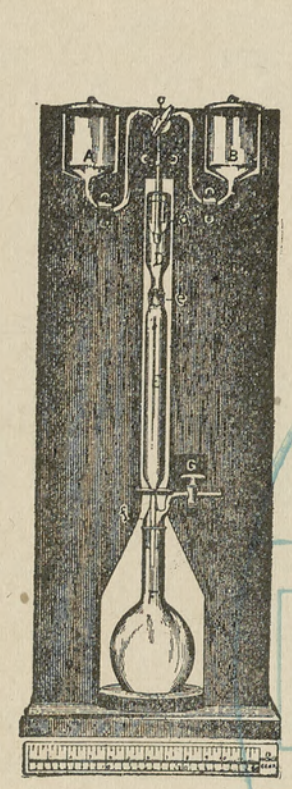

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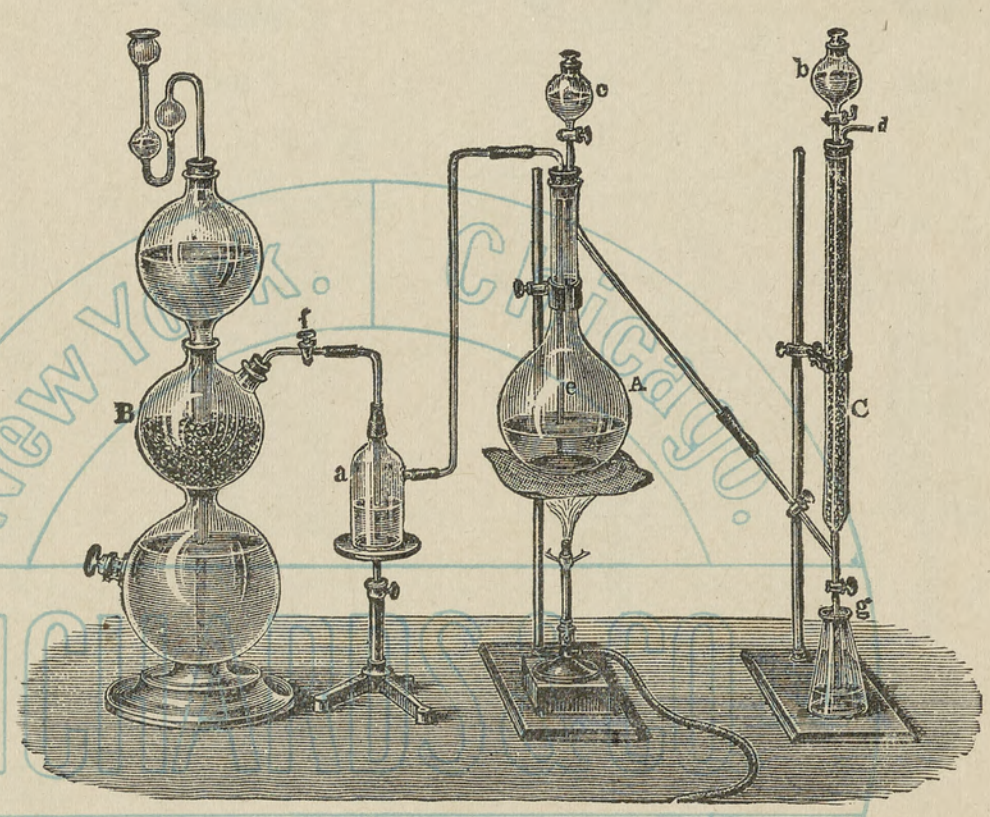


2307

18. APPARATUS FOR IRON AND STEEL ANALYSIS.

No.

2300. **Braun's Patent Centrifugal Machine** for Goetz' method **ascertaining** rapidly the amount of **phosphorous** in **iron and steel,** with 14 graduated bulbs, revolution counter and fittings **$340.00**

(Fres. Zeits, 1889, P. 638.)

2300a. **Goetz's Precipitation Flask** with graduated tube, each glass with number **1.50**

2301. **Finkner's Apparatus** for estimation of **sulphur in iron** **3.50**

2302. **Fresenius' Apparatus** for estimation of **sulphur in iron** **2.00**

2303. **Finkner's Apparatus,** for estimation of **carbon in iron** **6.00**

2304. **Ullgren-Finkner's Apparatus** for the estimation of **carbon in iron** **7.50**

2305. **Clemens Jones' Apparatus** for the **reduction of iron solutions** by filtration through zinc. **20.00**

(Jl. Anal. Chem. 89, P. 123)

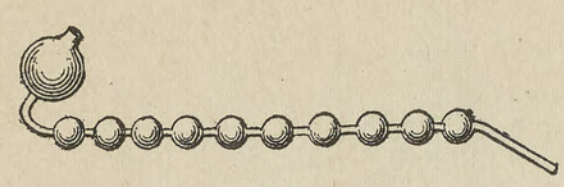
2306. **Ledebur's Apparatus** for **carbon determination** by the combustion method, complete as per illustration **12.00**

2307. **Ledebur's Apparatus** for **sulphur determination** by the bromine method as described by Classen, complete as per illustration **20.00**

2308. **Ledebur's Apparatus,** smaller size consisting of flask "A" and funnel "C" drying tube "C" and funnel "B" without supports **7.50**

2308a. bead tube "C" with 2 stop-cocks not filled **3.75**

2308b. bead tube "C" with 2 stop-cocks filled **4.50**



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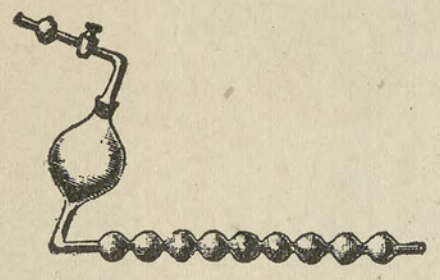

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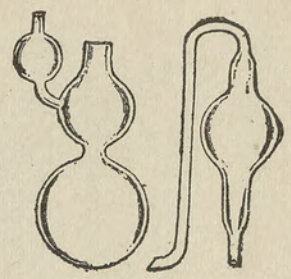

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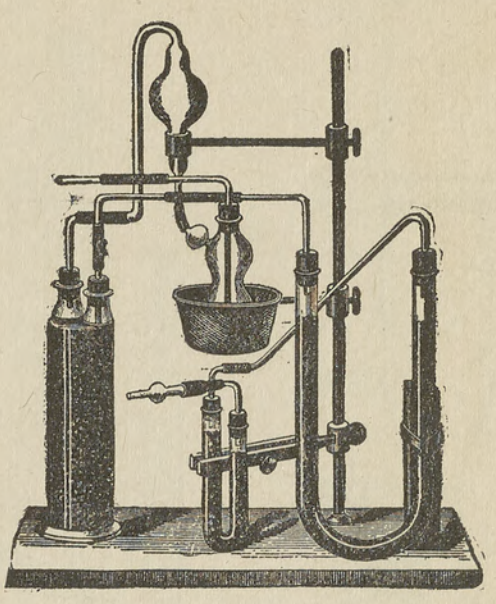

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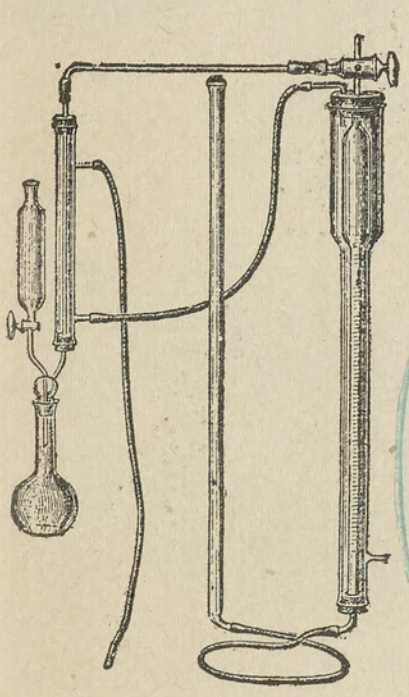

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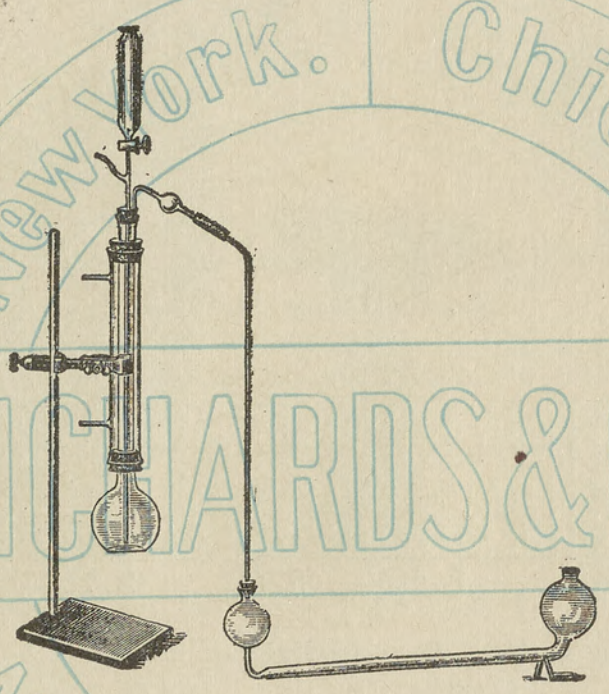

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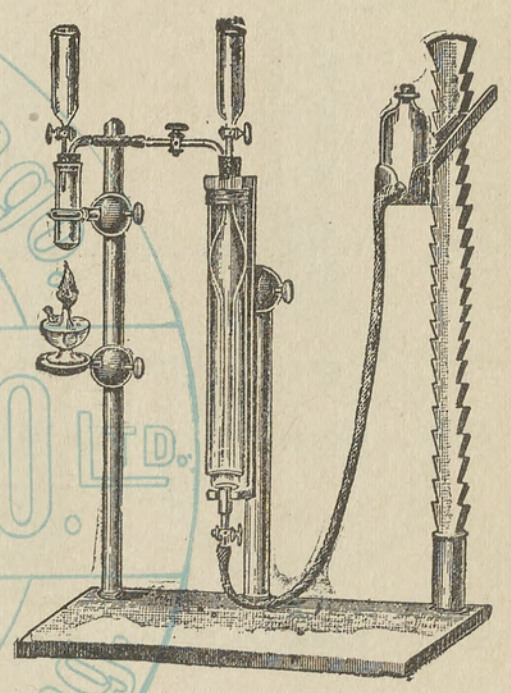


2315

No.

2309. **Meyer's Bulb Apparatus** for **sulphur determination** with 10 small bulbs..... $ 1.25

2309a. same with ground on stop-cock..... 2.75

2310. **Neumann's Apparatus** for determining the **iron in slags**. Glass parts only..... 5.25

(Fres. Zeits, 1887, P. 532.)

Petterson's Apparatus for **carbon** determination see No. 36—Various Apparatus.

2311. **Thoerner's Apparatus** for the determination of **sulphur in iron**, consisting of flask, condenser and separatory funnel, bulb tube and absorption tube as per illustration, (supports extra.)..... 5.00

(Fres. Zeits, 1888, P. 487.)

2312. **Thoerner-Wiborgh's Apparatus** for volumetric determination of **carbon in iron** and steel, complete, without support..... 15.00

(Fres. Zeits. 89, P. 198.)

2313. **Ullgren's Apparatus** for gravimetric **Carbon test in iron,** all glass parts with connections..... 8.00

(Fres. Zeits, 1881, P. 421.)

2313a. Same with supports..... 15.00

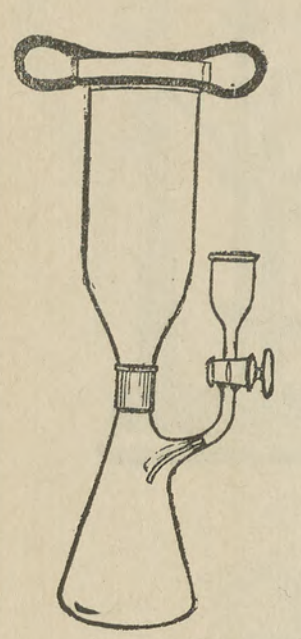
2314. **Ullgren's Carbon Test Flasks** grad. in 20°..... 1.00

(Analyt. Chem. and Pharm. 124, P. 59)

2315. **Wiborgh's Carbon Test Apparatus** for the volumetric estimation of sulphur in iron. Glass parts only..... 8.50

(Fres. Zeits. 1890, P. 198.)

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.



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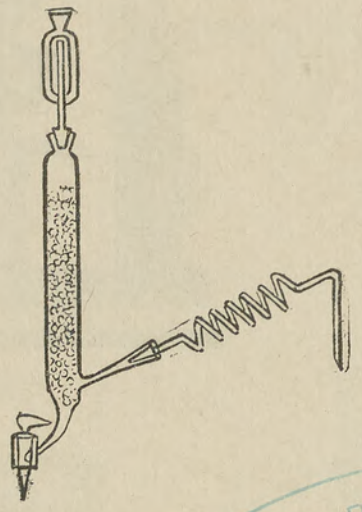

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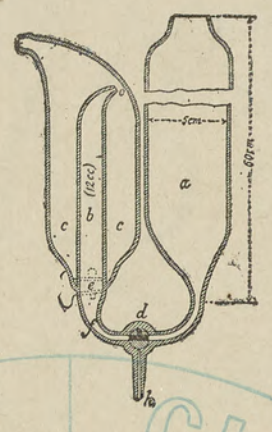

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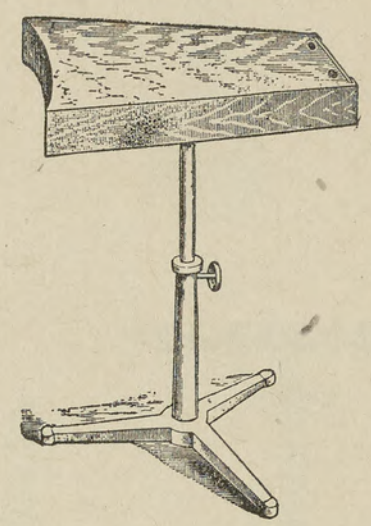

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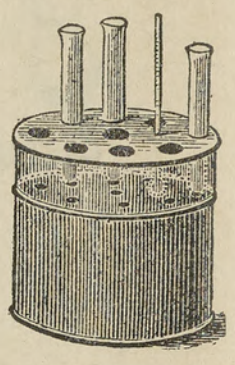


2322

No.

2316. **Wiborgh's Apparatus** for **colorimetric sulphur test, etc**..... $6.00

(Jl. Anal. Chem. 1892, P. 342)

2317. **Burette, with stopcock,** filled with glass beads, and condensing worm..... 5.00

2318. **Eggertz' Color Comparing Tubes,** for the colorimetric estimation of carbon in steel.

Capacity	25	30	50	50	100 cc.
Grad.	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{10}$	$\frac{1}{5}$
Set of 2	$2.25	2.50	2.50	2.75	3.00

2318a. **Eggertz' Color Comparing Tubes,** glass stoppered.

Capacity	50	100 cc.
Grad.	$\frac{1}{5}$	$\frac{1}{5}$
Set of 2	$3.75	4.50

2318b. **Color Comparator,** for Eggertz' Tubes..... 5.00

2318c. **Color Comparator,** mounted on stand. (In ordering it is necessary to give diameter of tubes used)..... 7.50

2319. **Color Comparing Tubes,** in form of test tubes.

Capacity	5	10	15	20	25 cc.
Grad.	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
Each	.50	.55	.60	.65	.75

Supports for Comparing Tubes, See Part I:—Supports.

2320. **Vanier's Measuring Pipette** for equal successive portion of liquids..... 6.00

(Jl. Anal. Ch. 1888, P. 144)

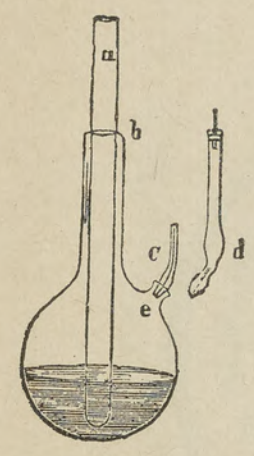
2321. **Dissolving Tubes.**

Size	8x1 in.	9x$\frac{3}{4}$ in.
Dozen	.60	.80

2322. **Water Bath,** Copper, for Dissolving Tubes..... 3.00

See also : Part I.—Tubes, Filtering ; and Part II.—Specific Gravity, Colorimeters, Spectroscopes, etc.

New York. Chicago. RICHARDS & CO. Newark. Hamburg.



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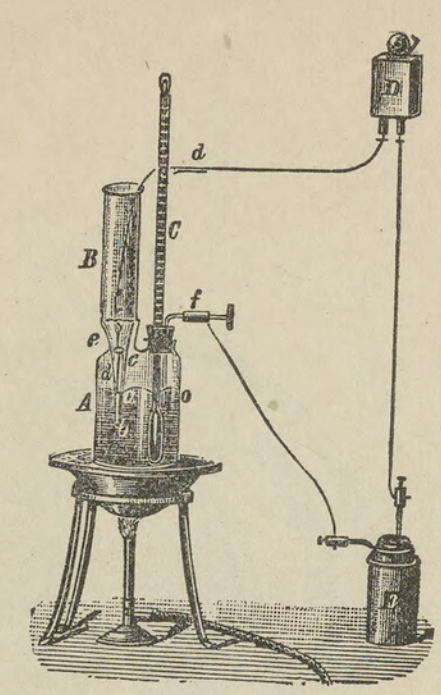

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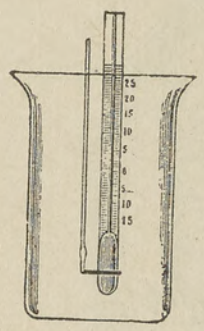

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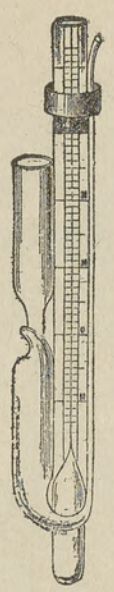

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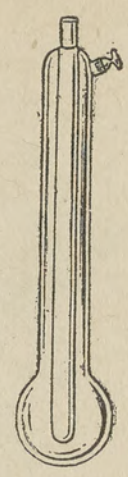

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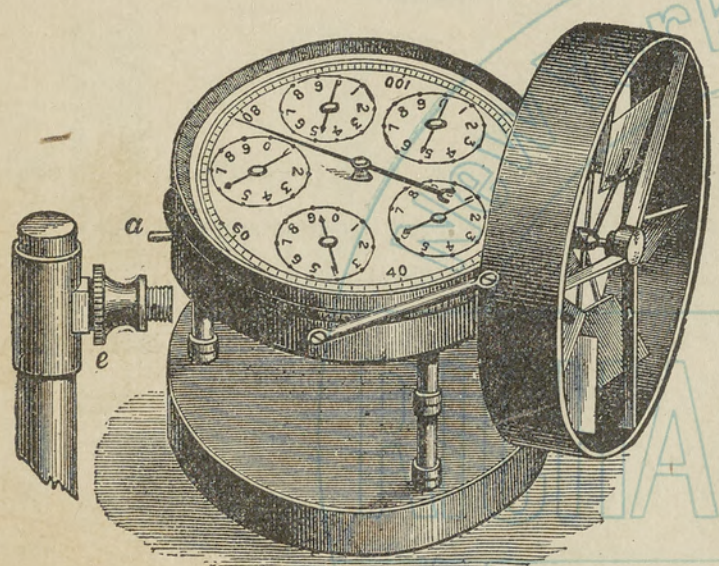

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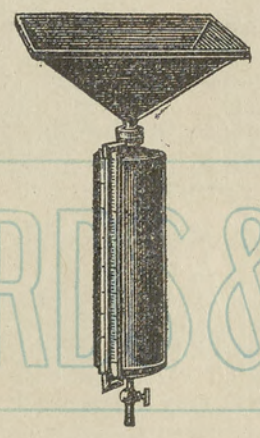

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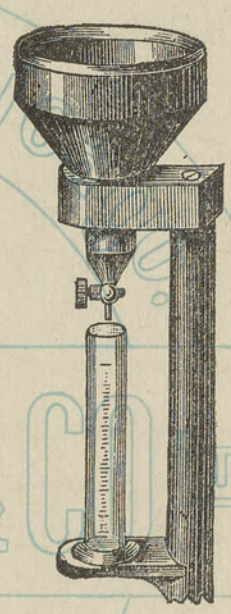

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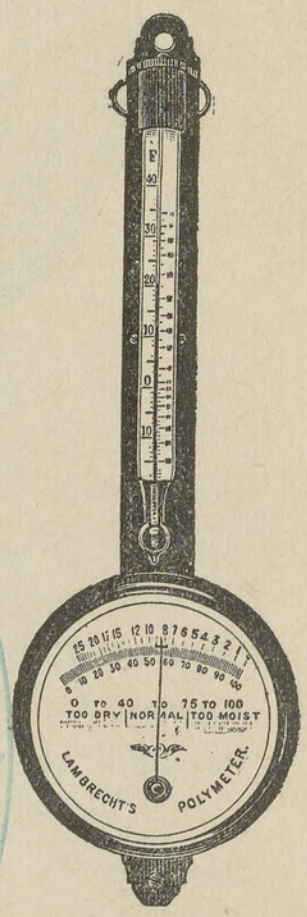


2330

17. APPARATUS FOR MELTING POINT DETERMINATION.

No.

2323. **Anschuetz & Schulze's Apparatus,** with sealed in cylinder..... 3.00
(Berichte Deutsch Chem. Ges. 1877, P. 100 and Fres. Zeits. 1878, P. 470.)

2324. **Christomanus' Apparatus,** with arrangement for electrical signal, complete..... 21.50

2325. **Cross & Bevan's Apparatus,** consisting of Beaker, Thermometer, Platinumfoil and Glass swimmer..... 4.00
(Beilstein Org. Chem. P. 59.)

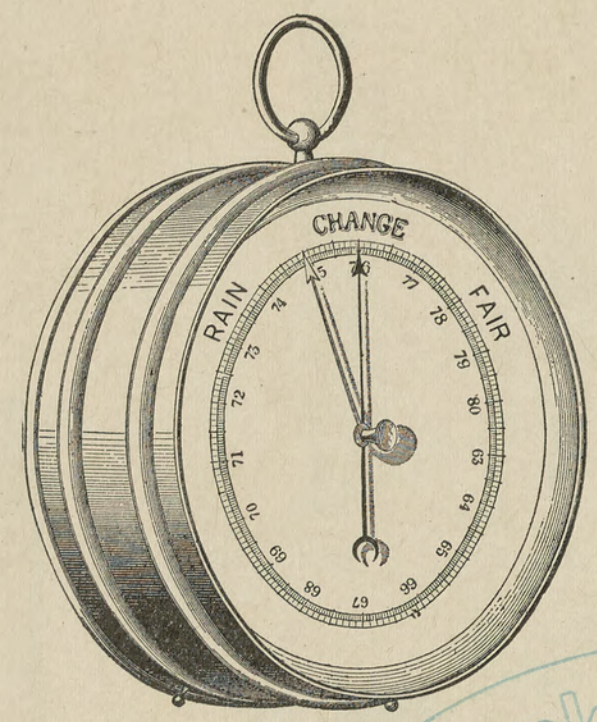
2326. **Piccard's Apparatus;** a U tube, with one large end and one capillary tube..... 4.00
(Beilstein Org. Chem. P. 58.)

2327. **Roth's Apparatus,** with sealed in tube tubulature, and ground in stopper..... 2.00
(Ber. d. Deutsch. Chem. Ges. 1886, P. 1971.)

20. APPARATUS FOR METEOROLOGY.

2328t. **Normal or Standard Barometer.** The construction of this instrument is on that principle known as Fortin's, in which the mercury in the cistern is adjusted at each observation to a fixed ivory point, the zero of the scale. The tube is half an inch in interior diameter. The cistern is made partly of glass, showing the ivory point, or zero, to which the mercury in the cistern is adjusted at each observation by means of the thumb-screw shown at the base of the figure. The vernier reads to the 500th part of an inch, and is adjusted by a rack and pinion. A delicate thermometer is attached in the front of the barometer, and shielded from injury by the brass casing. The whole instrument is finished with brass and mounted upon a solid mahogany frame, as shown in the cut..... 65.00

2329t. **Standard Smithsonian Barometer.** Reading to $\frac{1}{100}$ of an inch..... 35.00



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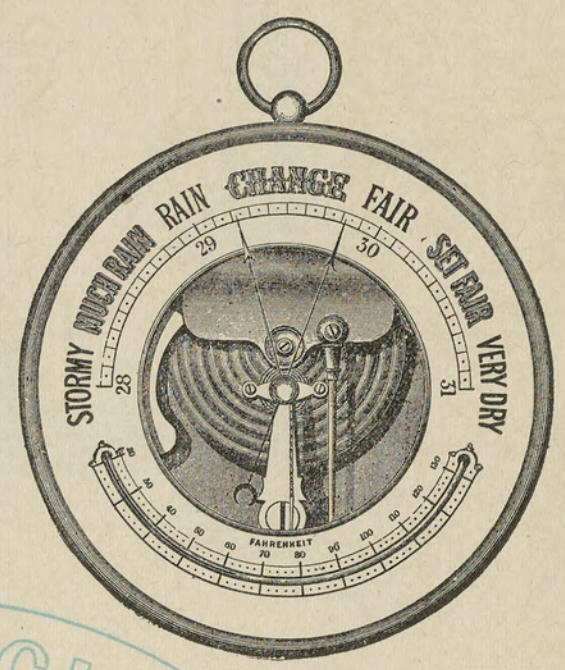

2331

No.

2330n. **Polymeter,** for determining humidity, vapor, pressure, dewpoint and temperature. (Cut, page 217)..... **$8.00**

2331n. **Aneroid Barometer,** in lacquered metal case, open silvered metal dial, two curved thermometers reading Fahrenheit, Reaumur and Celsius scales, beveled glass front, in velvet lined case 8 in. size..... **16.00**

2331a.n **Aneroid Barometer,** as No. 2330, 6½ in. size..... **12.50**

2332n. **Aneroid Barometer,** as No. 2330b but without thermometer, 5 in. size..... **9.00**

2333. **Portable Air Meter,** for measuring air currents in sewers, mines, hospitals, etc., with stop and counting work recording the velocity up to 10,000,000 feet. In leather case..... **22.50**

2334. **Portable Air Meter,** as No. 2333, with two extra small dials recording to 1000 feet..... **21.50**

2335. **Hiram's Anemometer,** for registering current of air in mines, etc., with disconnector. Directions for use supplied with each instrument.

2335a. **Hiram's Anemometer** of 12 in. diameter reading to 10,000,000 feet, in case..... **45.00**

2335b. —— " " 6 " " " 10,000,000 " " **40.00**

2335c. —— " " 6 " " " 1000 " " **25.00**

2335d. —— " " 4 " " " 1000 " " **20.00**

2335e. —— " " 2 " " " 1000 " special watch form..... ..... **30.00**

2336n. **Wind Vane Compass,** for ascertaining the direction of the Wind, 2⅛ in. diameter, bee needle, agate centre, in German silver case..... **12.00**

2337. **Rain Gauge,** area of funnel $\frac{1}{10}$ sq. meter with zinc cylinder, stopcock, glass gauge and brass scale, giving the amount of rain in cubic centimeters. (Cut, page 217)..... **22.50**

2338. **Rain Gauge,** consisting of zinc funnel of 1 sq. decimeter, and stopcock and glass cylinder. (Cut, page 217). **15.00**

2339. **Rain Measure Cylinder,** showing the amount of rain in millimeter..... **1.25**

2340. **Hygrometer, Daniell's**..... **6.00**

2341. " **Mason's**..... **2.50**

2342. " **August's**..... **12.00**

2343. " **Mitthoff's.**

Size	Sml.	Med.	Lge.
Each	$2.75	8.00	12.00

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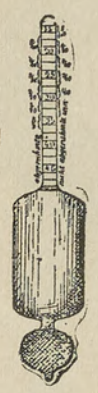

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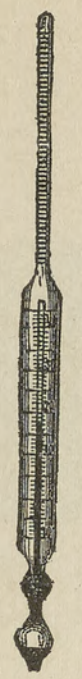

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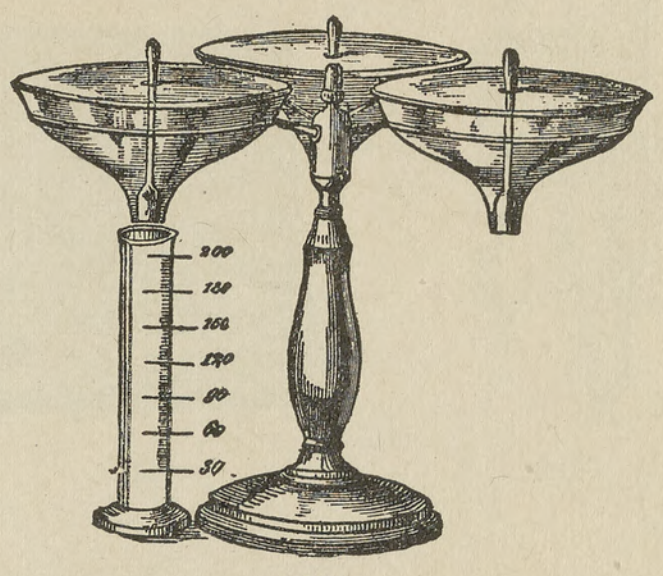

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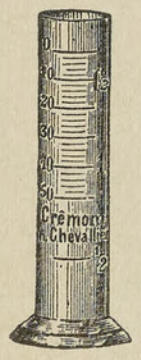

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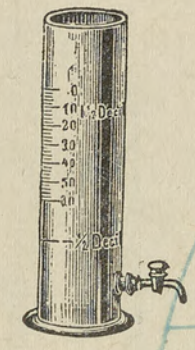

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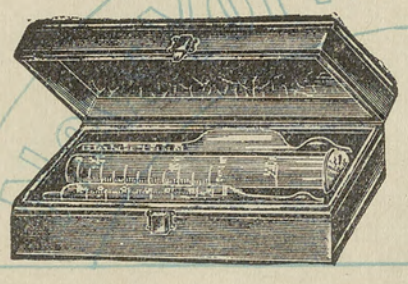

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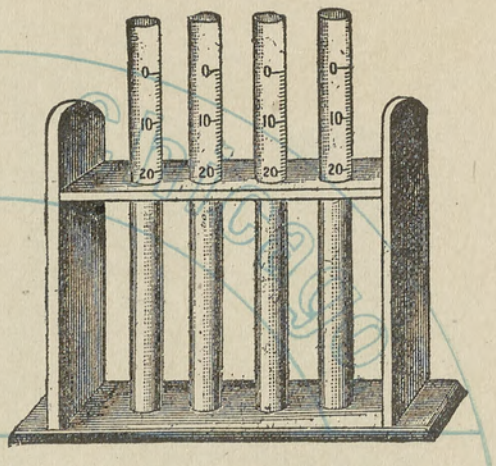

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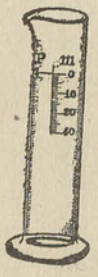

2360

21. APPARATUS FOR MILK ANALYSIS.

A. AREOMETERS.

No.		
2344.	**Lactometer,** with mark, indicating "good milk," "$\frac{1}{4}$ water," "$\frac{1}{2}$ water" and "$\frac{3}{4}$ water"	$ 1.00
2345.	—— as No. 2344, with sealed in thermometer	2.50
2346.	**Lactodensimeter, Quevenne's,** indicating specific weight	2.00
2347.	—— as No. 2346, with thermometer sealed in, reaching above surface of the milk	2.75
2348.	—— **Soxhlet's,** with large scale intervals reading to the fourth decimal (accepted by the Bavarian chemists); in pasteboard case	2.50
2348a.	same in fine leather case	4.50
2349.	—— **Soxhlet's,** as No. 2348, with thermometer in body, in pasteboard case	4.00
2349a.	same in fine leather case	6.50
2350.	**Correction Tables,** for fresh and skimmed milk	.25
2351.	**Lactodensimeter, Recknagel's,** of hard rubber, scale divided into $\frac{1}{5}$ degrees, with reduction table and directions	10.00
2352.	—— **Quevenne's,** improved by Mueller	2.00
2353.	**Lactometer, Board of Health**	.50
2354.	—— same with thermometer	2.00

B. CREMOMETERS.

2355.	**Cremometer, Krocker's,** for measuring the cream of three different kinds of milk; consisting of three glass jars with cover and ground in stoppers; with graduated cylinder, on support	10.00
2356.	—— **Chevalier's,** with scale	1.00
2357.	—— same with glass stopcock	3.00
2358.	**Milk Testing Apparatus, Mueller's,** consisting of cremometer, Quevenne's lactodensimeter, Celsius thermometer, correction table and directions; in case	7.50
2359.	**Cream Tubes,** set of four, on wooden stand	3.00
2359a.	Single Tubes	.60
2360.	**Cream Cylinders,** of glass, on foot; giving direct percentage of cream	.50

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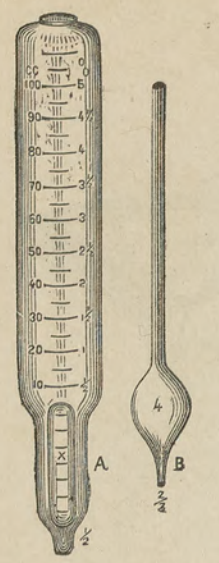

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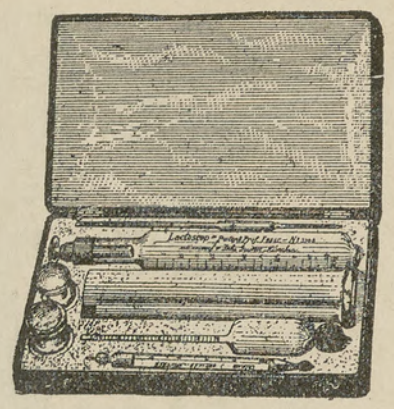

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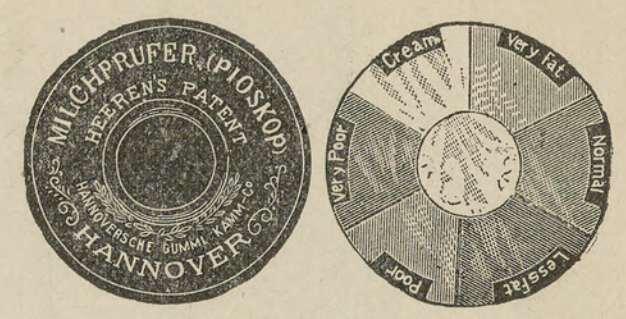

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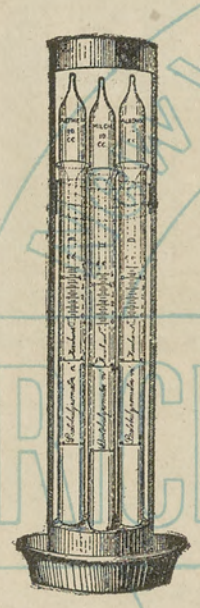

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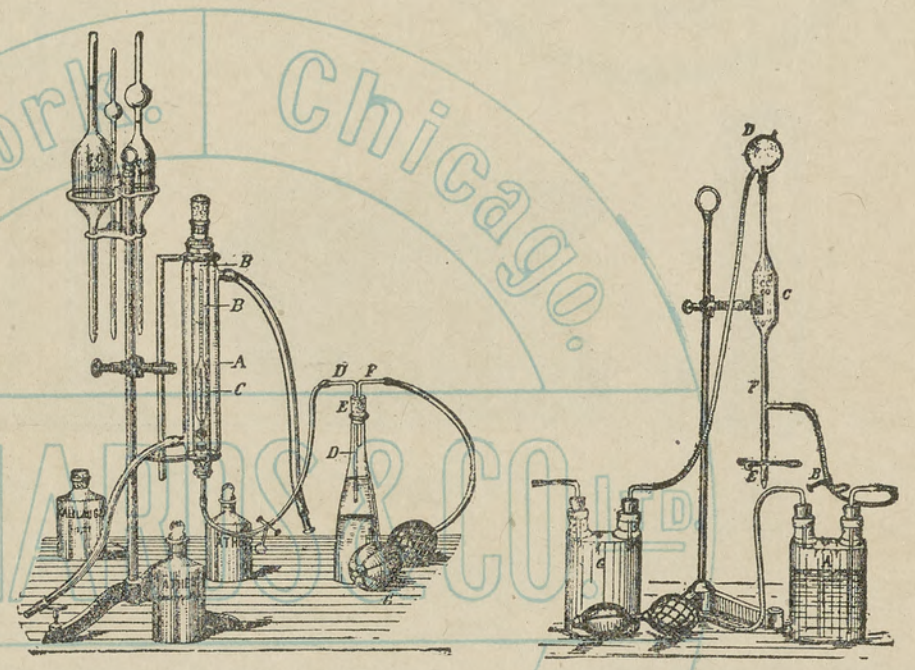

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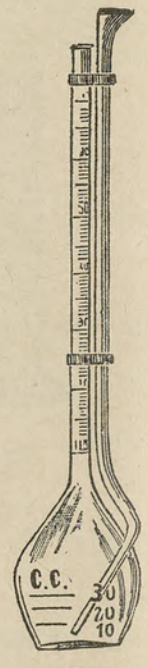

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C. FAT DETERMINATION.

No.

2361. **Lactoscop, Feser's,** for rapid determination of fat, with pipette and directions; in polished case..... $ 3.40

2362. **Complete Apparatus for Testing Milk, Feser's,** consisting of lactoscop with pipette, lactodensimeter, thermometer, glass cylinder, tincture of iodine and litmus paper; with tables and directions, in case..... 12.50

2363. **Pioscop, Heeren's** color tester..... .50

2364. **Lactobutyrometer, Marchand's,** on foot..... 1.00

2365. —— **Marchand's,** modified by Gerber..... 2.50

2366. —— **Marchand's,** for three simultaneous determinations; consisting of three lactobutyrometers, three 10 cc. pipettes, marked: Milk, Ether, Alcohol; brass cylinder, serving as water bath; with directions and tables; in case..... 10.00

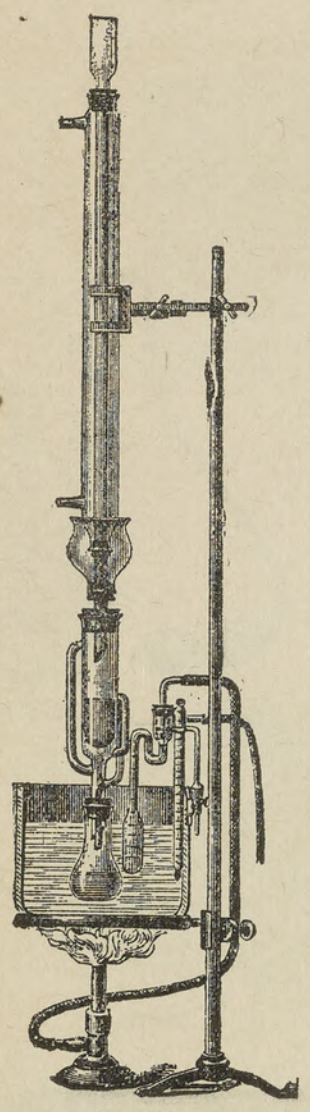
2367n. **Fat Determination Apparatus, Soxhlet's,** by areometer method; consisting of support with adjustable clamp, condenser, areometer tube, two areometers with thermometer sealed in and tested for rich and poor milk, three measuring tubes, potash solution, ether, rubber tubing connections with pinchcock, rubber bulbs, ten bottles numbered, of 300 cc. capacity each; with directions and tables. 30.00

(See Jl. Anal. Chem. 1887, p. 124.)

2368. **Etherpipette, Soxhlet's,** of 60 cc. capacity, for areometric determination of fat, complete as per illustration; support and pipette holder nickel-plated; the great advantage is that the ether is not sucked up by the mouth, but mechanically..... 12.50

2369. **Lactobutyrometer, Demichel's,** very reliable for quick determination of fat..... 3.00

2370. —— **Caldwell's,** consisting of graduated tube with rubber stopper, two pipettes and one cylinder..... 2.50



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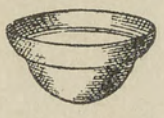

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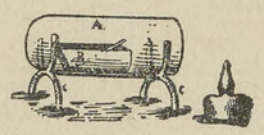

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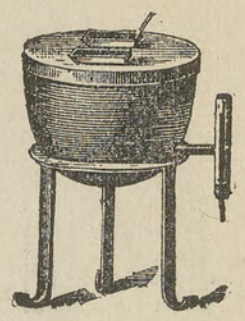

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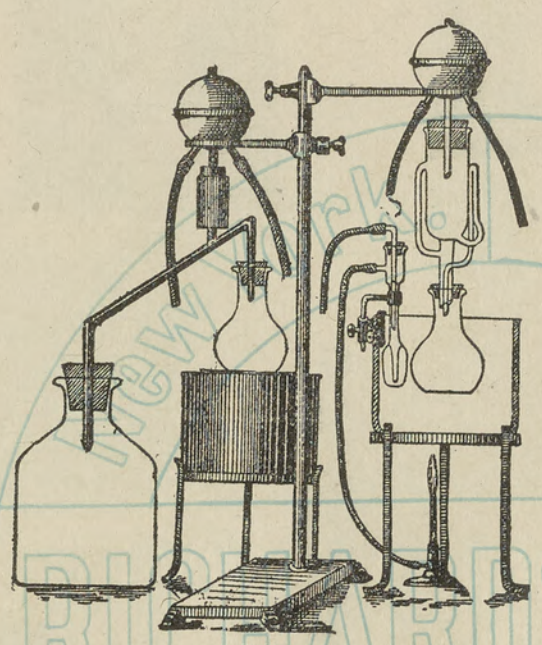

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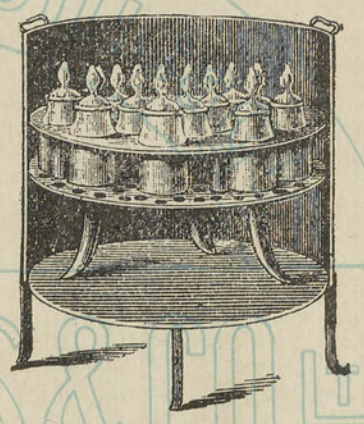

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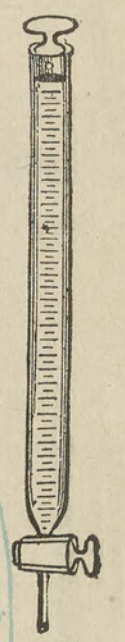

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D. DETERMINATION OF FAT AND DRY SUBSTANCES BY CHEMICAL PROCESS.

No.

2371. **Complete Extraction Apparatus, Soxhlets,** with upright condenser, clamp, tripod, regulator for temperature, thermometer, enameled water bath on tripod, and gas burner for same..... $30.00

2372. The same **with Soxhlet's new ball** or reverse flow condenser..... 32.50

2373. The same apparatus as No. 2372 **with a second ball condenser** and distilling tube for regaining the Ether, as per illustration..... 45.00

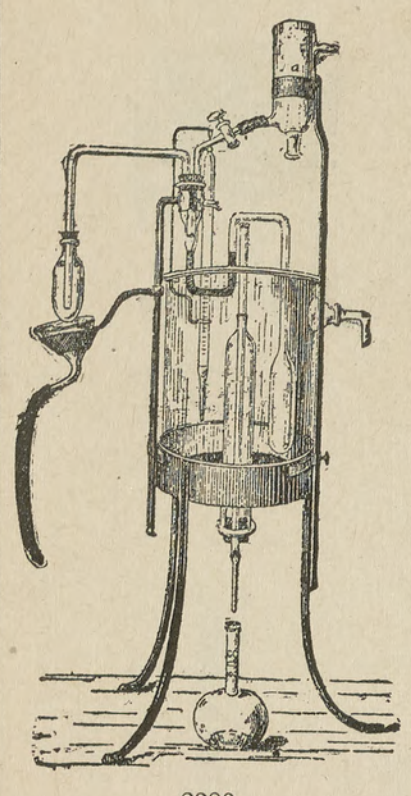
2374. **Hofmeister's** Dishes, for Evaporating, of very thin glass.....Per doz 1.25

2375. **Apparatus for determining Dry Material, Vogel's,** consisting of weighing glass, with 2 boats of nickel, glass stirring rod, horizontal and vertical support, constant level water bath and disc of tin with 2 openings for the sheet iron boats..... 10.00

2376. **Water Bath, Soxhlet's,** with 12 Drying Tubes..... 20.00

2377. **Separating-Burette, Roese's** for determining fat in milk, with stopcock. Capacity 100 cc. in $\frac{1}{2}^{o}$ 6.00

(Fres. Zeits. 1888, P. 100.)



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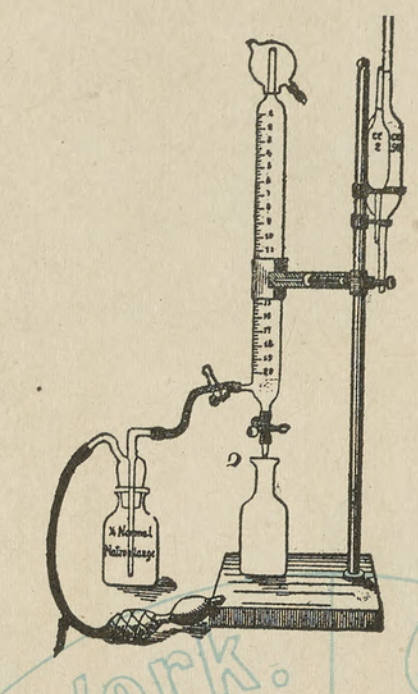

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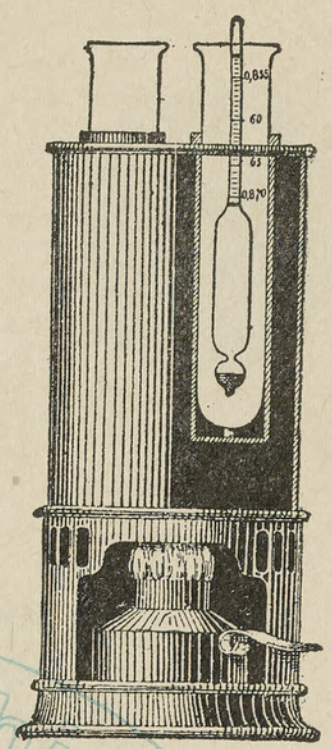

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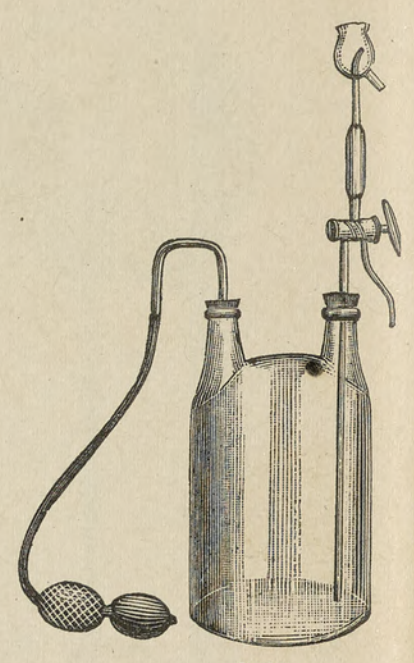

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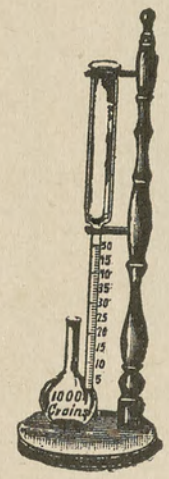

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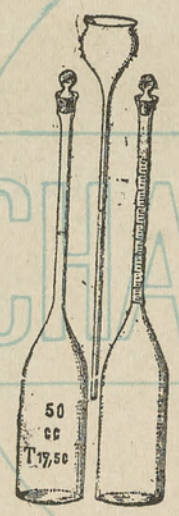

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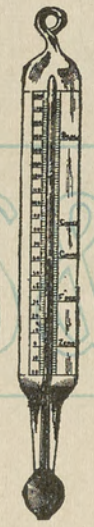

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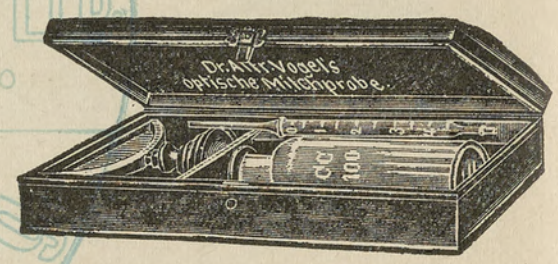

2384

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E. DIFFERENT APPARATUS.

No.

2379. **Halimeter, Fuchs'** ..... $ 2.00

2380. **Viscosimeter, Reischauer's,** for Milk, with regulator for temperature after Soxhlet. Complete with directions 24.00

2381. **Titration Apparatus Soxhlet's** and **Henkel's**, for the determination of the acidity of milk, metal parts all nickel-plated, support with enamelled iron plate, with directions 17.50

2382. **Butter Analysis Apparatus, Koenig's**, for distinguishing margarine from true butter; for 2 simultaneous determinations, with 2 areometers, water bath with nickel-plated support and alcohol lamp 10.00

2383. **Piknometer, Reischauer's,** with mark on neck, and ground in stopper 2.00

2383a. Same, **with Aubrey's Millimeter** scale on neck 2.75

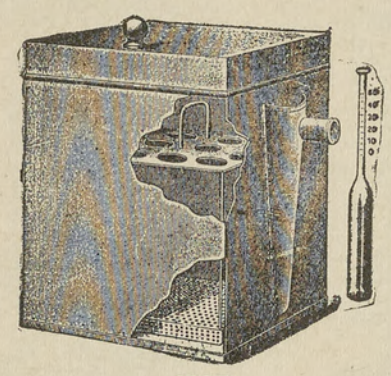
2383b. Funnel for same, with long drawn out point ..... .25

2384. **Optical Milk Tester, Vogel's** consisting of cylinder, receiver with mark of 100 cc. and test tube; with directions, in elegant case 8.00

2385t. **Paper, for absorbing milk, Adams,** absolutely free from fat, recommended by Prof. Soxhlet. In strips 6½x56 ctm., 50 in a package 1.75

2386. **Dairy Thermometer,** floating, 8 in. long, marked freezing, cheese, churning and scalding, each .35 Doz. 3.00

2386a. **Automatic Measuring Apparatus,** Farrington's Design, for Babcock's Milk Test; consisting of 17.6 cc. pipette, etc., as per illustration 8.50



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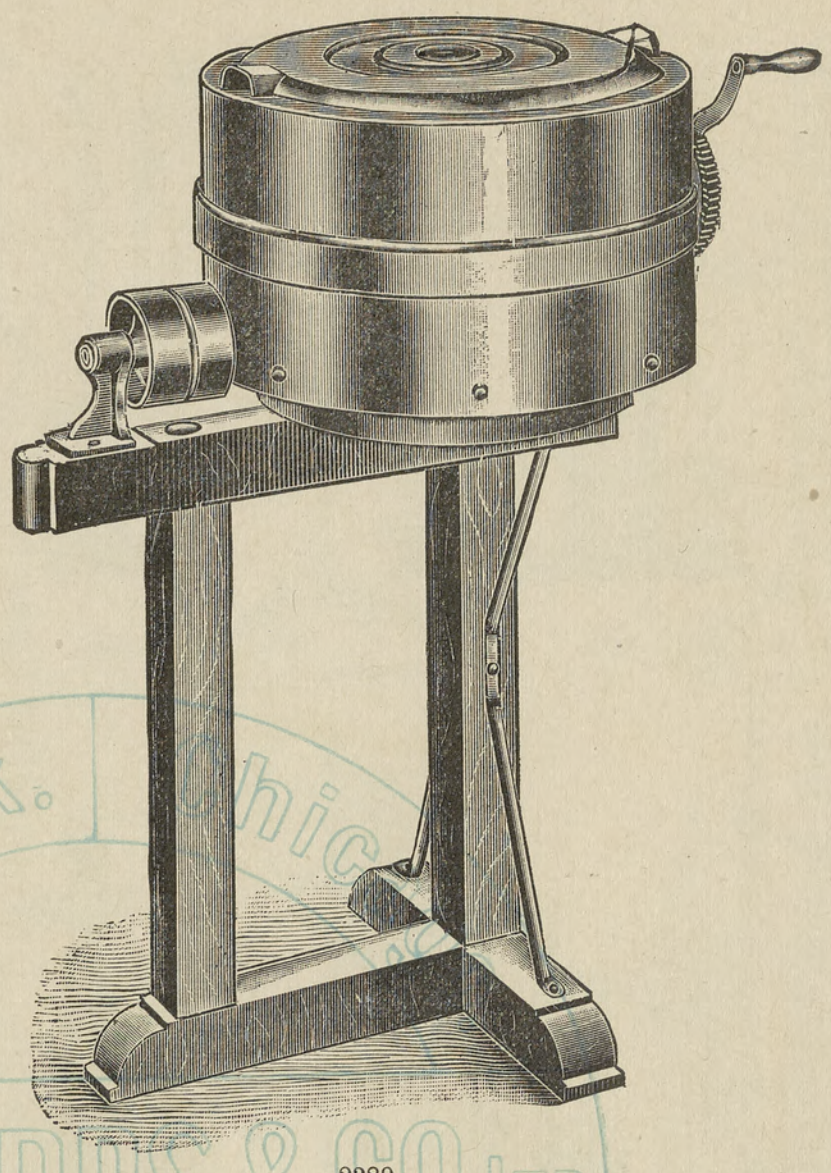

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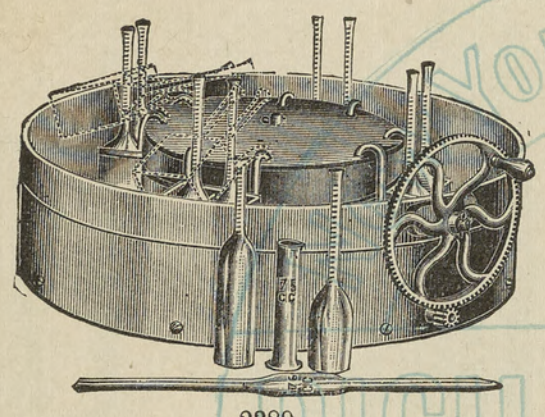

2389

No.

2387. **Milk Testing Apparatus,** Short's, complete..... $15.00

Single parts,

2387a. Tubes, 2 cc. graduated in 50 parts.....Per doz 4.50

2387b. Tubes, plain..... " " 2.25

2387c. 1 Copper Water-bath, with rack..... 7.00

2387d. 2 Pipettes, each 10 cc..... .40

2387e. 1 Pipette, 20 cc..... .25

2387f. 1 Pt. Wash Bottle..... .60

(Jl. Anal. Chem. 1888, P. 371.)

2388. **Milk Testing Apparatus, Cochran's.**

For	4	12	32	60 tests.
Each	$10.00	25.00	42.00	50.00

2389t. **Milk Testing Apparatus, Babcock's,** for the estimation of fat in milk, with Roe's improved Swinging Heads.

a. Four bottle test..... 8.00

b. Eight " 10.00

c. Twelve " 14.00

d. Twenty-four bottle test..... 21.00

NOTE.—With each machine is included Testing Bottles, Pipette, Acid Measure and Acid for 50 to 200 tests according to size.

Single parts,

e. Test Bottles, with graduated neck.....Per doz. 4.00

f. Measuring Pipettes..... " 2.25

g. Graduates, for acid..... " 2.50

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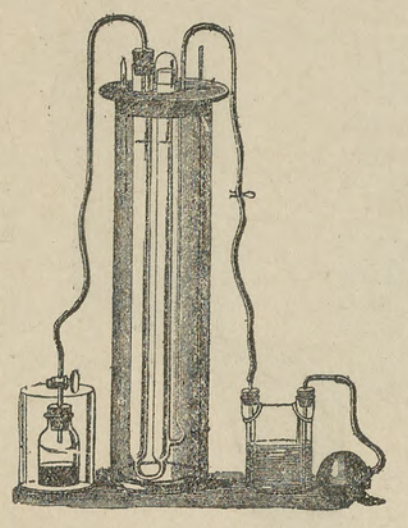

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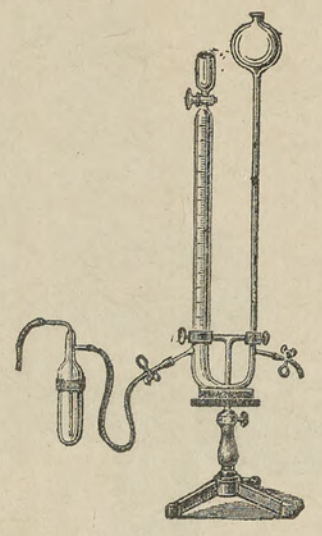

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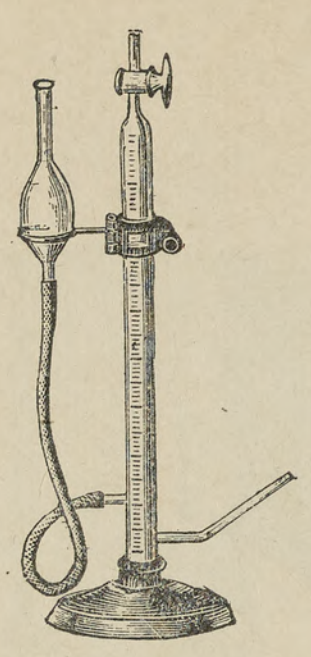

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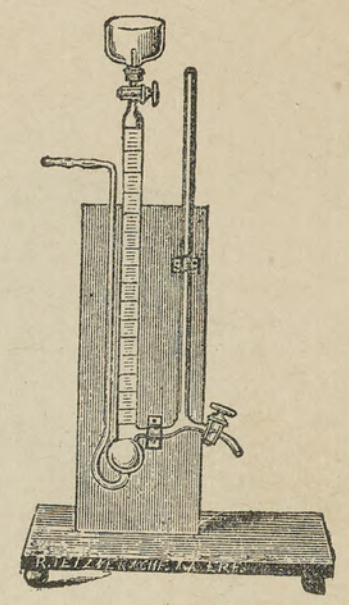

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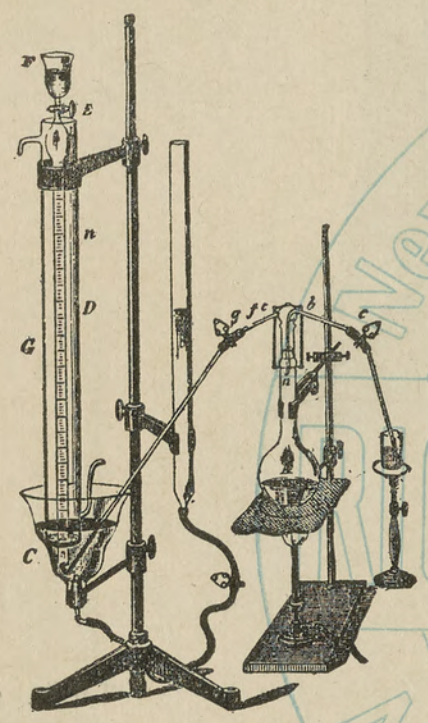

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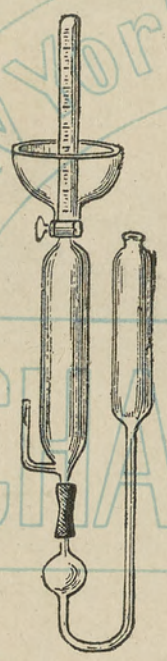

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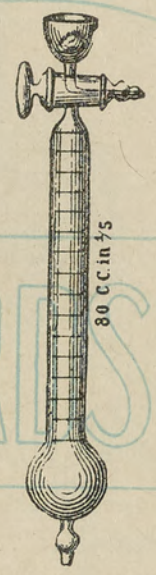

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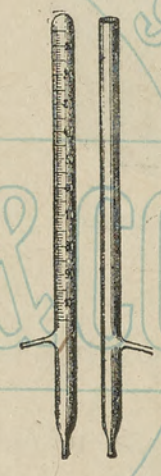

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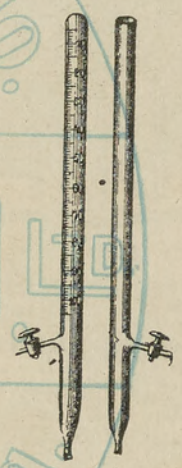

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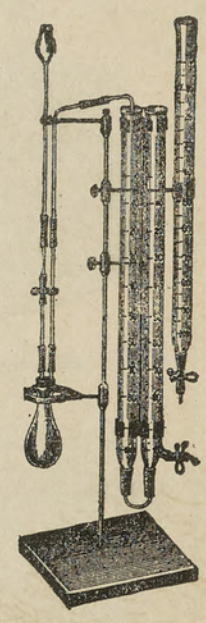


2409

22. APPARATUS FOR NITROGEN DETERMINATION.

A. GENERAL APPARATUS.

No.

2400. **Franke's Burette for Nitrogen determination** $10.00

2401. **Knopp-Wagner's Apparatus.** (Neubauer & Vogel 81, P. 275 and Fres. Zeits. 1883, P. 383)..... 20.00

2402. **Ludwig's Apparatus,** for volumetric determination of nitrogen, with support..... 7.50
(Berichte d. d. Chem. Ges. 1880, P. 833)

2403. **Schiff's Apparatus,** with reservoir. (Berichte d. d. Chem. Ges. 1880, P. 881)..... 4.50

2404. **Schwartz' Apparatus,** measuring tube of 50 cc. in $\frac{1}{10}$, on wooden support..... 7.00
(Berichte d. d. Chem. Ges. 1880, P. 77, and Fres. Zeits. 1881, P. 259)

2405. **Schellbach's Apparatus,** for volumetric determination of nitrogen in gun cotton; gas measuring tube with stopcock, of 150 cc. in $\frac{1}{5}$; with water jacket, complete..... 22.00

2406. **Staedel's Apparatus,** for collecting nitrogen in volumetric determinations. (Fres. Zeits. 1880, P. 454)... 6.50

2407. **Tennant's Gas Measuring tube,** grad. up to 100 cc. in $\frac{1}{5}$°..... 4.00

2408t. **Zulkowsky's Nitrometer.**

a) without stopcock, without graduation.....each .50

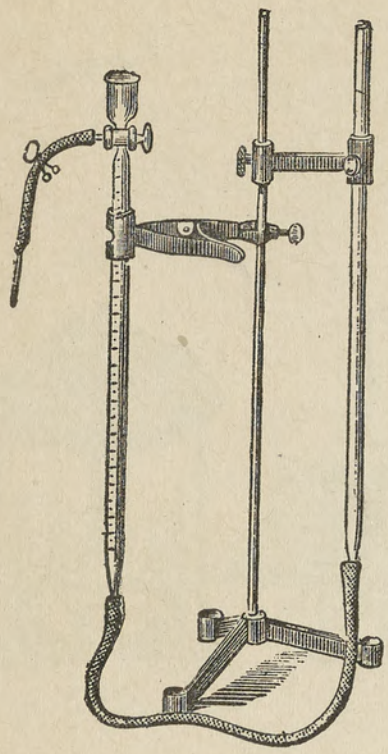
b) " " with " ..... " 1.75

c) with " without " ..... " 1.50

d) " " with " ..... " 3.75

2409. **Knopp's Apparatus,** consisting of 3 burettes 50 cc. in $\frac{1}{5}$, flask, connection tubes, rubber fittings and clamps 15.00

New York. Chicago. RICHARDS & CO. Newark. Hamburg.



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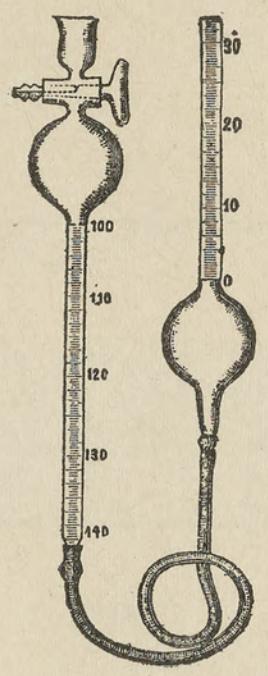

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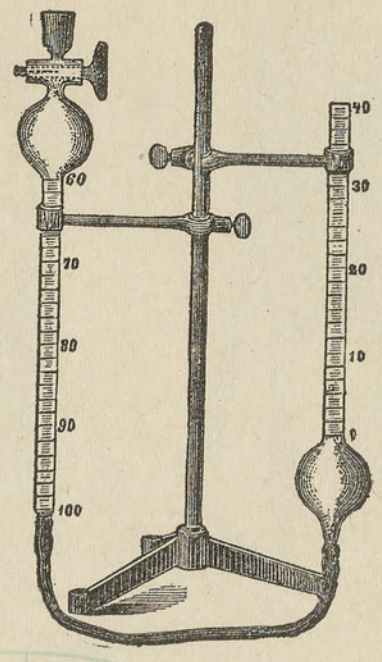

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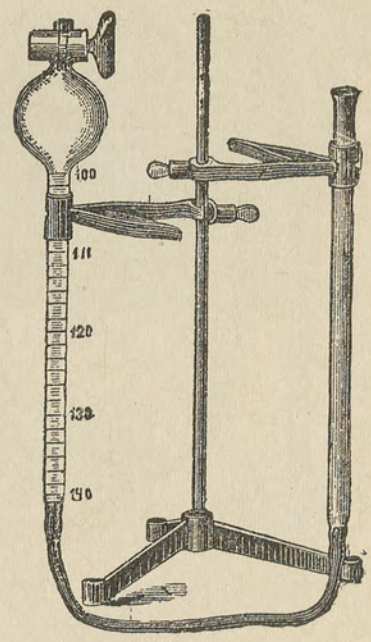

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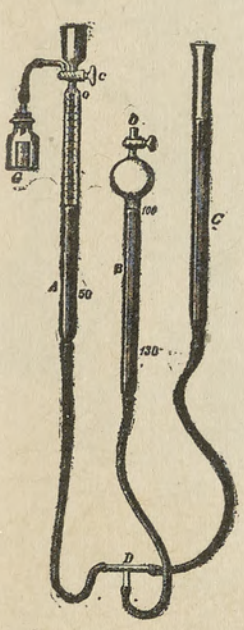

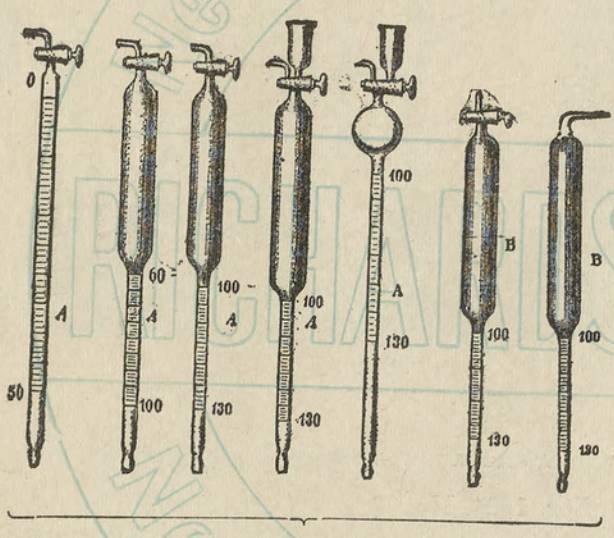

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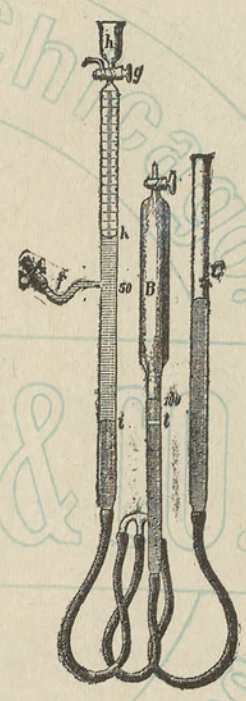

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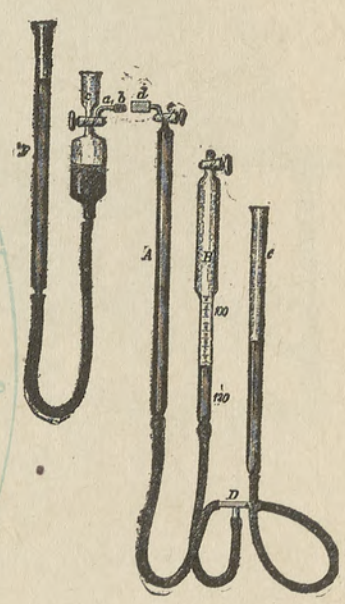


2417

C. LUNGE'S APPARATUS FOR NITROGEN DETERMINATION.

No.

2410. **Lunge's Nitrometer,** for saltpetre, nitroglycerine, etc., graduation 50 cc. in $\frac{1}{10}^0$, without support..... $ 5.00

2411. **Lunge's Nitrometer,** for saltpetre, soda nitrate, nitroglycerine, etc., graduated from 100 to 140 cc. in $\frac{1}{10}^0$, without support..... 6.00

2412. **Lunge's Nitrometer,** for smoke gases, has both the advantages of Bunte's and Hempel's Burettes, with possibility of working over mercury, glass parts only..... 8.00

2413. **Lunge's Correction Apparatus,** in gases, shows exactly the difference in volume, which may be caused by fluctuation of temperature or pressure, leaving out observation by thermometer, barometer, etc., glass parts only..... 6.50

2414. The above with patent stopcock, having angular bore.....extra each 1.25

C. LUNGE'S GAS BURETTES FOR NITROGEN DETERMINATION IN ELEMENTARY ANALYSIS.

(See Berichte d. d. Chem. Ges. 1890, P. 440; Fres. Zeits. 1890, Vol. 5; Chem. Ztg. 1890, No. 26.)

2415. **Gas Volumenometer,** 50 cc. in $\frac{1}{10}^0$, with 3 ways patent stopcock, and accessories..... 14.00

Other forms of Gas Measuring Burettes "A" are:

No.	2	2	3	4	5	6
	50 cc. $\frac{1}{10}$	100 cc. $\frac{1}{5}$	60 to 100 cc. $\frac{1}{10}$	100 to 130 cc. $\frac{1}{10}$	100 to 130 cc. $\frac{1}{10}$	100 to 130 cc. $\frac{1}{10}$
Each	$4.50	4.50	4.50	4.50	6.00	6.00

Other forms of Reduction Burettes "C" are:

2415b. No. 7, with straight outlet tube..... 5.00

2415c. No. 8, with capillary tube for sealing..... 3.00

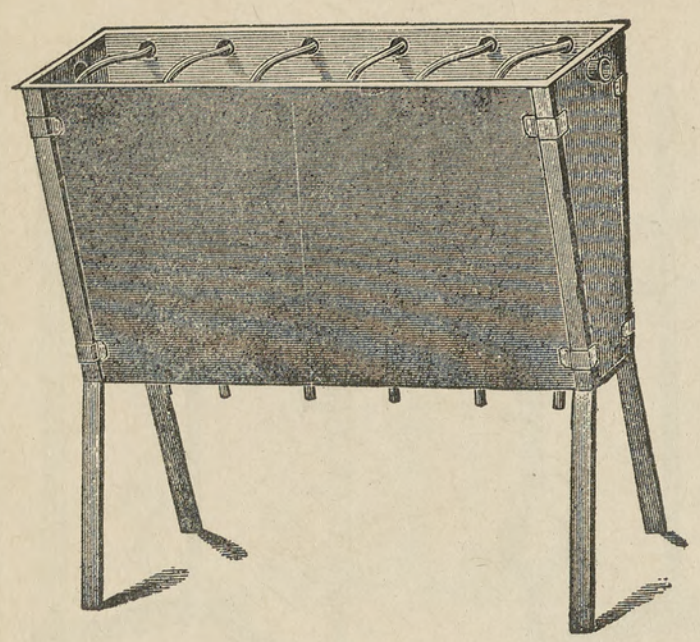
2416. **Lunge-Dumas' Apparatus,** for nitrogen determination, graduation in 50 cc. or 60 mm. nitrogen, consisting of 3 parts, with rubber tubing and T tube..... 16.00

2417. **Apparatus for nitrometric operations,** for analysis of nitrous saltpetre, dynamite, gun cotton, etc., consisting of 5 parts, with rubber tubing and T tube..... 15.00

Directions given with each apparatus without charge.

In ordering please state if the gas volumenometer is for dry or humid gases.

New York. Chicago. RICHARDS & CO. LTD. Newark, England.



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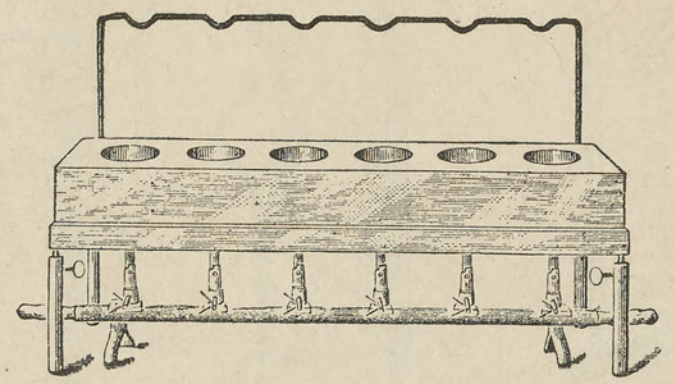

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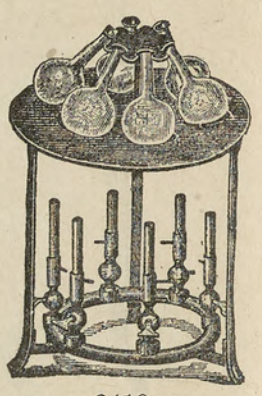

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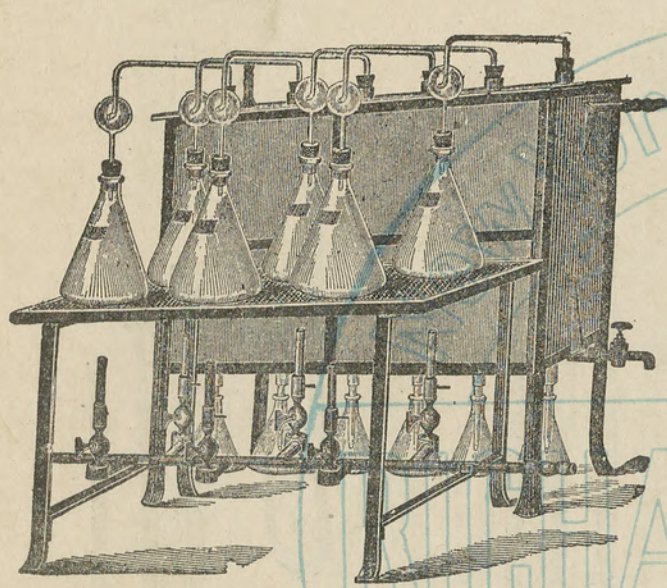

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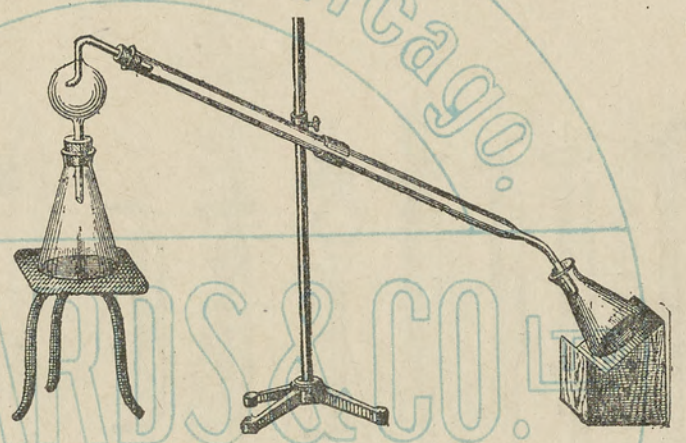

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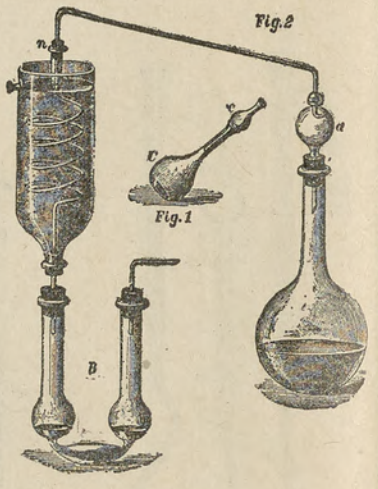


2422

D. KJELDAHL'S APPARATUS, AS USED BY LABORATORIES OF AGRICULTURAL EXPERIMENT STATIONS, FERTILIZER WORKS, ETC.

(Chem. Ztg. 1884, No. 25)

No.

2418a. **Kjeldahl's Condensers,** of copper tin lined, 6 coils of pure block tin..... $30.00

2418b. —— " " " 10 " " " 50.00

2418c. —— " of zinc 6 " " " 25.00

2419a. **Kjeldahl's Digesting Shelf,** square form with 6 burners..... 18.00

2419b. —— " " " " " 10 " 25.00

2419c. —— " " round " " 6 " 18.00

2420. **Kjeldahl's Distilling Apparatus,** complete, consisting of..... 55.00

a) Distilling shelt with 6 Bunsen Burners

b) Condenser of copper, tin lined and 6 cooling tubes with ball top attachments improved by Aubry

c) 10 Erlenmeyer's Flasks Bohemian glass, 24 oz. with ground labels

d) Rubber stoppers at 20 c. per oz.

2421. **Kjeldahl's Apparatus,** for nitrogen determination; modified by Reitmair & Stutzer..... 7.00

2422. **Kjeldahl's Apparatus,** for nitrogen and ammonia determination, modified by Arnold..... 6.00

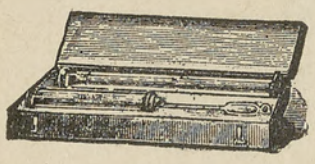
(Rep. d. Analyt. Ch. 1886, No. 46.)

2423. **Kjeldahl's Distilling Flasks.** Capacity 6 oz.....doz. 3.00

2424. **Kjeldahl's Digesting Flasks.** Capacity 6 oz..... " 4.50

2424a. **Kjeldahl's Connecting Bulb Tubes**..... " 3.00

New York. Chicago. RICHARDS & CO. Newark. Hamburg.



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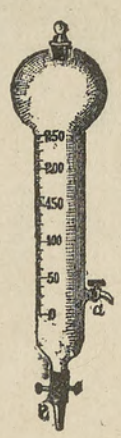

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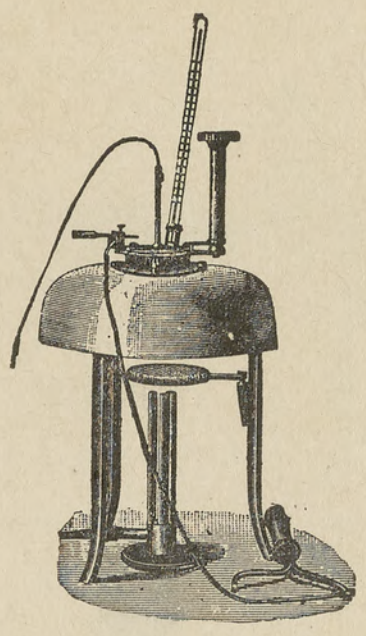

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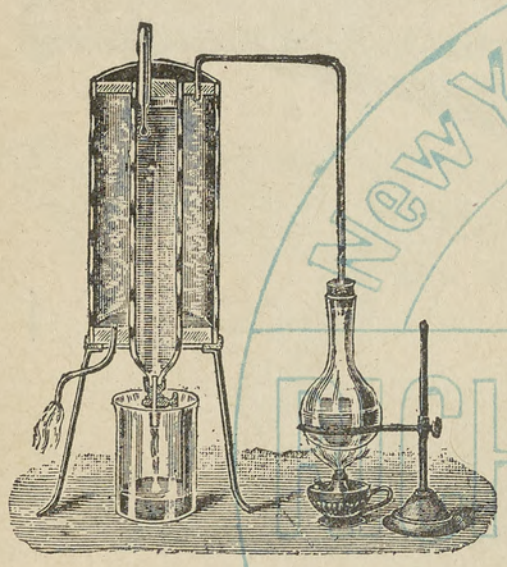

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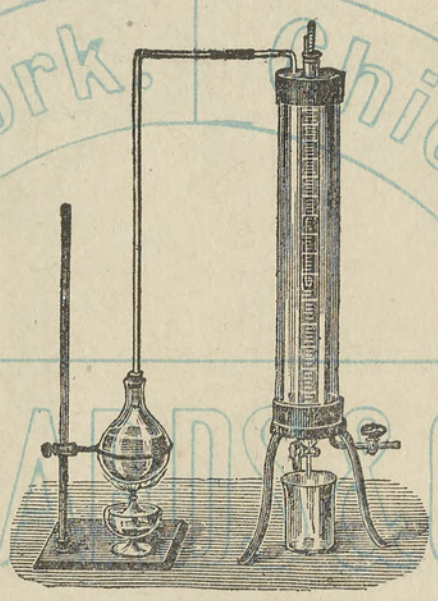

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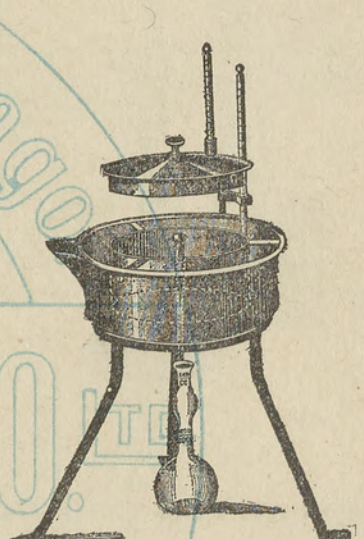

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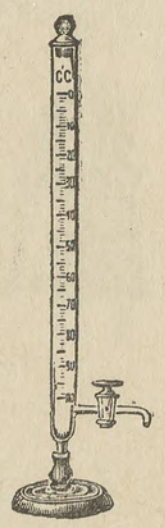


2431

23. APPARATUS FOR OIL TESTING.

No.

2425. **Albrecht's Apparatus,** for testing the consistency of Lubricating Oils, with support..... $ 21.50
(Post. P. 646.)

2426. **Purstyn's Oleic Acidimeter,** for determination of free acid in fatty oils..... 16.00

2427. **Cleveland's Cup,** for ascertaining the flask point of lubricating oil, with burner, complete..... 6.50

2428. **Coleman's Viscosimeter,** for testing the consistency of lubricating oils, with support..... 20.00

2429. **Engler's Viscosimeter,** adopted by the German Government; with double walls, 2 thermometers, tripod, measuring flasks, etc.; with directions, in fine case..... 24.00

2429a. Extra flasks for same ..... each .80

2430. **Koningh's Oil Burette,** for analysis of fat oils. (Fischer's Zeits. 1884, P. 261.)..... 5.00

2431. **Muter's Tube** 2.40

2432t. **New York State Board of Health Oil Tester,** Standard of N. Y. State, Iowa, New Jersey, Michigan, etc., with thermometer.

2432a.t. Arranged for oil..... 6.50

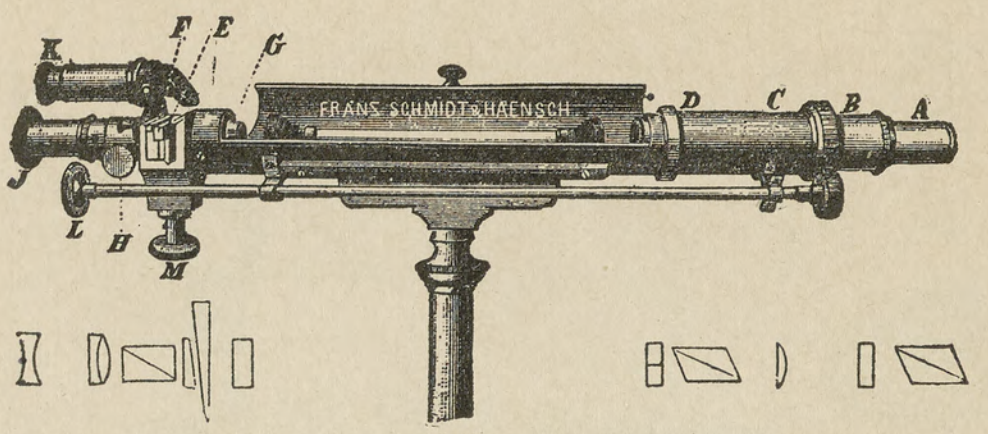
2432a.t. Arranged for gas..... 7.00

2433. **Pensky-Martens Apparatus,** for testing the flash point of mineral oils, improved by Abel, thermometer reading from 80 to 250°C., with directions, complete in box..... 75.00

2434. **Tagliabue's Coal Oil Pyrometer,** for testing the explosiveness and combustibility of coal oil and its products used as Standard by N. Y. Fire Department..... 5.00

2435. **Improved Standard Lubricating Oil Freezer,** approved by the "N. Y. Petroleum Association." The value of lubricating oils depending to a great extent on their relative resistance to cold temperatures, the adoption of a suitable instrument by means of which their congealing point could be determined became a necessity..... 30.00

New York, Chicago, Hamburg. RICHARDS CO. LTD



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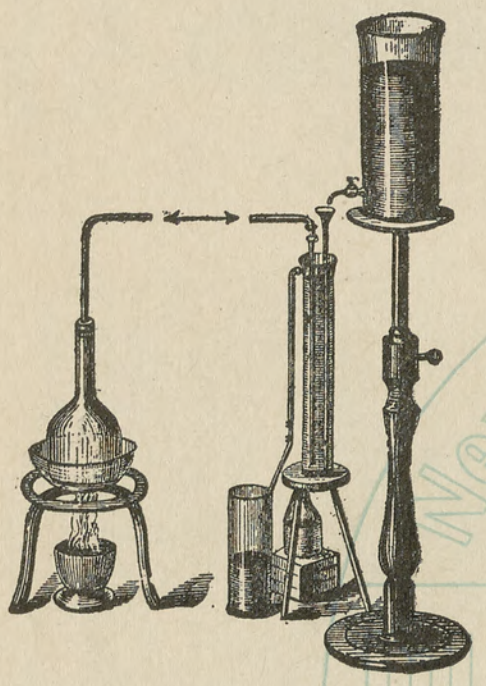

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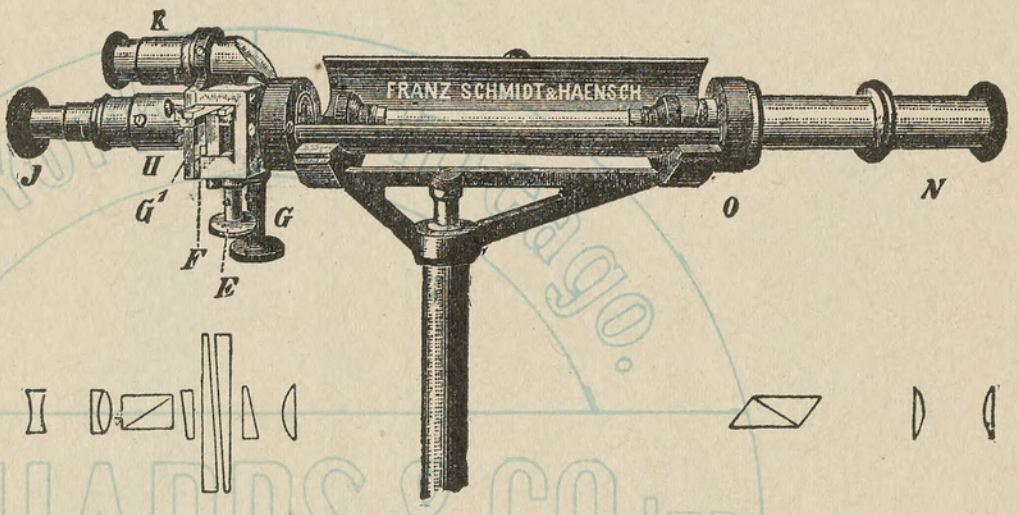


2441

24. APPARATUS FOR PHOSPHORUS DETERMINATION IN FREE STATE.

No.

2436. **Mitscherlich's Apparatus,** consisting of Cylinder with stopcock, condenser with tripod, distilling tube, flask, receiver, sandbath and support, without burner..... $10.00

(Pharm. Atlas 237.)

2437. **Hussard & Bandlot's Apparatus,** consisting of generating flask with ground in globe, chloride calcium tube on support, platinum tip fixed to the glass tube and stopcock, complete..... 8.00

(See also : Iron and Steel Analysis.)

25. APPARATUS FOR POLARIZATION.

I. APPARATUS FOR USE WITH WHITE LIGHT OF SUN OR LAMP, HAVING WEDGE COMPENSATION AND LINEAR SCALE.

Accurate and convenient in practice but for use only with substances such as cane sugar, having same dispersive power as quartz, and therefore especially adapted for use in sugar factories and custom houses.

a Apparatus showing colored field with arrangement for varying at pleasure the colors exhibited by the two halves of the field.

2440t. **Polariscope, Soleil-Scheibler** (Soleil-Ventzke), with 2 tubes each 100 and 200 mm. long ; in mahogany case..... 160.00

2440a.t. Same, with 3 tubes, each 100, 200 and 400 mm. long..... 180.00

2440b.t. Same, with 4 tubes, each 100, 200, 400 and 600 mm. long..... 200.00

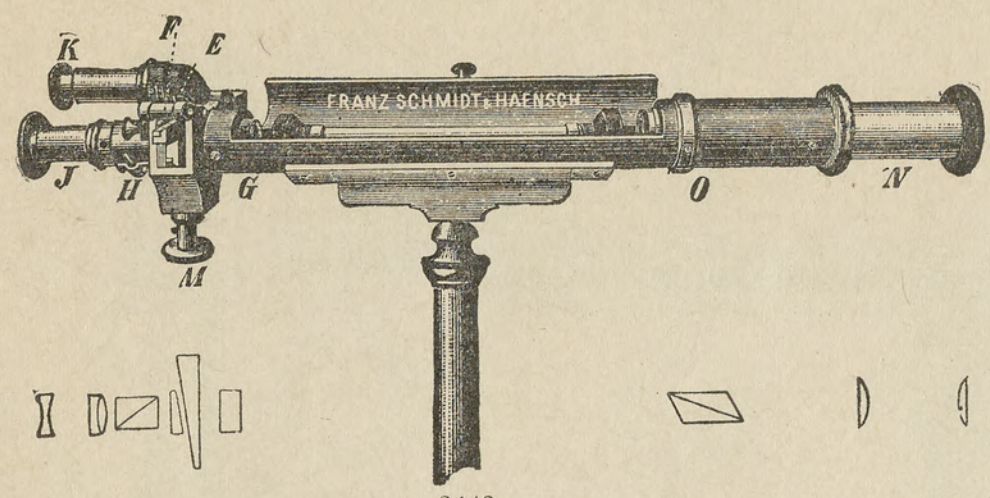
2441t. **Polariscope, Soleil-Scheibler, with double wedge compensation,** with 2 tubes each 100, and 200 mm. long ; and accessories..... 250.00

2441a.t. Same, with 3 tubes each 100, 200 and 400 mm. long ; and accessories..... 275.00

2441b.t. Same, with 4 tubes each 100, 200, 400 and 600 mm. long ; and accessories..... 300.00

The double wedge compensation with two movable quartz wedges and the accompanying scale allows the analyst not only to control in the most convenient and precise way the accuracy of the scale in all its parts (without a separate check plate of quartz, having but a single unalterable value), but also to verify the rotary effect thrice determined in the ordinary way.

New York Chicago. Newark Hamburg. RICHARDS & CO. LTD.



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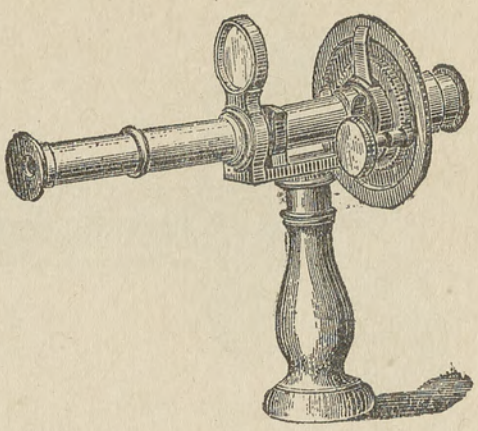

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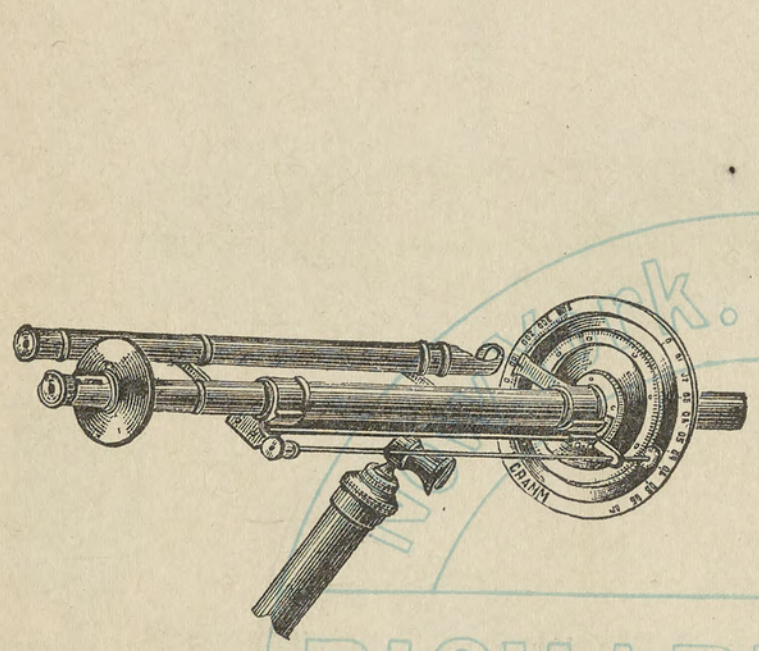

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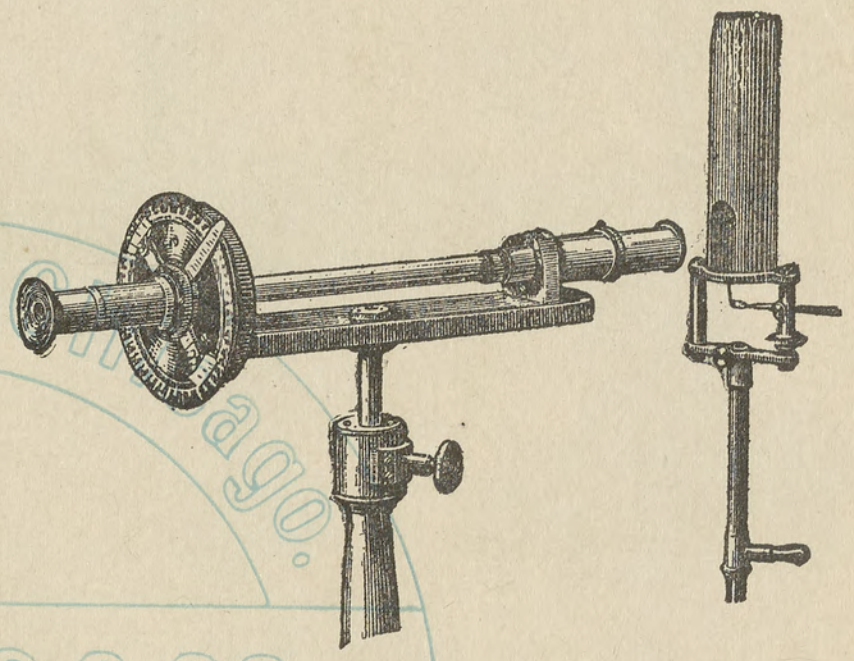


2447

b) Half shade apparatus (a penombre) to produce the same degree of brightness in both halves of the field of view instead of identity of color.

The development of the identity of tint in the two halves of the field of view is impossible to a person who is color blind and inaccurate in the case of one whose perception is imperfect.

The attempt to secure such identity is also much more trying to most person's eyes, when the instrument is long used, than the production of equal illumination in the two halves of the field. Most analysis therefore get more accurate results with the half shadow apparatus than the color apparatus and the former is gradually displacing the latter in use.

No.

2442t. **Polariscope—Jellet-Corny** with accessories with 2 tubes each 100 and 200 mm. long..... **$160.00**

2442a.t. Same, with 3 tubes each 100, 200 and 400 mm. long..... **180.00**

2442b.t. Same, with 4 tubes each 100, 200, 400 and 600 mm. long..... **200.00**

2443t. Same, **with double wedge compensation** with 2 tubes each 100 and 200 mm. long.... **250.00**

2443a.t. Same, with 3 tubes, 100, 200 and 400 mm. long..... **275.00**

2443b.t. Same, with 4 tubes, 100, 200, 400 and 600 mm. long..... **300.00**

2444t. **Polariscope—Hoppe-Seyler,** larger pattern for 100 and 200 mm. tube..... **110.00**

2445t. Same, **smaller pattern** for 25, 50 and 100 mm. tubes..... **85.00**

NOTE—This apparatus can be furnished to work with the color or half shadow field, the graduation reads directly to 0,1 per cent. of diabetic sugar.

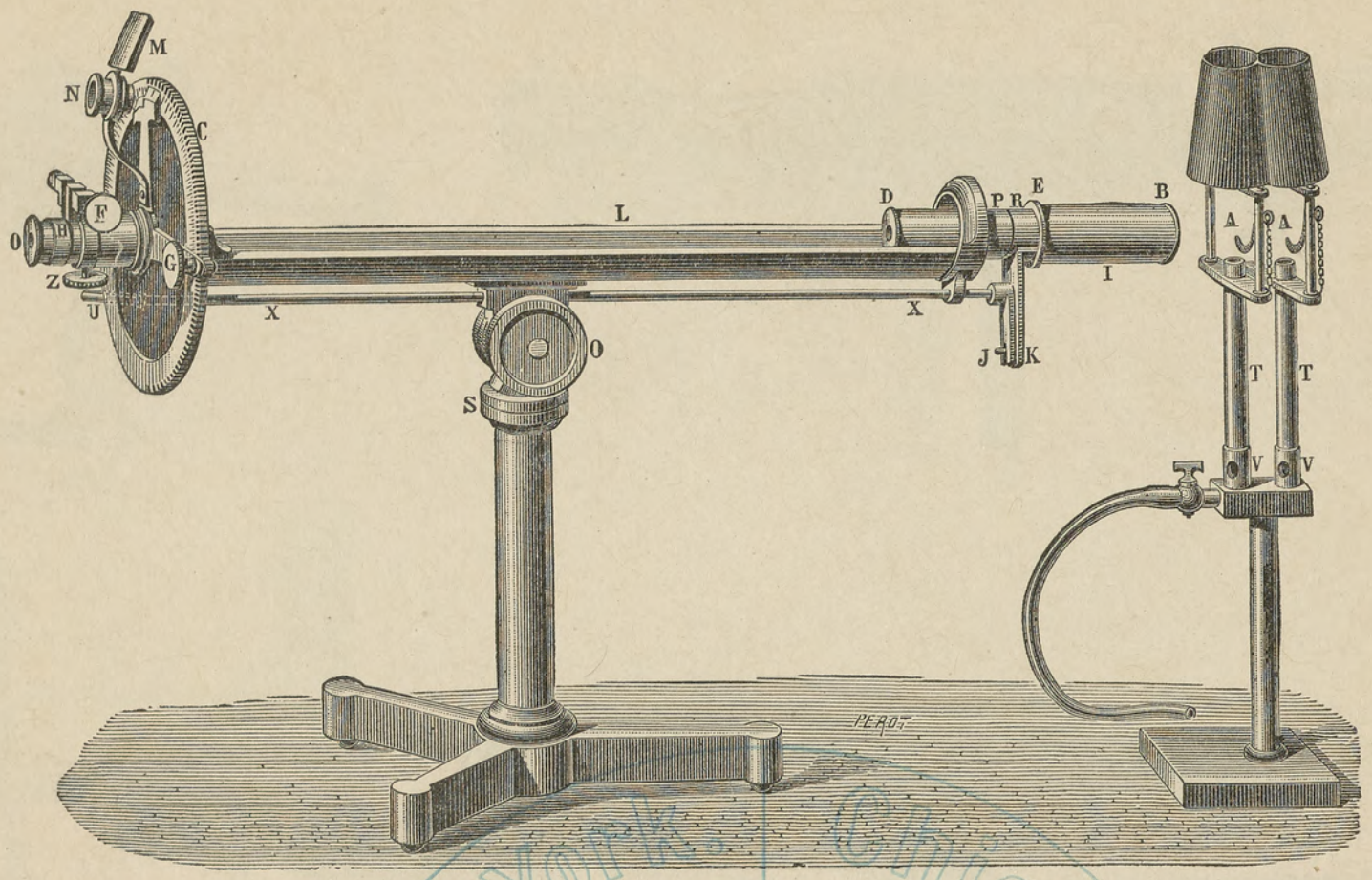
II APPARATUS FOR THE HOMOGENEOUS LIGHT OF THE SODIUM FLAME WITH DIVIDED CIRCLE.

2446t. **Polariscope, Wild's, large size,** with latest improvements quadrant divided on silver, the vernier reading 30 seconds, with 3 tubes each 100, 200 and 220 mm. long, complete in mahagony case..... **160.00**

2446a.t. **small size,** with 2 tubes, 25 and 50 mm. long ; in mahagony case..... **75.00**

2447t. **Half shade Polariscope,** after **Mitscherlich,** with 2 tubes each 99,2 and 198,4 mm. in length, which are according to Wild, chosen so that every degree of rotation corresponds to one gramme of grape sugar in 100 cc. The vernier reads to 0 1 degree..... **65.00**

RICHARDS & CO. LD.



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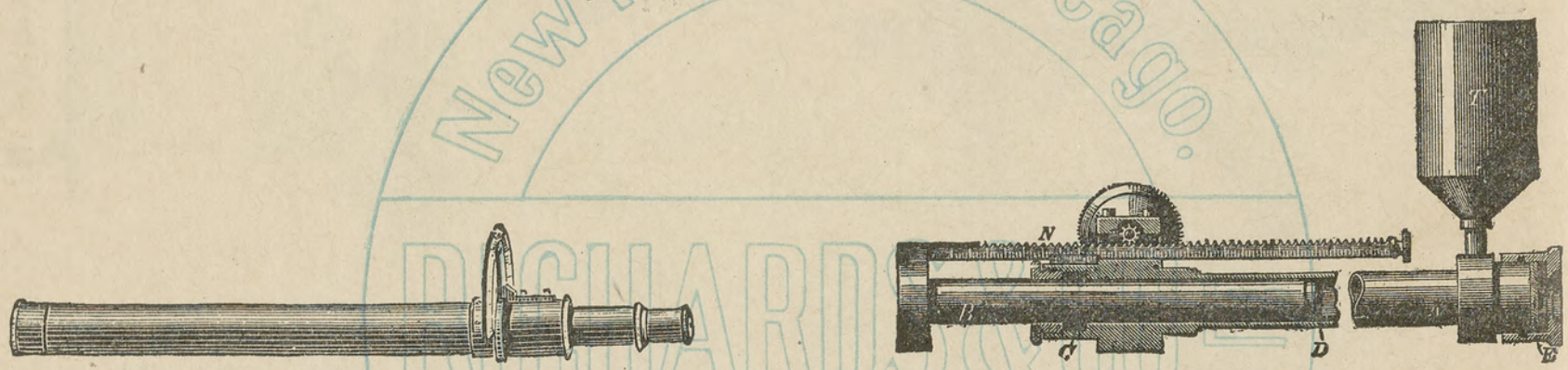


2458 2460

No.

2448. **Large Half Shade Polariscope,** after **Laurent, Grand Model** for tubes up to 500 mm. in length ; with two divisions, one circular, the vernier of which reads to one minute, the other a per-centage division for sugar in urine or for raw sugar, reading direct to 0,1 per cent., in case..... $175.00

2449. **Smaller model,** with 2 tubes each 100 and 200 mm. in length..... 130.00

2450. —— **Lamp for above** with special support..... 15.00

2451. —— **Set of 4 tubes for above**—1 each of 200, 300, 400, 500 mm , of glass..... 35.00

2452. —— Set of 4 Tubes, of brass..... 25.00

2453. —— **Inversion tubes** for above ..... Each 13.50

2454. —— **Observation tubes** for above with water jacket..... " 13.50

2455. —— **Quartz plates** for above ..... " 18.00

2457t. **Polaristrobometer, Landolt's** with Lippich's polarizor with 2 Nicol prisms of peculiar construction ; with Landolt's sodium lamp..... 370.00

This apparatus is extremely delicate ; allows the reading to 0,01° and can be used with any homogenous light. It allows the introduction of two tubes at the same time, either of which can be brought into the field of view by a slight motion of the hand. Accessories : one tube 100 mm. in length with water jacket, one each of 200, 300 and 400 mm.

2458t. **Polariscope, Neubauer's,** for researches of grape sugar in wines; with division and vernier; on support 35.00

2459t. —— **for** determination of **diabetic and grape sugar** and of the quinine alkoloids, divided with vernier, and with tables..... 27.50

III. POLARISCOPE ACCESSORIES.

2460t. **Control Tube** for **half shade Polariscope.**

2460a.t. for 200 mm. tube instrument..... 27.00

2460b.t. for 400 " " 28.50

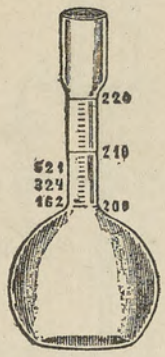
2460c.t. for 600 " " 30.00

2461t. **Conversion and Observation Tube,** after **Landolt,** with jacket for water circulation

2461a.t. for 100 mm. tube instrument..... 7.50

2461b.t. for 200 " " 8.00

2461c.t. for 400 " " 9.50



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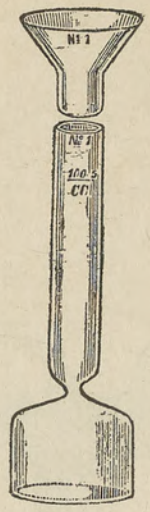

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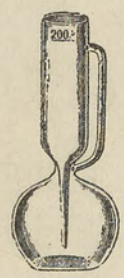

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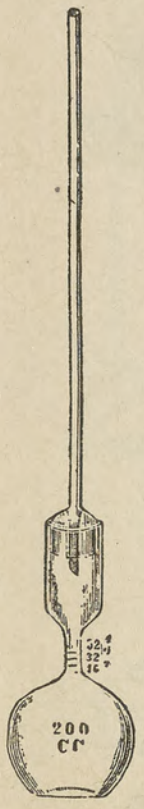

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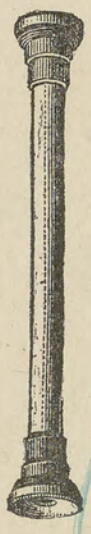

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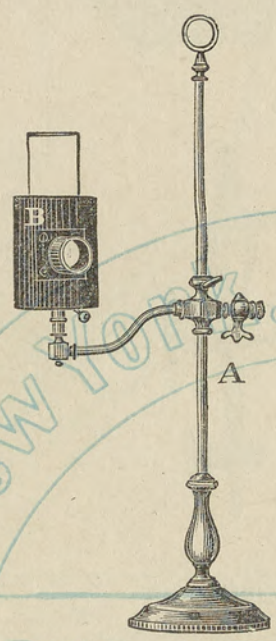

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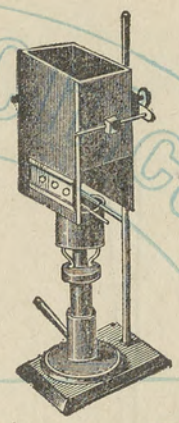

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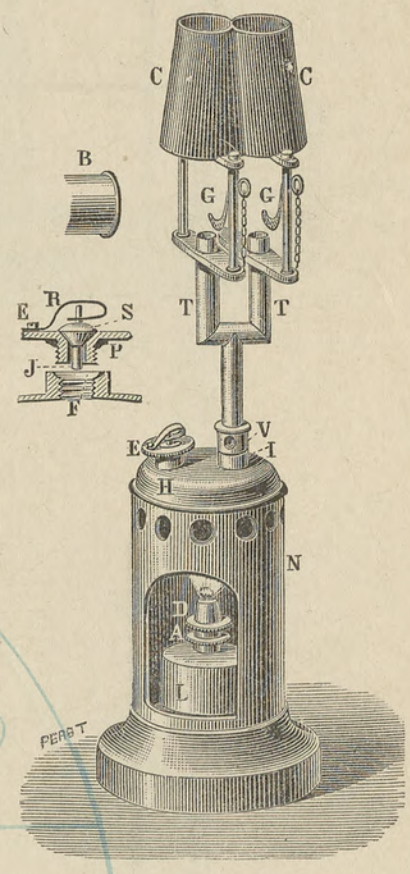

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No.

2464. **Polarization Tubes,** of glass.

Length	25	50	100	200	400	600 mm.
Each	$1.00	1.00	1.00	1.00	1.25	1.50

2465. —— of glass, **mounted** with caps.

Length	25	50	100	200	400	600 mm.
Each	$3.50	3.50	3.50	3.50	4.00	4.50

2466. —— of **brass.**

Length	25	50	100	200	400	600 mm.
Each	$4.00	4.00	4.00	4.00	4.50	5.00

2467. **Polarization Tube Covers,** of glass ..... Doz. $ 1.00

2468. **Polarization Tube Washers,** of rubber ..... " .20

2469. **Polariscope Lamp,** for gas, nickel-plated with clay cylinder 8.00

2470t. **Landolt's Lamp,** for Sodium light 16.00

2471t. **Laurent's Lamp,** for Sodium light 15.00

2472t. **Laurent's Lamp,** for alcohol (Eolipile) 25.00

2473. **Polarization Flasks,** with 3 marks in neck: 200, 210, 220 cc. ½ cc. and $\frac{0}{0}$°, 16_2, 32_4, 52_1 ..... Doz. 10.80

2473a. —— with **ground in** hollow **stopper** ..... " 14.40

2474. —— neck 18 mm,, outlet 40 mm. and ground on cooling tube 50 ctm. long. mark at 201_2 cc and 16_2, 32_4, 52_1 ..... Each 1.75

2475. —— after **Pellet,** with mark at 100_5 cc ..... " .75

2476. **Extraction Flasks,** after **A le Docte,** with parallel side tube and sealed in tube, mark at 200,5 cc.. " 1.25

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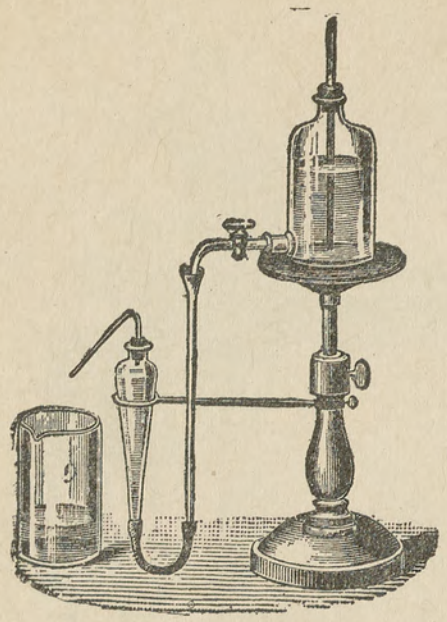

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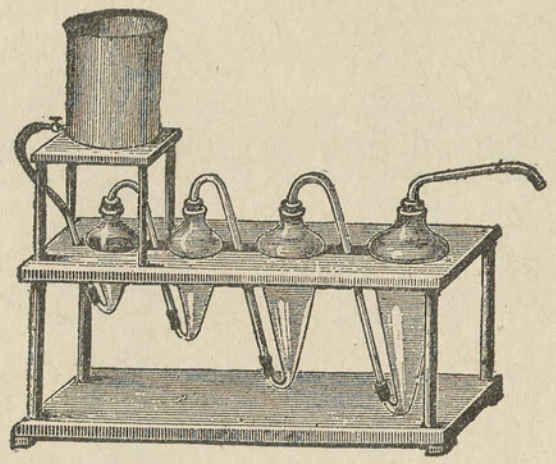

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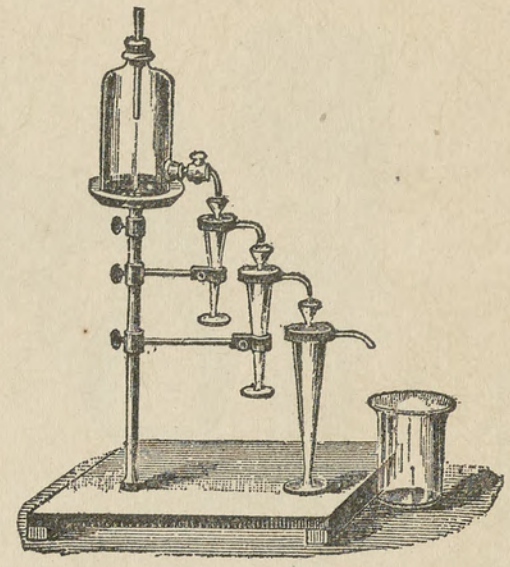

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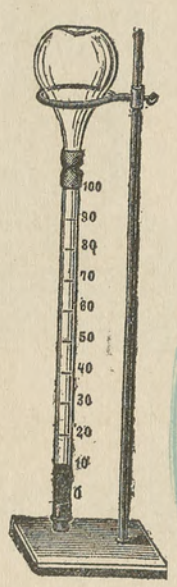

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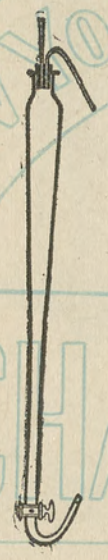

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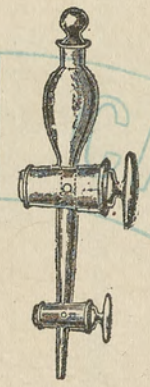

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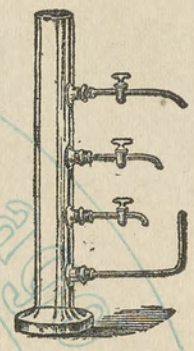

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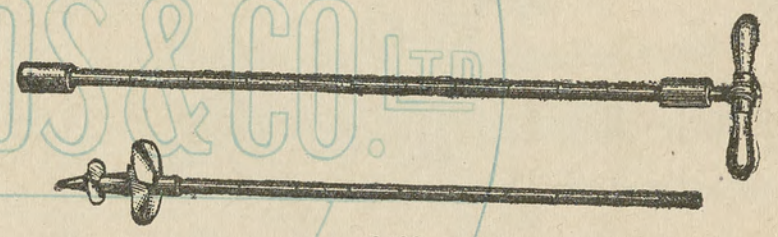

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26. APPARATUS FOR SOIL ANALYSIS.

No.		
2480.	**Broegger-Haradas' Elutriating Apparatus** for soils, minerals, etc., bore of upper stopcock 15 mm.	$ 12.00
2481.	**Kuehn's Elutriating Apparatus,** a flask, graduated tube and rubber connections	2.00
2481a.	Support Extra	.75
2482.	**Knopp's Elutriating Apparatus,** 20 in. high and 3¼ in. diam., with 4 tubulatures, 3 of which with stopcocks and one with tube fitted with rubber stoppers	11.00
2482a.	Cylinders with 4 tubulatures only	6.00
2483.	**Masure's Elutriating Apparatus,** consisting of receiver, funnels, beaker, etc., with support	8.00
2483a.	The glass parts only	6.00
2484.	**Noebel's Elutriating Apparatus,** the complete set, capacity of receiver's ½, 1, 2 and 4 pints, with support	7.50
2484a.	The glass parts only	4.00
2485.	**Schulze's Elutriating Apparatus,** consisting of receiver, 3 test glasses with funnel tops, beaker and support	12.00
2485a.	The glass parts only	7.00
2486.	**Schulze's Elutriating Glass,** with brass ring, funnel and outlet tube	2.50
2487.	**Schoene-Meyer's Elutriating** Pipette, with stopcock	4.75
2488.	**Scooping-iron.**	

Dia.	50	80	100	120	160 mm.
Each	$2.75	3.25	4.00	5.25	6.50

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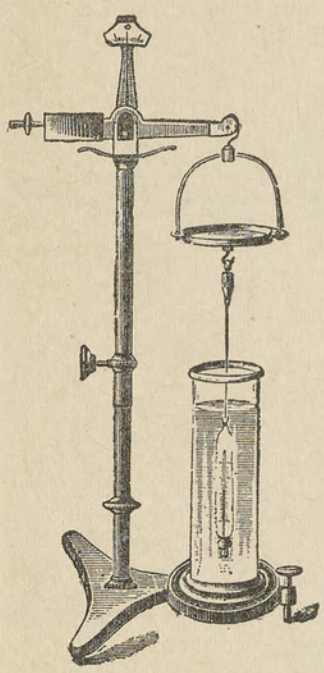

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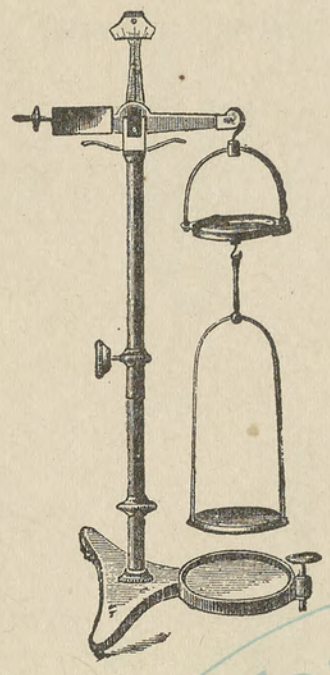

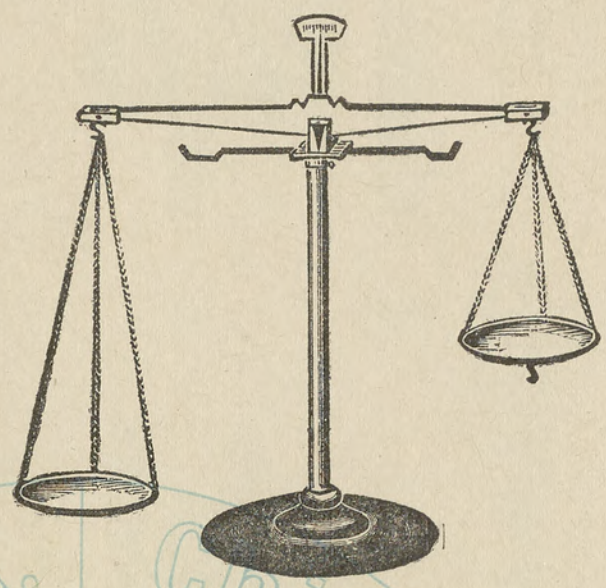

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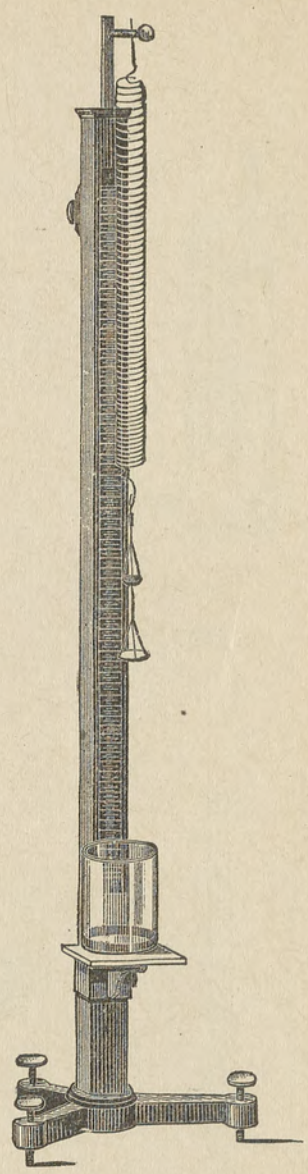

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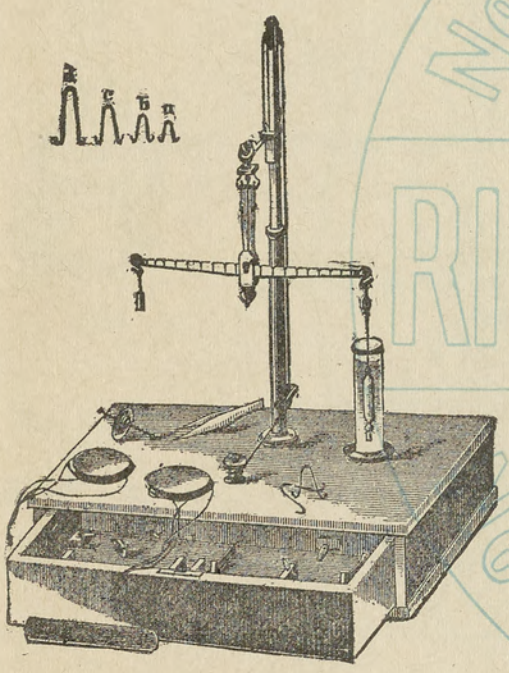

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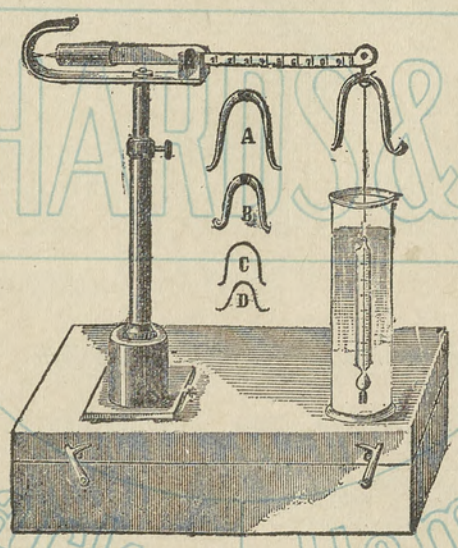

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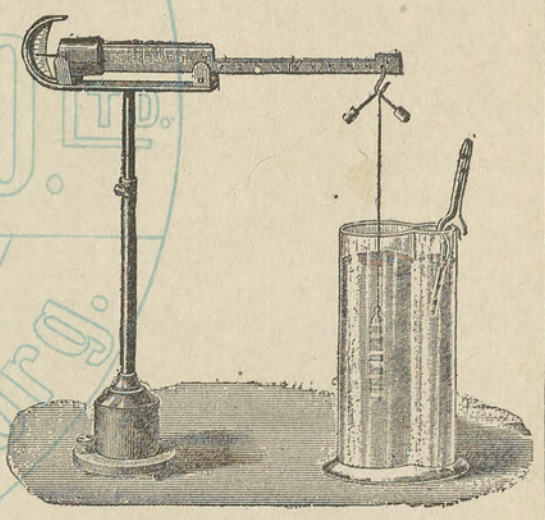

2494

27. APPARATUS FOR SPECIFIC GRAVITY.

No.

A. BALANCES FOR SPECIFIC GRAVITY DETERMINATION.

2490. **Balance, Mohr's,** for both liquids and solids, with Reimann's Patent Thermometer, riders, glass cylinder, forceps, also extra pans for regular weighings..... $20.00

2491. —— **Westphal's,** for liquids, bean and axis gilded, movable support,and Reimann's patent thermometer 15.00

2492. —— **Reimann's** for liquids, with body of one gramme, complete with cylinder..... 20.00

2493. —— " same as above but with 10 gramme body..... 21.00

2494. —— **Sartorius' Hydrostatic,** for specific gravity determination of liquids, complete in case..... 26.50

2495. —— **Prof. Jolly's Spiral,** for rapid and exact determination of the specific gravity of minerals, with 4 assorted spirals on wooden support and scale on mirror glass..... 17.00

2496. **Balance and Globe for weighing air,** brass beam, with steel knife edges, pans fitted for taking also specific gravity, one 6 in. polished brass globes with stopcock and hook..... 15.00

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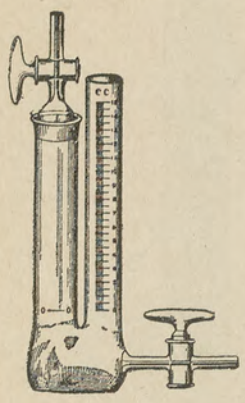

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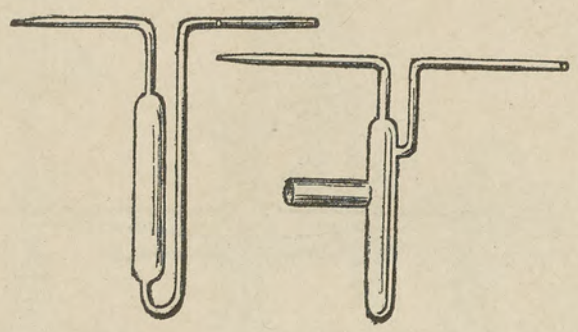

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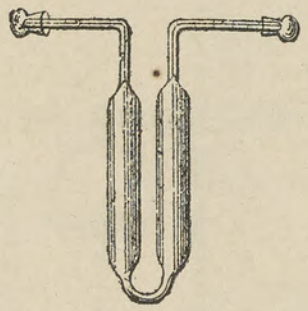

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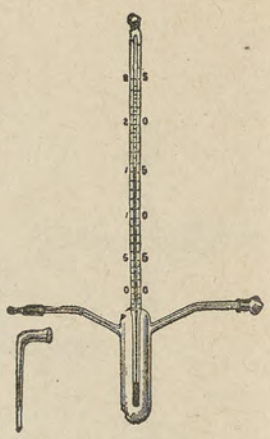

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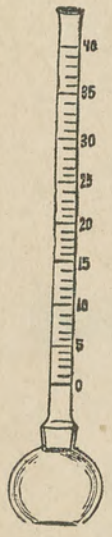

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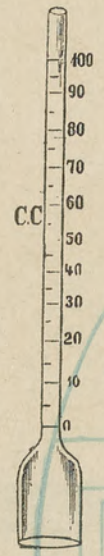

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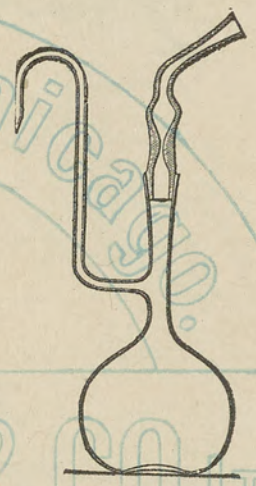

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2507

No.

2497. **Greiner's Specific Gravity instrument,** for liquids and solids..... $ 4.50

2498. **Nicoll's Tube, for specific gravity of liquids**..... .50

2499. —— " " " **solids**..... .60

2500. **Sprengel's Specific Gravity Tube,** with caps ground on U shape..... 1.50

2501. **Sprengel's Picnometer, with thermometer** and cap and suction tube ground on..... 5.00

2502. **Schumann's Specific Gravity Bottle,** for **cement**..... 2.25

2503. **Pawlewsky's Picnometer,** capacity 50 cc..... 2.00

2504. **Thoerner's Volumenometer,** for the specific gravity of solids, graduated from 0 to 100 cc. in $\frac{1}{5}$°..... 7.50

2505. **Volumenometer,** capacity 21 cc. divided from 19 to 21 cc. in $\frac{1}{20}$ degrees, with thermometer ground in..... 4.00

2506. **Hogarth's Flasks,** for determining the specific gravity of iron ores..... 2.00

2507. **Squibb's Specific Gravity Bottle,** for different standard volumes.

Capacity	25	50	100 cc.
Each	$3.50	3.75	4.00

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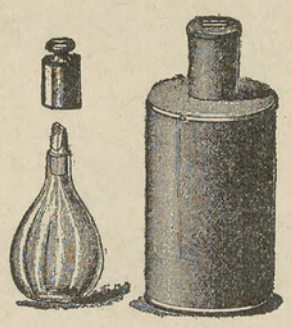

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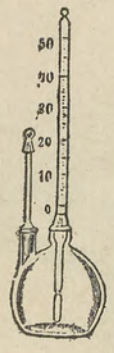

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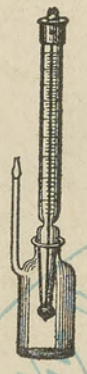

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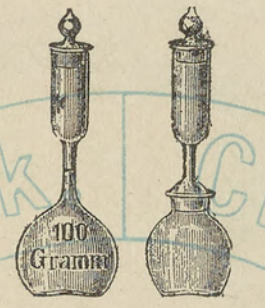

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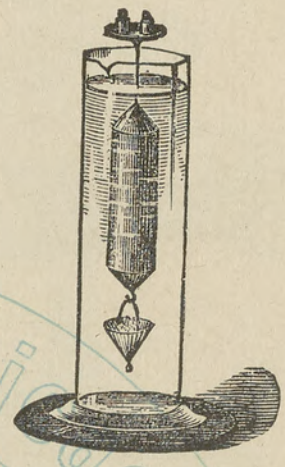

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No.

2508. **Specific Gravity Bottle,** of light glass, with **perforated stopper,** not adjusted.

Capacity about	10	25	50 cc.
Each	.25	.30	.40

2509. —— most accurately **adjusted,** stopper perforated.

Capacity	250	500	1000 grains.
Each	.90	$1.00	1.30

2510. —— most accurately **adjusted,** stopper perforated.

Capacity	10	25	50	100 grammes.
Each	.70	.85	$1.20	1.25

2511. —— same as No. 2509, in case with tare weight.

Capacity	250	500	1000 grains
Each	$1.50	1.75	2.00

2512. —— same as No. 2510, in case, with tare weight.

Capacity	10	25	50	100 grammes.
Each	$1.25	1.50	2.25	2.50

2513. —— **with thermometer** ground into neck, accurately adjusted.

Capacity	25	50	100 cc.
Each	$2.00	2.25	2.50

2514. —— **with thermometer** ground into neck, and **capillary tube** with cap, at side, form a or b.

Capacity	10	25	50	100 cc.
Each	$3.00	3.10	3.25	3.50

2515. **Regnault's Specific Gravity Bottles.**

Capacity	25	50	100 cc.
For liquids	.60	.85	$1.00
For solids	.75	$1.00	1.25

Specific Gravity Bottles, for weighing gases, see apparatus for gas analysis.

2516. **Areometer, Nicholson,** of **glass** ..... $ 2.00

2517. —— " of **brass** 3.50

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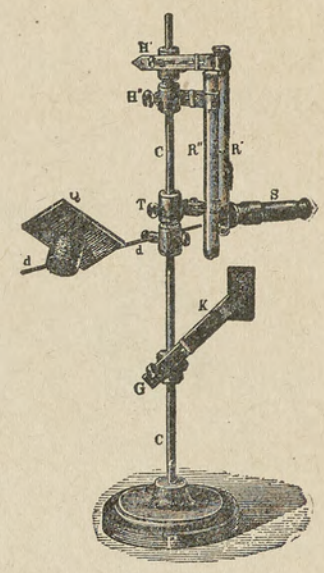

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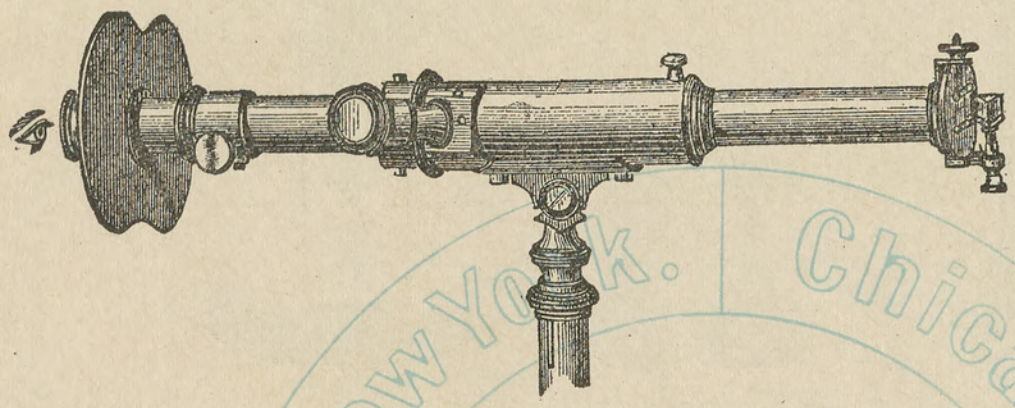

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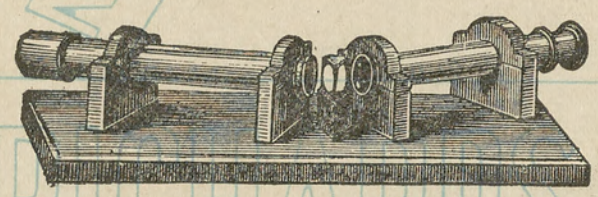

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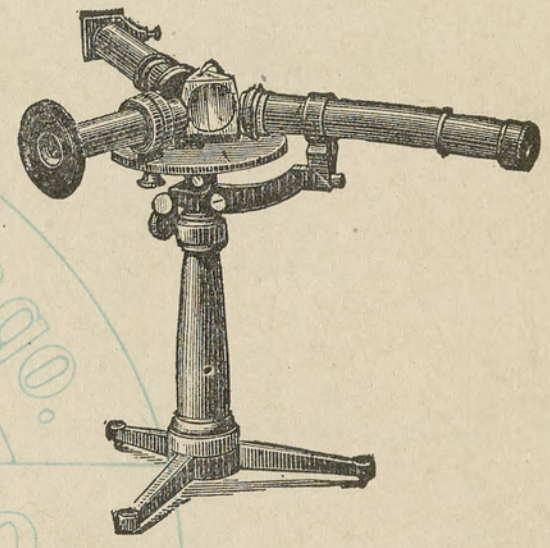

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28. APPARATUS FOR SPECTRUM ANALYSIS.

A. SPECTROSCOPES.

No.

2520. **Spectroscope, Browning's pocket instrument** with micrometer screw and reflecting prism for comparing spectra, in case $30.00

2521. **Spectroscope, Browning's pocket instrument**, with adjustable slit 15.00

2522. **Spectroscope, Browning's most recent form**, with 5 prisms easily separating the D lines in the Solar spectrum, in case 85.00

2523. **Spectroscope, Vogel's Pocket instrument**, with universal support, 5 clamps, attached spectral tubes, test tubes, and fastened illuminating mirror, bearing rotating star for support and test tubes, in case 50.00

2524. **Spectroscope, with straight vision,** on support.

2524a. With 3 prisms 240.00

2524b. With 5 prisms 250.00

2525. **Spectroscope, simple model,** especially for Schools, mounted on blackboard, with small achromatic telescope, prism of flint glass and collimator with acromatic lens and with slit 37.50

2526. **Spectroscope, height adjustable,** for Schools, flint glass prism of 60° (sp. gr. 3.78) fixed to a brass plate. The telescope has an aperature of 19.5 mm., 143 mm. focal distance, magnifying power 5 times. The Callimeter has the same dimensions and micrometer screw dispersion 4° 40.00

2526a. The above with comparison prism 48.00

2526b. The above with telescope 60.00

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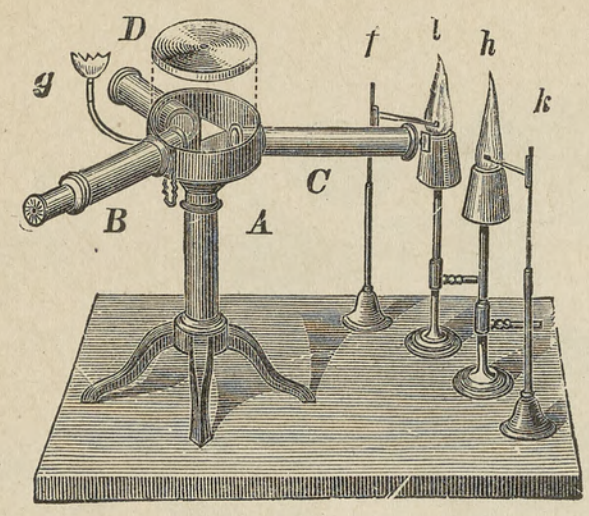

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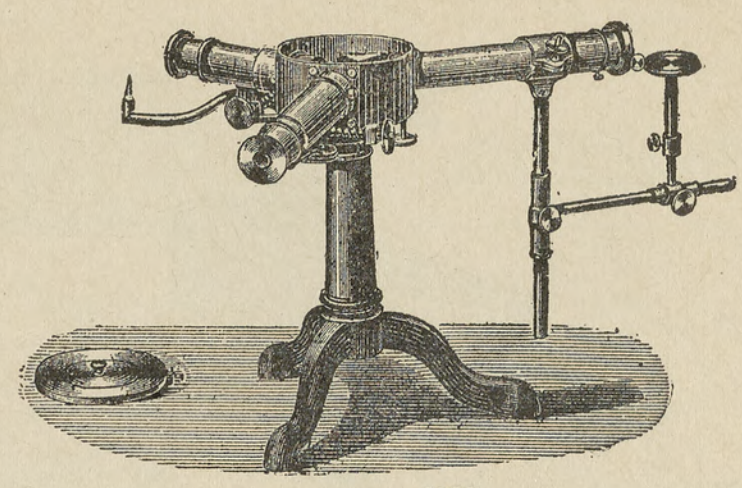

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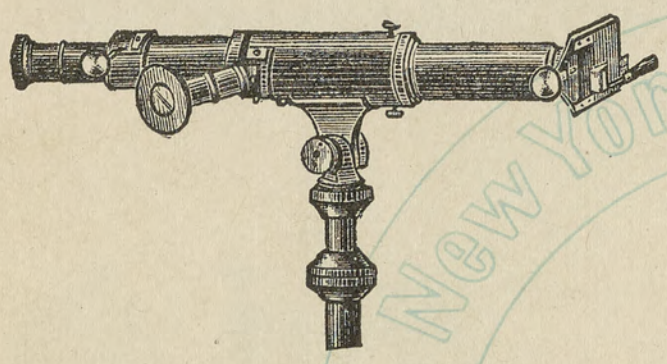

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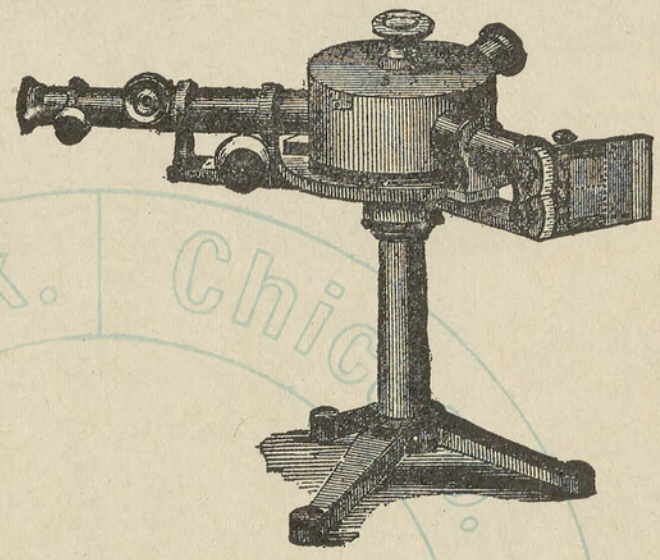

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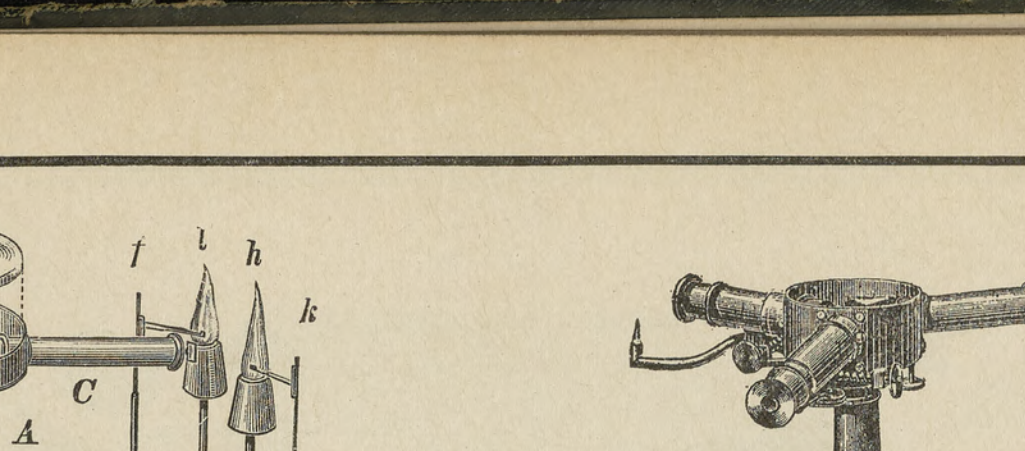

2532

No

2527n. **Spectroscope, Kirchhoff and Bunsen's**, complete with micrometer scale, illuminating lamp and adjustable slit with adjustable B. burner, with air regulator and chimney, 12 tubes with Plat. wire, on stand, two spectroscopic charts and 5 millimeter scales..... **$45.00**

2527a.n. The above with comparing prism and one extra burner and stand..... **55.00**

2528n. **Spectroscope, Kirchhoff and Bunsen's**, with **Comparison Prism** and screws for Prism adjustion, with micrometer scale, illuminating lamp and adjustable slit, 2 Bunsen burners, adjustable, with chimneys, 12 tubes with Platinum wire and 2 stands, 2 spectroscopic charts and 5 Millimeter scales, complete with Schellen's universal holder..... **90.00**

2529n. **Spectroscope, Kirchhoff and Bunsen's large model** with covered prism of 60°, enclosed in a brass case, to which the telescope, collimator and scale tube is attached. Movable burner is fixed to illuminate the scale tube. The telescope being provided with spider line, which can be adjusted to any part of the spectrum.

The telescope is focussed by rack work. It has 27 mm. aperature, 234 mm. focal distance and magnifies about 8 (6) diameters. The collimator is of the same dimensions. The slit is provided with micrometer screw and comparing prism, cast iron stand. Dispersion 7° (has no Schellen's support.) **180.00**

2530. **Spectroscope for direct vision, Janssen-Hoffmann's**, on brass column, with iron tripod movable in any direction. The telescope and collimator are both of a 22.7 mm. aperature, 182 mm. focal distance and six fold magnifying power. Slit with micrometer screw and prism for comparing spectra. A scale tube with a photographic scale is attached to the side of the cylinder containing the prisms. The telescope has a lateral motion for observing the spectrum and rackwork for focusing. Dispersion 120..... **190.00**

2531. **Spectro-Photometer**, after **Glan**, with reversion of the Nicol Prism, the circle being graduated to minutes in order to bring the surface of the liquids in the absorption vessel exactly in the centre of the spectrum; a stand provided with a micrometer screw is joined to each instrument. Complete with burner and lamp..... **360.00**

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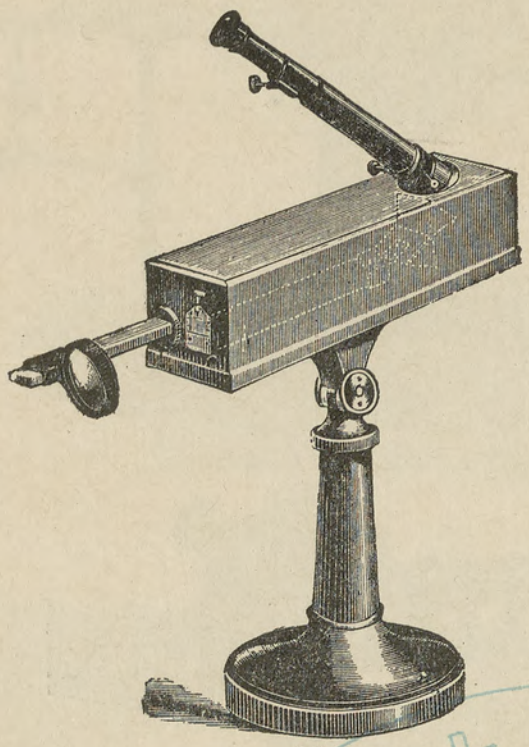

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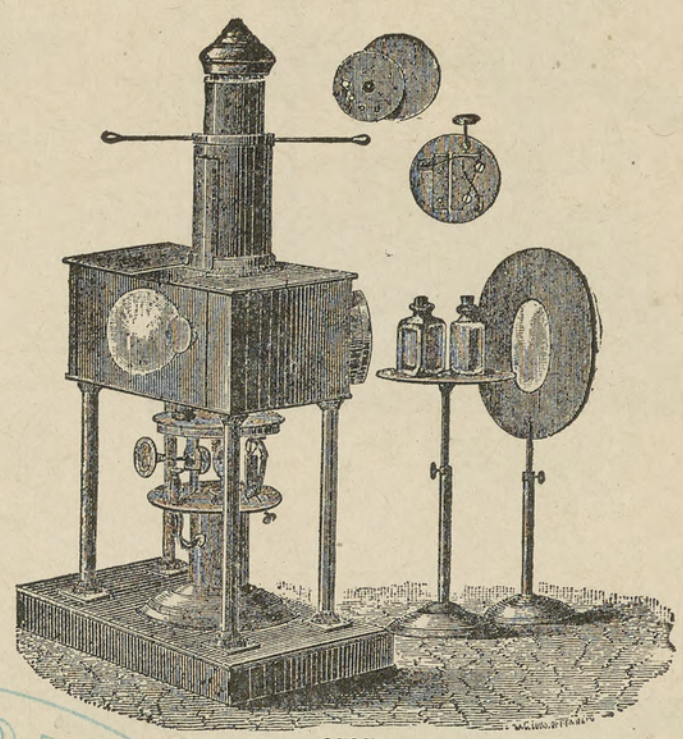

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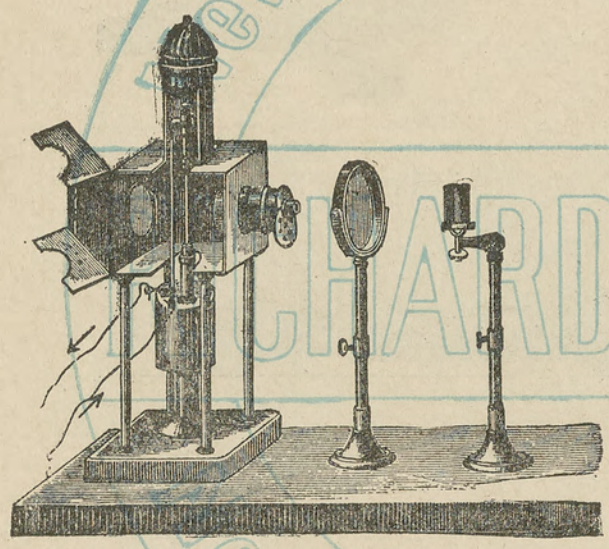

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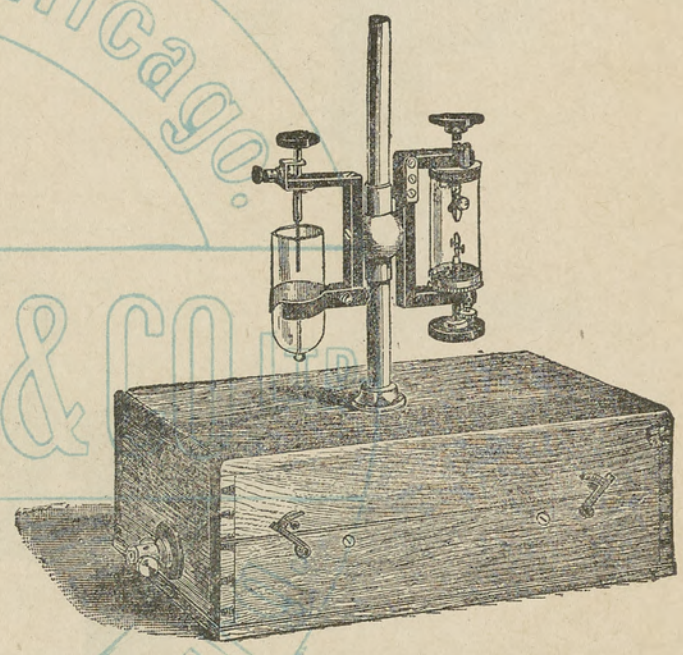

2537

No.

2532. **Spectro-Colorimeter,** after **Vierodt,** with prism of a very dense flint glass having an angle of 60°, sp. gr. 4.49, dispersion 7°, with absorption vessel, micrometer stand, smoked glasses, burner for scale and lamp for observation. (See cut, page 237)..... **$310.00**

2533. Same model as No. 2530, but smaller size..... **180.00**

2534. **Spectroscopes, Browning's, for Bessemer Process.**
The construction of this instrument allows the observer to sit with his back to the Convertor so that the eye is not unnecessarily strained. The telescope has 26 mm. aperature, 234 mm. focal distance and micrometer screw. The 2 prisms of 60° are of extra dense flint glass (sp. gr. 4.49) together with the collimator, and of the same dimension as the telescope, and are mounted in a long case to exclude extranes light. The condenser is mounted in such a manner as to allow of placing objects before the slit on a small stand..... **160.00**

2535. **Spectral Apparatus for** showing the **spectral lines** upon a screen with Duboscq's lamp, prisms and lenses. Price from..... **$400.00** to **800.00**

2536. **Spectroscopic Camera,** for use with Electric or Drummond light, with condensing lens, slit with micrometer screw and diaphragm with openings of various diameters. There is an arrangement on the base of the Camera by means of which the light can be moved in any direction while working. The condensing lens is movable by rack work so that the lamp will give parallel or converging light..... **240.00**

2537. **Spark Condenser, Browning's,** designed to replace the Leyden Jars which are used with induction coils to increase the temperature of the spark when it is required for spectrum analysis.

For Induction Coils of	2½	5	8 in. spark.
Each	$40.00	50.00	125.00

2538. **Becquerel's Apparatus,** for obtaining spectra from solutions of salts of the metals..... **10.00**

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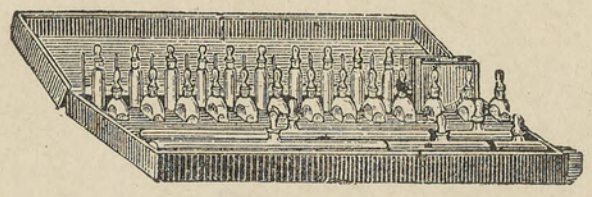

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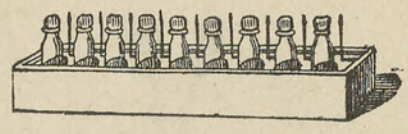

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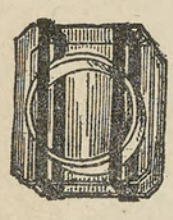

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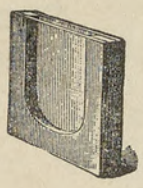

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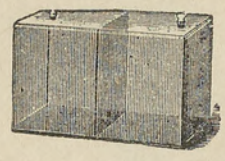

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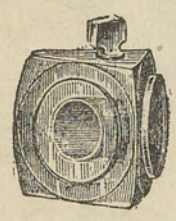

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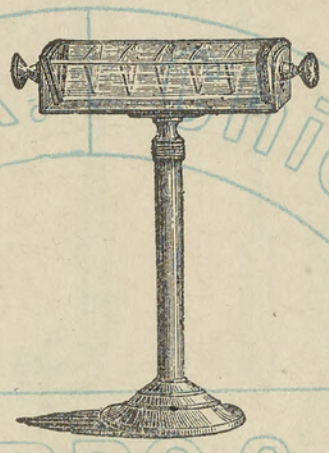

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2554

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B. ACCESSORIES.

No.

2540. **Small Bottles** with **parallel walls,** for examining absorption bands in liquids, 25x8 mm.; capacity 2 cc.....each $ .40

2541. same **square, long shape,** ground edges.

Length	2	5	10	15	20 ctm.
Each	.40	.50	.60	.70	$1.00

2542. **Complete Case,** including 5 bottles No. 2541, 1 glass cone to be taken apart, colored glass, plates, bottles with NO_3 iodine, etc., and 12 bottles with platinum wire..... 35.00

2543. **Chem. Pure Salts,** for **spectrum analysis,** in 10 small elegant bottles and case.

Na	Ka	Li	Ba	Sr	Ca	Rl	Cae	Qu	Tl

Complete..... 10.00

2544. **Absorption Cell, to be taken apart,** held together by rubber bands..... 2.00

2545. —— **U form**..... 2.00

2546. —— **bottle shape**..... 2.00

2547. **Double Absorption Cell,** for observing simultaneously two different liquids..... 10.00

2548. **Hollow Prism,** one wall blackened, with ground-in glass stopper..... 8.00

2549. —— **long form,** each part 50 mm. long, 60 mm. broad.

With	1	2	3	4 cells.
Each	$7.50	15.00	20.00	25.00

2550. **Bottles, triangular shape,** with plane, parallel lenses and stopper..... 7.50

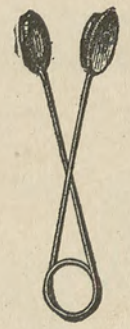
2551. —— **square**..... 7.50

2552. **Prism, Hollow,** 8 inches long, with cells for various liquids, on adjustable stand, finely finished..... 20.00

2553. —— **Crown Glass.** angles 60°.

Length	4	6	8 in.
Each	.25	.40	.60

2554. —— **Indigo, wedge shape**..... 1.75



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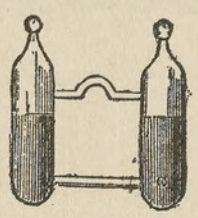

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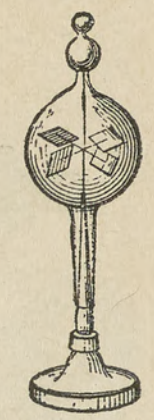

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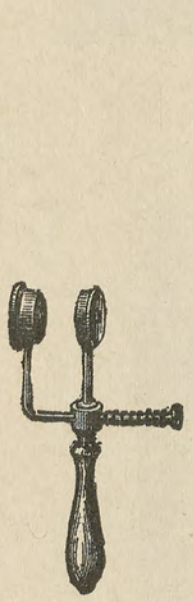

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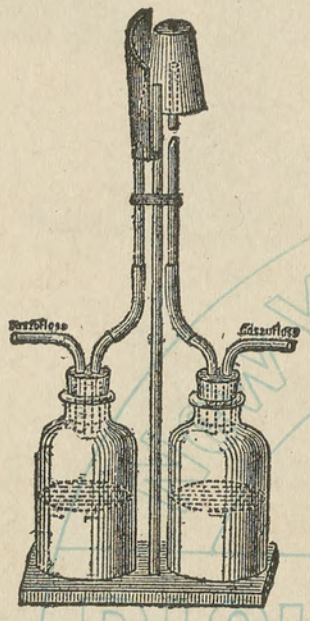

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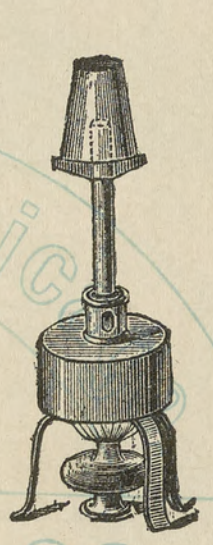

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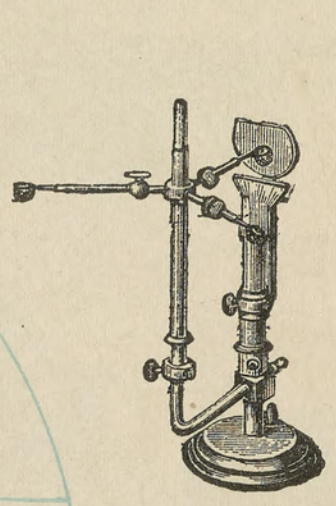

2573

No.

2556. **Tourmalin Tongs,** with two tourmalin plates, showing the colored rings in crystal plates..from **$7.50** to **$15.00**

2556a. —— arranged to be moved in a parallel line..... **20.00**

2557. **Spectrum Tables, colored,** after **Kirchhoff and Bunsen.**

2557a. Table No. 1, solarpectrum of Ka, Rb, Cs, Fl, Na, Ca, Sr, Ba.....each **4.75**

2557b. Table No. 2, spectrum of Sn, C, Bo, Mn, Pb, Cu, Co. Ni, Fe..... " **4.75**

2558. —— after **Huggins & Miller.**

Table No. 3, spectra of Aldebaran, Beteigeuze, T in the crown, Nebular spot 37 H, with comparing Solar spectrum..... **4.75**

2559. —— after **Vogel;** chromographic charts, size 40x28 in., with test by Prof. Scheiner.

2559a. Table No. 4, Ia Sirius, Ic Lyrae, IIa Sun, etc.....each **4.75**

2559b. Table No. 5, Nebular spot, Uranus, Comet, Carbon hydrogen (for comparing), North Light, and Sun Rim, etc.....each **4.75**

2560. **Millimeter Scale,** for mapping the lines of the spectrum..... " **15.00**

2561. **Tubes for reversing the sodium line,** of infusible glass, by **Schellen;** containing sodium in rarified hydrogen gas atmosphere.....each **6.50**

2562. **Apparatus for reversing the sodium spectrum,** after **Bunsen,** on stand, complete..... " **7.50**

2563. —— **for flame reactions,** after **Bunsen,** set complete..... **12.00**

2564. **Absorption Spectrum Tubes,** filled with NO_2..... **1.50**

2565. **Geissler's Spectrum Tubes,** filled with gases or vapors..... **2.00**

2566. —— for second order spectra, to be used in connection with a Leyden jar..... **2.40**

2567. —— containing solid substances, viz.: Hg, Hg S, J, S, Se, etc., to be heated before using..... **2.40**

2568. —— with two stopcocks for self filling..... **3.50**

2569. —— with tubulated, ball-shaped reservoir for solid substances,..... **6.50**

2570. —— new model, end on tubes, for longitudinal view, filled with same gases and vapors..... **4.00**

2571. **Lamp, Alcohol, Breitenlohner's**..... **8.00**

2572. —— **Laspeyer's,** for **homogeneous light,** with three platinum baskets..... **20.00**

2573. **Radiometers, Crook's**..... **3.50**

2574. —— Same, with two globes, the platinum plates revolving in opposite directions..... **5.00**

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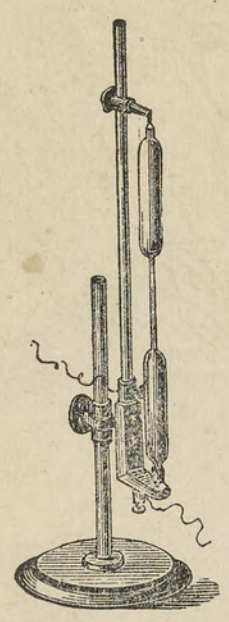

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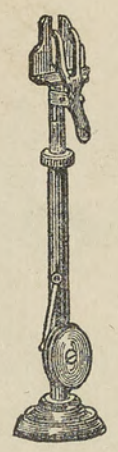

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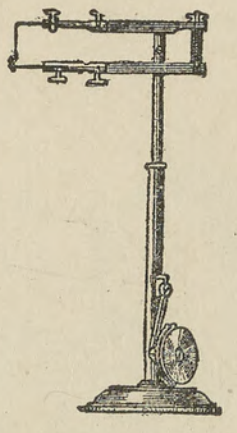

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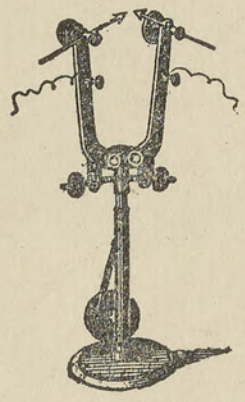

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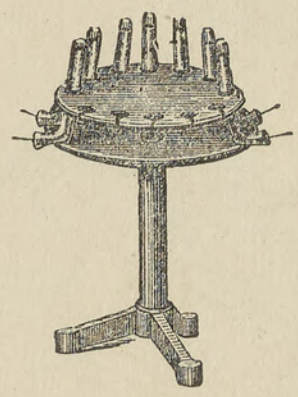

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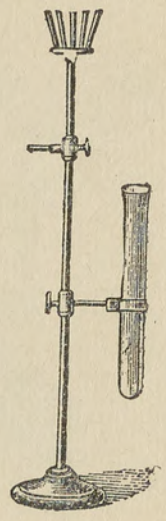

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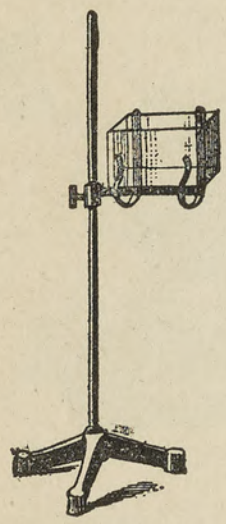

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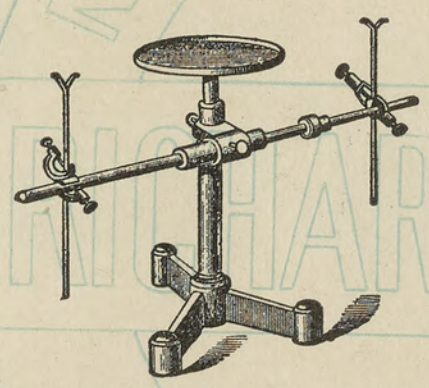

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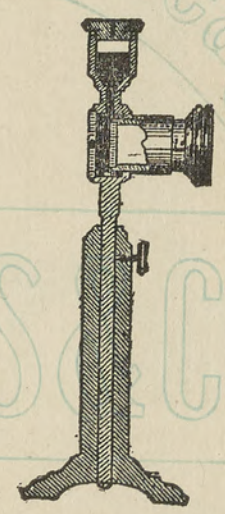

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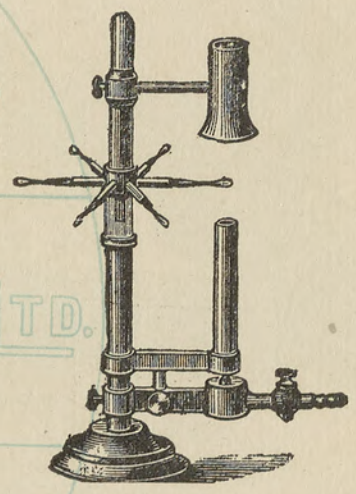

2581

No.

2576. **Support, of polished wood,** for holding 25 spectrum tubes..... $ 6.50

2577. —— **of metal,** for holding one spectral tube..... 5.00

2578. —— **of metal,** for holding spectral bottles spectrum tubes..... 5.00

2579. —— for observing the spark spectrum, latest improved model..... 15.00

2579a. —— other style, for holding carbon points..... 15.20

2579b. —— after **Mitscherlich,** of polished wood, with 8 glass tubes and platinum brush for producing constant spectra..... 7.20

2579c. —— **of iron,** very light, with pins on top, for 8 tubes, clamps charged extra..... 1.50

2579d. —— for holding absorption cells..... 2.00

2579e. —— for absorption tubes..... 4.00

2580. **Haemoscope, Herrmann's,** of brass, nickel plated..... 20.00

2581. **Burner, Terquem's,** for monochromatic light..... 8.50

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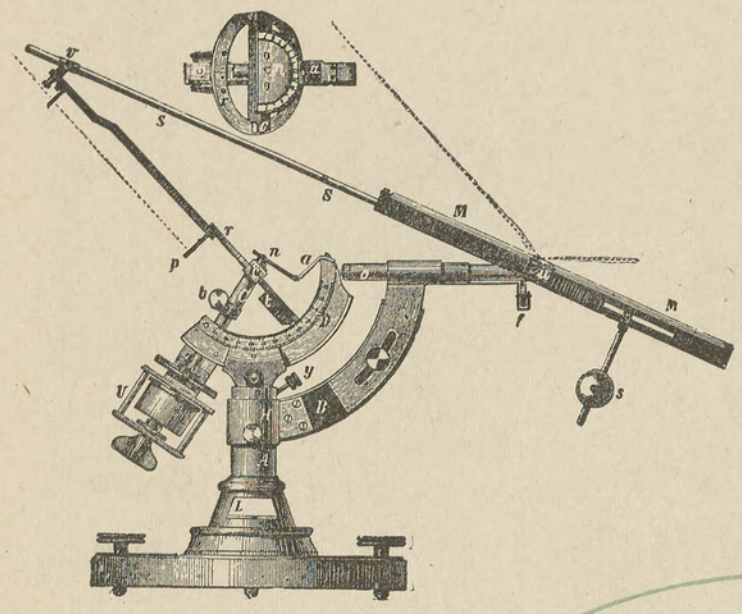

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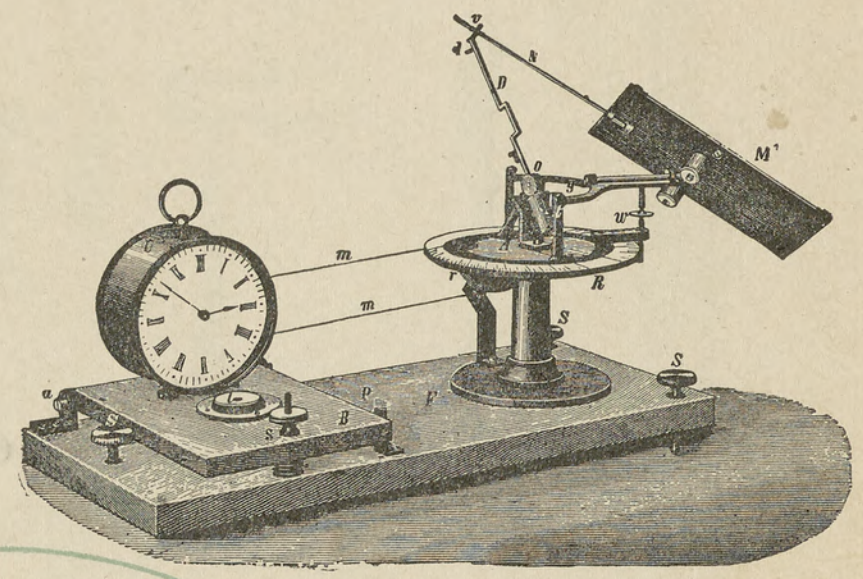

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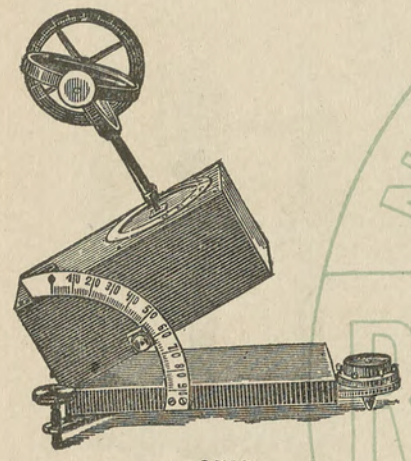

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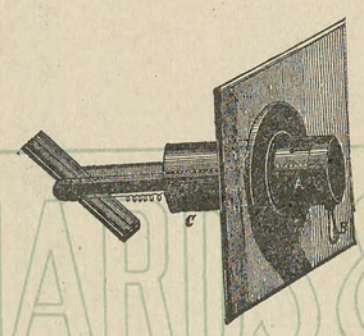

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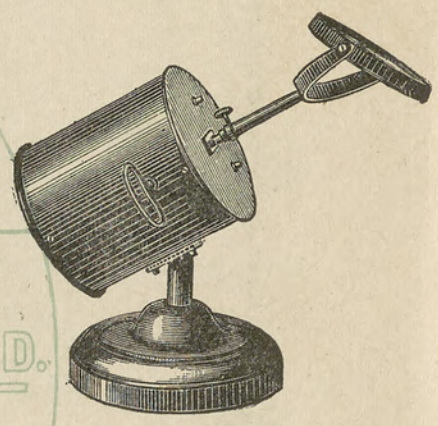

2588

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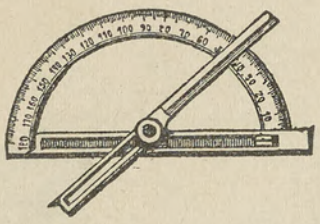
C. VARIOUS INSTRUMENTS.

No.			
2582n.	**Heliostat,** after **Fuess.**		$190.00
2583t.		same, **with two mirrors,** operated by hand, arranged to fasten to shutter	80.00
2583a.		slit arrangement for same extra	9.00
2584t.	——	after **Spencer,** with clockwork	67.50
2585.	——	after **Meyerstein,** with one quicksilver and one black mirror, and declination circle	80.00
2586.		same, **without declination** circle and with one mirror	65.00
2587.	**Hand Heliostat** ; the mirror is turned by an endless screw ; the instrument is intended to be fastened to shutter		40.00
2587a.	——	**simpler form** as No. 2587	30.00
2588.	——	with **clockwork.** (Miller-Pouillett II., fig. 296.)	50.00



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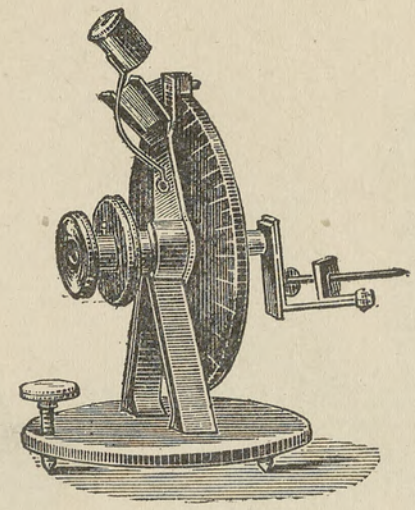

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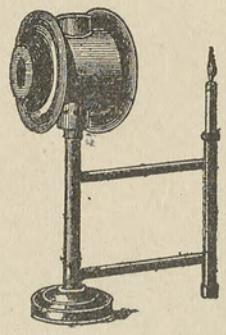

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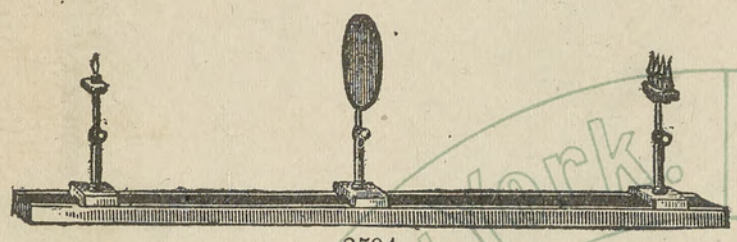

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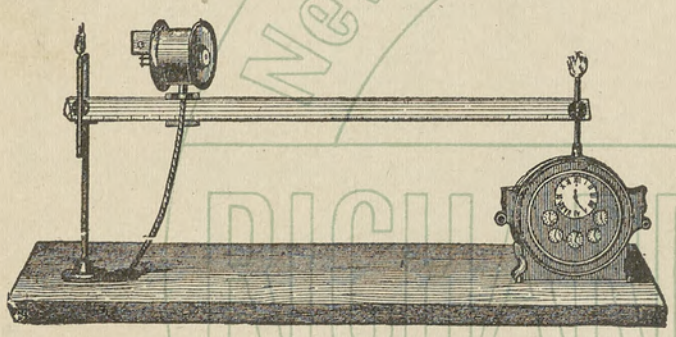

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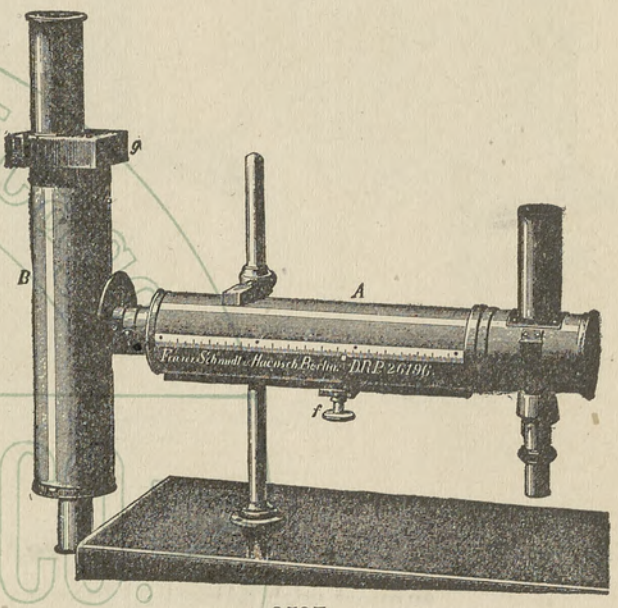

2597

No.

2589. **Goniometer,** for **measuring** the angles of crystals ; improved construction, circle divided into $\frac{1}{2}^{0}$ $10.00

2590. **Goniometer, Wollaston's Reflecting** 30.00

2591. **Photometer,** single form, for schools 12.00

2592n. **Photometer, Bunsen's;** improved construction, consisting of gasometer, micrometer, gas pillar, candle pillar, divided bar, mahogany sliding box, candle balance, normal candles, pressure gauge, argand burner, bar holder, chimneys, complete 200.00

2593n. same, **without micrometer pillar** and candle balance 150.00

2594. **Photometer, Bunsen's;** consisting of sliding movement of 1,1 meter length, with movable diaphragm, candle pillar for one and one for four candles ; illustration shows $\frac{1}{16}$ natural size 18.00

2595t. **Photometer,** 3 meters in length, with two polished carrying rods of wood, divided so that they may be used in entire or half length with candle holder, lamp-support, photometer shade with two mirrors, with rough and fine adjustment, a revolving mirror to determine the intensity of arc-lamps in varying adjustment, all parts may be readily raised or lowered, with three dispersion-lenses, after Perry and Ayrton (or revolving sector-disks) 175.00

2595a.t. The same, without dispersion-lenses and mirror 145.00

2596t. **Photometer, Compensating** (German Patent No. 34,627) with bench, 3 meters in length and with all accessories 200.00

The compensating-photometer is specially adapted to the comparison of different colored lights by means of partial mixture of both light-rays, whereby a diminution in the difference of the color is obtained. It can also be used as the ordinary Bunsen's photometer.

2597t. **Photometer, Weber's,** with determination of the constants (D. R. P. 26,196) 160.00

2597a.t. Spectroscope extra 45.00

2597b.t. Gas regulator 17.50

2597c.t. Gas meter, simple, with manometer attachment 65.00

2597d.t. Same, with clockwork, level and set screws 80.00

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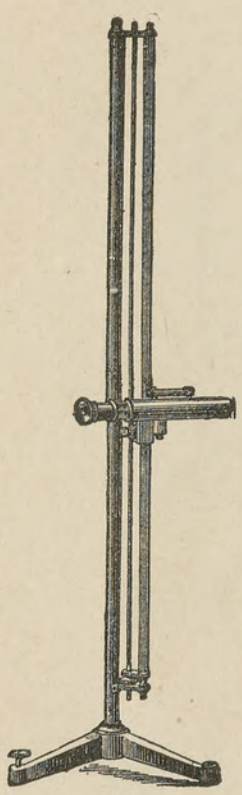

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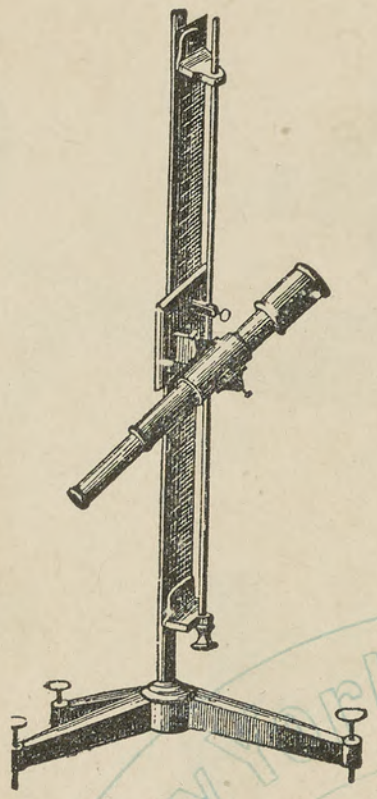

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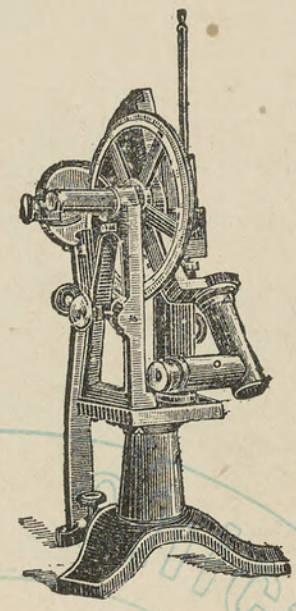

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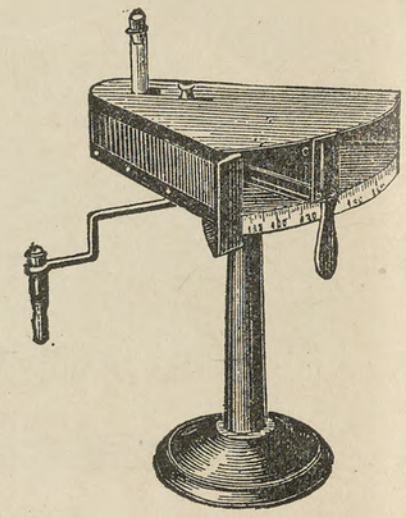

2599b

No.

2598t. **Kathetometer** for **barometer reading,** the telescope with movement for convenient adjustment, the support with adjusting screws..... $ 45.00

2598a.t. —— with millimeter divisions, vernier and spirit level..... 60.00

2598b.t. —— same also suitable for physical experiments. Spirit level attached to tripod for vertical adjustment of prism and with spirit levels on telescope parallel to the optical axis. The telescope is adjusted means of a micrometer screw..... 120.00

2598c.t. —— for **differential measurements.** A cylinder accurately adjusted revolves on an axis 1,30 meter long; it carries 2 sliders with fine adjustment by micrometer screw, each of which is provided with telescope and eye pieces very exactly adjustable. Everything is balanced in the most careful manner and the micrometers are so arranged as to prevent any lateral dislocation. The meter bars as well as the instruments to be examined are fastened to a support mounted in a similar way. Including a meter bar 120 cm. long, graduated in millimeters..... 1,800.00

2598d.t. —— mounted in a similar way, with 1 slider and 1 telescope. The meter bar on cylinder permits a reading of 0,5 millimeter by means of a vernier..... 450.00

2598e.t. —— simple prismatic steel rod with millimeter graduation, 0,1 millimeter reading by vernier, spirit level attached to telescope, fine adjustment by micrometer screw..... 200.00

2599t. **Refractometer,** for chemists for the determination of the refraction-exponents of liquids, with condensing lens and microscopes. Refraction of the prism 1.61—without Thermometer..... 96.00

2599a. **Crystal-Refractoscope,** for investigating crystals, refraction of prisms 1,74—..... 180.00

2599b. **Refractoscope,** for chemists for the determination of refraction exponents of liquids in test tubes, accurately to one unit of the second decimal, with an exactly ground test tube..... 30.00

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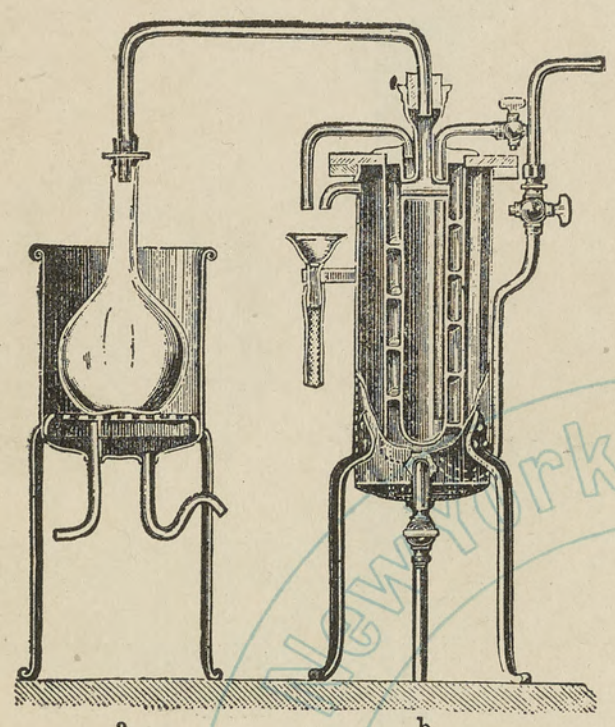

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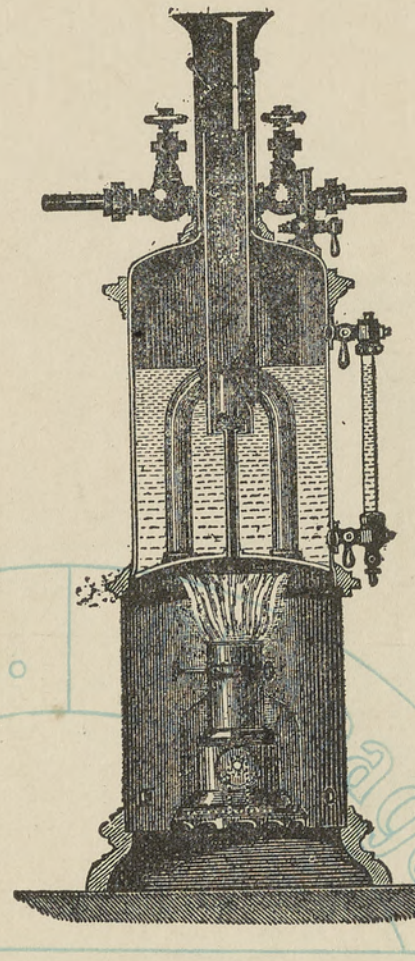

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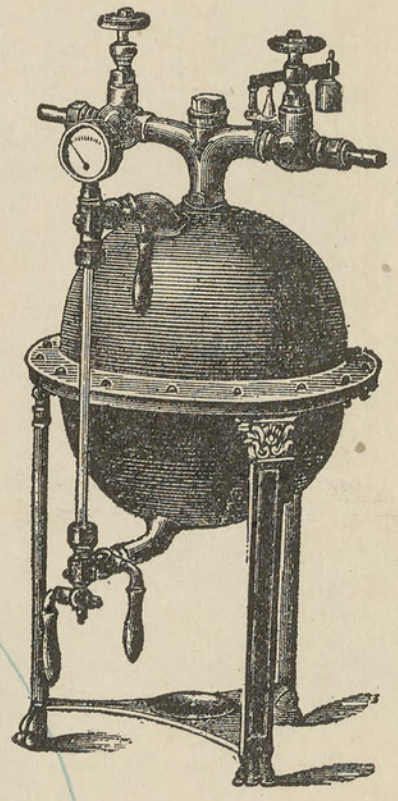

2602

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29. STEAM AND VACUUM APPARATUS.

No.

2600. **Steam Bath,** after **Landolt,** consisting of tin lined copper cylinder with perforated bottom, with steam pipe and bent tube for discharge of condensed water, with condenser.

For flasks of	1	2 Liters capacity.
	$62.50	65.00

2600a. Brass ring for use with a distilling boiler ..... extra **$4.00**

2600b. **Copper Stills** with tin crown, brass ring joint, aperture with screw plug for filling, conical joint for condenser.

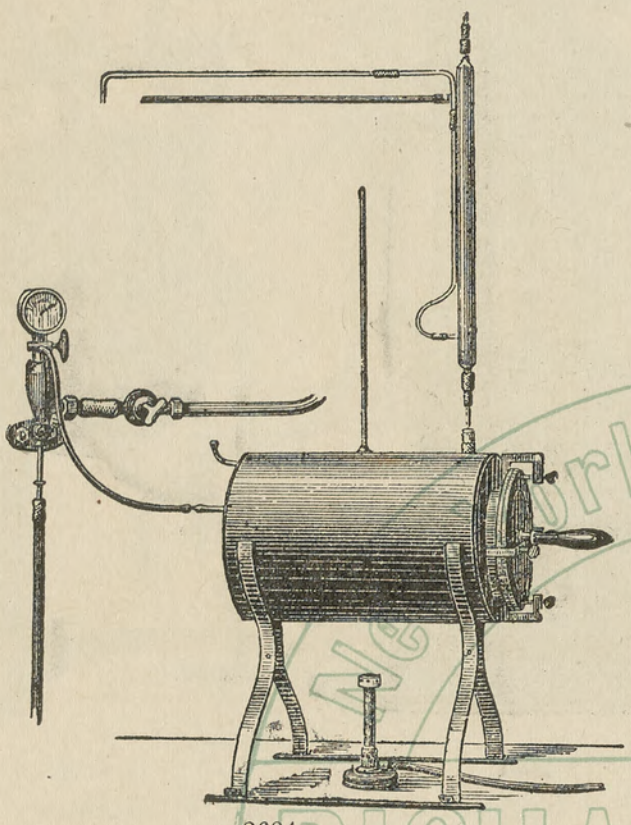
Capacity	1	2 Liters
Each	$20.00	25.00

2601t. **Steam Boiler, Landolt's,** of copper, 8 liters capacity, with 3 heating tubes, water gauge, steam cock, brass cock with two steam-outlet-valves, steam gauge, safety valve for pressure of ½, 1 and 1½ atmosphere, stop-cock for filling with water. The boiler has been subjected to 8, and is warranted to withstand 4 atmospheres pressure **82.50**

2601a.t. Maste's Lamp, with a flame surface of 50 mm **9.00**

2602. **Steam Boiler, Globe Shape,** of heavy copper, 2½ gallon capacity, with pressure gauge, for heating jackets, etc., steam is generated by alcohol or gas **50.00**

2603. **Steam Boiler,** of heavy copper and iron stand. The boiler is 30 cm. long, 12 cm. in diameter, it is provided with water gauge, safety valve and with 2 stop-cocks for steam outlet. The boiler is closed on one end, while the other can be opened. (The apparatus is used in Bonn laboratory.) **62.50**



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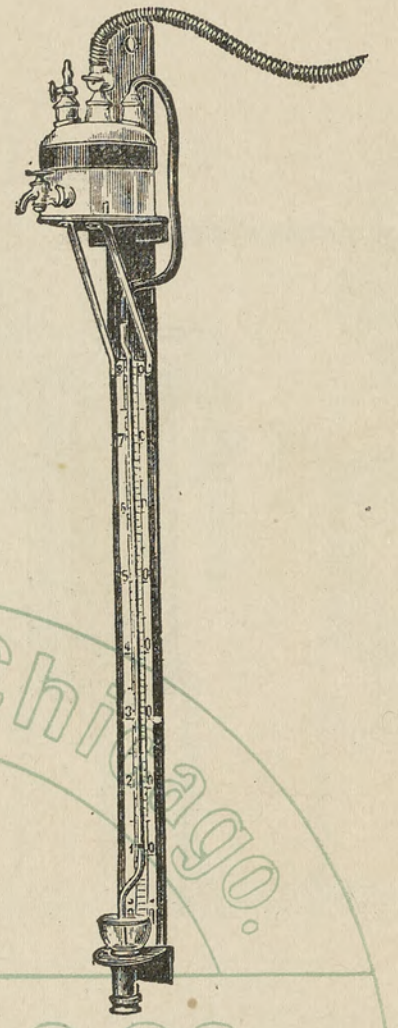

2607

No.

2604. **Apparatus for drying in vacuo,** using Arzberger and Zulkowsky's water pump of heavy copper, tinned in the inside, perfectly steam and air proof with smooth brass plate. The apparatus measures externally 400x250 mm., the space for vacuum is 150 mm. in diameter, and is provided with 2 shelves; it is the best apparatus for rapid work as it will dry within 3 hours preparations which generally require 3 days time in desiccator. Price without pump..... **$105.00**
(The apparatus is first heated and after the rind has become correspondingly warm it is covered with Syrian asphaltum, diluted with paraffine. The plate is then laid on and screwed fast.)

2605. —— **Same, smaller size,** vacuum being 100 mm. in diameter, with 1 shelf..... **75.00**

2606. **Steam Drying Apparatus,** after **Scheibler,** with water pump, for drying and evaporating in vacuo at a constant temperature and with constant level in the steam generator. (Fres. Zeits. 1878, P. 578.) The complete steam drying apparatus, the cylinder 350 mm. high and 110 mm. diameter, on iron stand, with water pump on support, and frame with 6 shelves..... **120.00**

2606a. The steam drying apparatus without water pump..... **88.00**

2607. **Brumme's Controlling Apparatus** for **Vacuum Apparatus,** consisting of a Woulff and Absorption Bottle combined. Mercury barometer with adjustable Mercury vessel (Email) Scale and Rubber connections on iron support..... **30.00**

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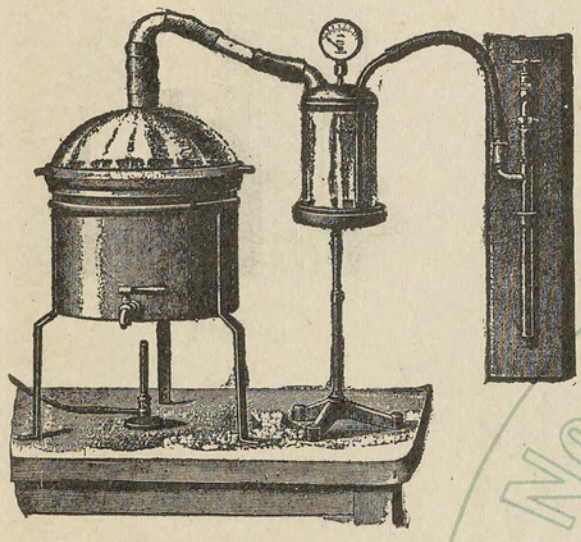

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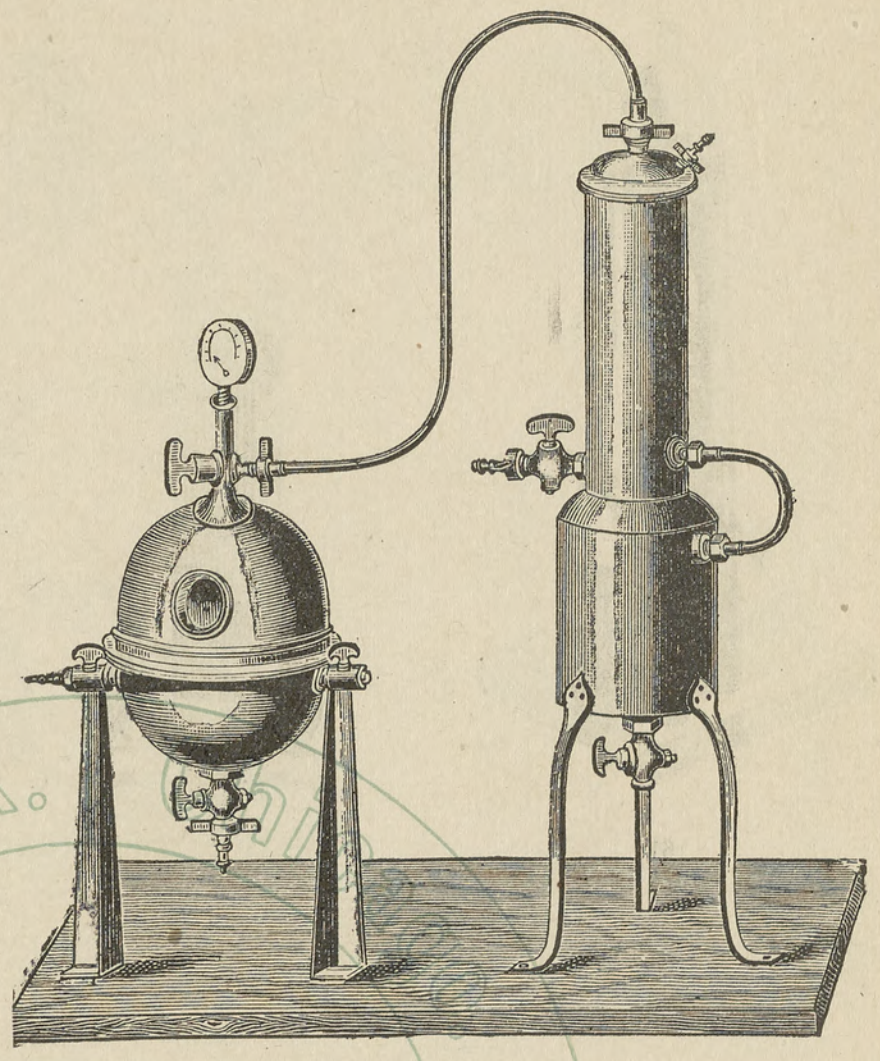

2609

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No.

2608t. **Vacuum Apparatus,** for Experimental and Laboratory work, provided with a glass hood, so that the operation can be observed. The Vacuum is obtained by connecting the apparatus with a filtering pump. An additional supply of liquids can be added while at work. The alcohol from alcoholic preparations is collected in the condenser.

Capacity	1	1½ gal.
Each	**$66.00**	**78.00**

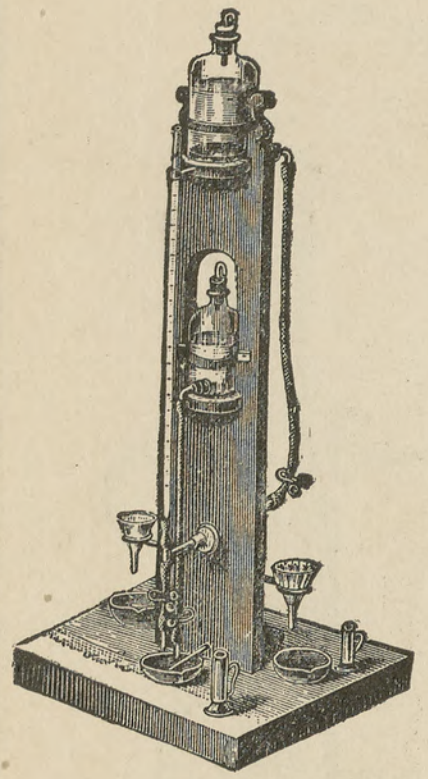
2609t. **Vacuum Apparatus,** for laboratories. The advantages of this apparatus over those with glass globes are, that it is fitted with a copper globe with two opposite glass windows, by which the process inside is observed. Experiences teach, that a glass globe easily cracks and is also difficult to fasten tight. The Condenser is constructed so as to regain the evaporized liquid, thus giving a constant work in a vacuum. Heated by steam; receiver has double walls, capacity 6 liter, and is suspended, hangs on switches so as to turn over..... **$135.00**

2609a.t. Same, tin lined inside..... **160.00**

2609b.t. Same, inner basin of copper and loose, to be taken out or of acid proof enamel..... **160.00**

2609c.t. Same, for gas with water bath..... **155.00**

2609d.t. Water Air Pump for above..... **9.00**



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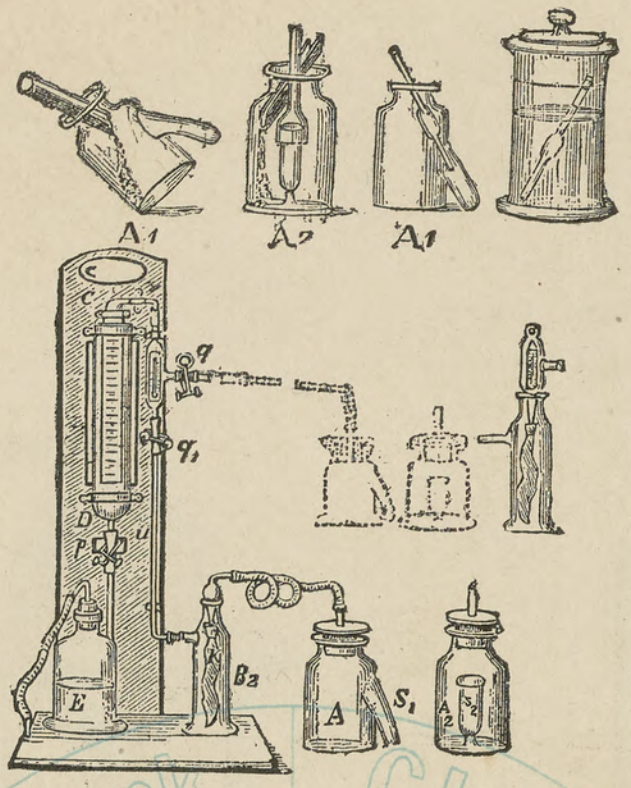

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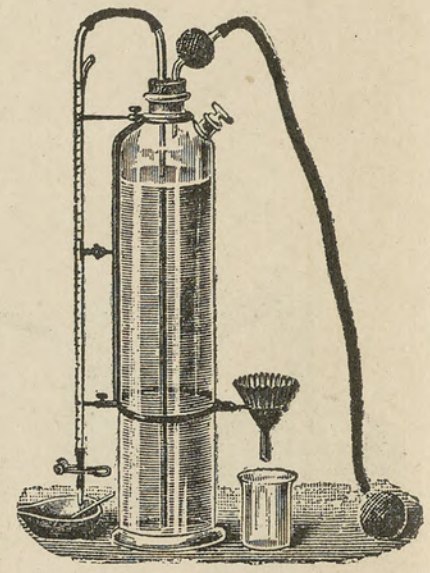

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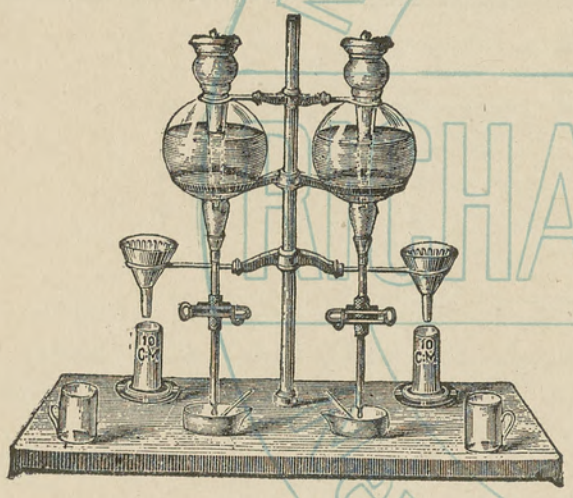

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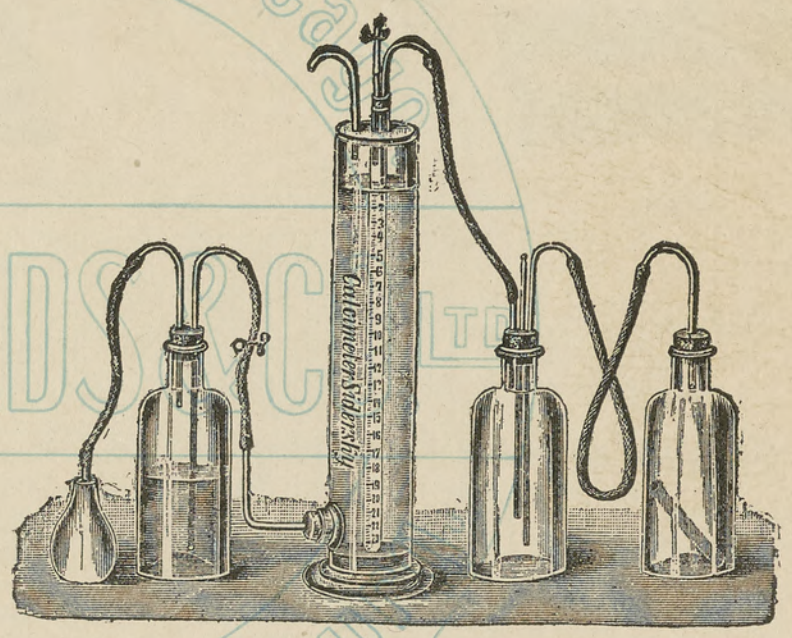

2614

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30. APPARATUS FOR SUGAR ANALYSIS.

No.

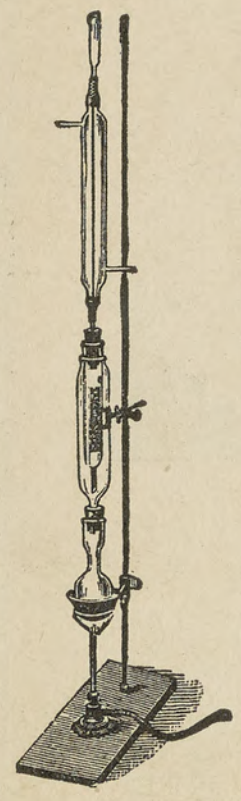
2610. **Fruehling & Schulz' Apparatus** for determining the percentage of alcaline in sugar, complete..... $16.00

2611. **Gavalowsky's Calcimeter.** (Azotometer) improved Scheibler system, complete as per illustration; with directions..... 40.00

2612. **Hodeck-Siegert's Apparatus** for determination of percentage of alcaline substance in beet juice..... 24.00

2613. **Kappus' Apparatus** for exact analytic determination of syrups and molasses, with directions..... 16.00

2614. **Sidersky's Apparatus** for volumetric analysis of CO_2 in carbonates..... 12.00



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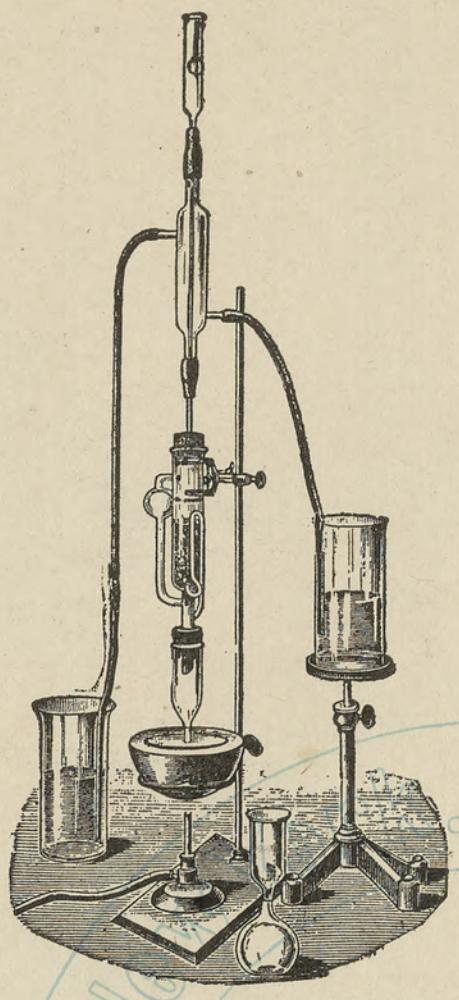

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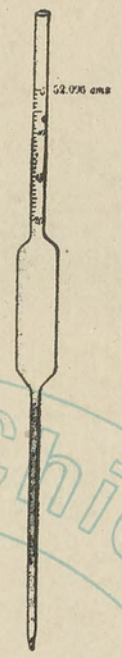

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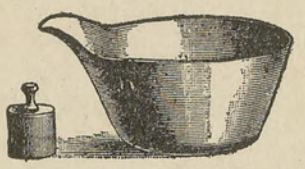

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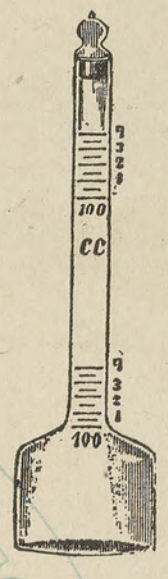

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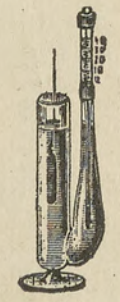

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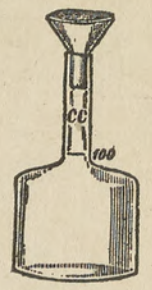

2620

No.

2615. **Scheibler's Apparatus** for the direct determination of the sugar in beets, consisting of 1 condenser, flask and extraction apparatus, without support and burner..... $ 5.00

Scheibler's Calcimeter, see Apparatus for Boneblack.

2616. **Szombathy-Soxhlet's Extraction Apparatus, improved by Sickel,** for determination of sugar in beets

a, the glass parts filled with corks and rubber tubing..... 3.00

b, complete with support, and sets of glass parts, two beakers and two extra flasks (without burner).. 22.50

2617. **Fruehling & Schulz' Picnometer** for determination of specific weight..... 4.00

2618. **Wiechmann's Sugar Pipette,** 10 cc. complete fitted..... 1.50

2619. **Crampton's Sugar Pipette,** graduated..... 2.50

(Jl. of Anal. Chem., P. 43.)

2620. **Flasks for diffusion** of sugar, with **short neck** and 100 cc. mark.....doz. 4.50

2620a. **Filling Funnel,** for above, angle 75°, with corresponding numbers..... " 2.25

2621. **Flasks for diffusion** of sugar, with **long neck,** glass stoppered.

Grad.	50 to 55 cc. in $\frac{1}{10}$	100 to 110 cc. $\frac{1}{10}$
Each	.90	$1.10

2622. **Dishes of German Silver, small,** without lip, in sets of three with counterpoise..... 3.25

2622a. Same, **large,** with lip and counterpoise..... 3.50

2623. **Normal Weights,** 13.024 or 26.048 ..... 1.00

Polariscopes, see Part II. Apparatus for Polarization.

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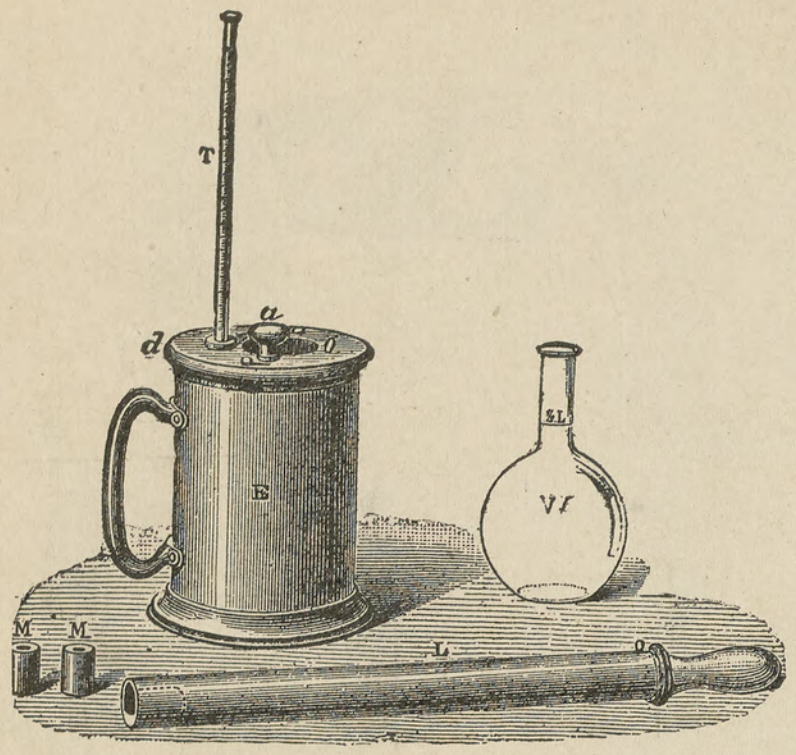

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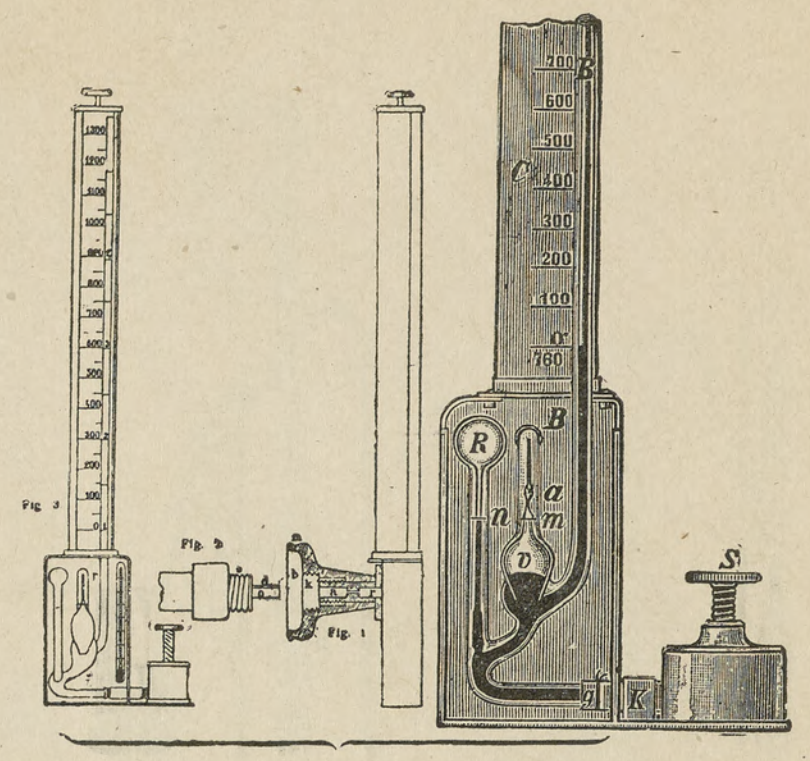

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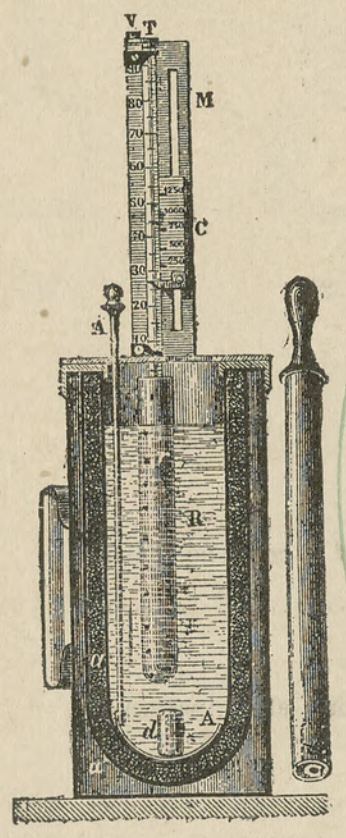

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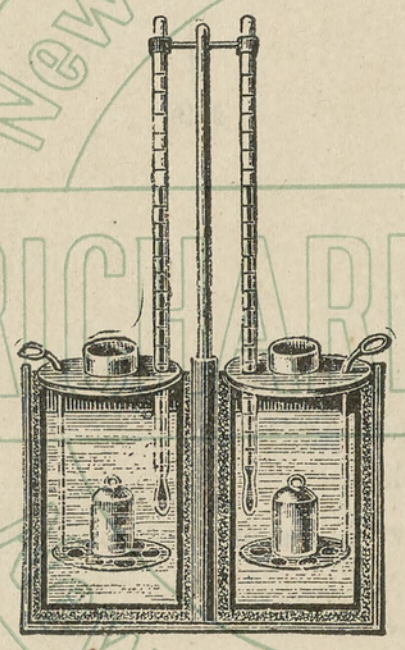

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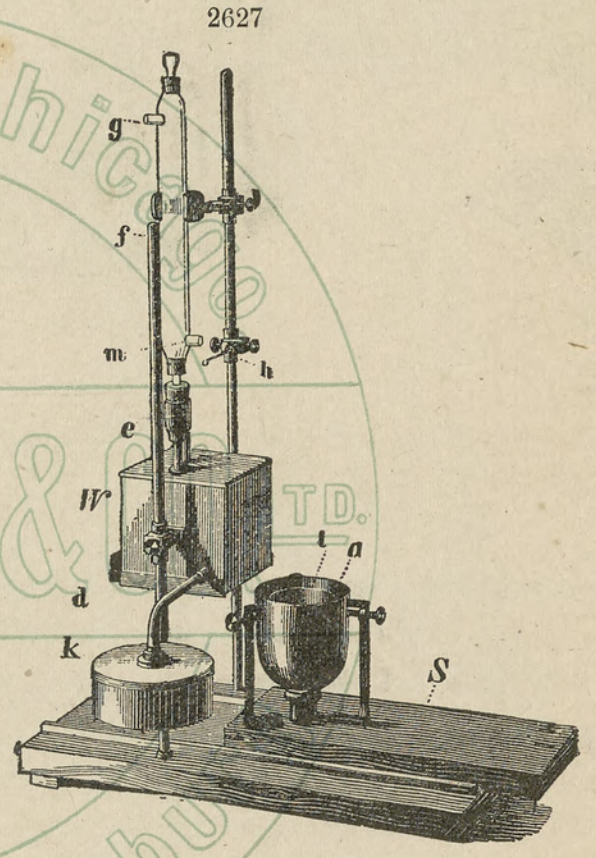


2628

31. APPARATUS FOR TEMPERATURE DETERMINATIONS.

No.

2624t. **Pyrometers** of **metal,** with registering gauge up to 1500° F.

Dia. of Dial	5	7 in.
Each	$26.00	30.00

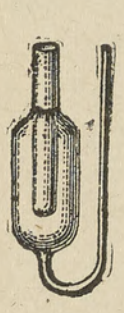
2625t. **Silman's Water Pyrometer,** with thermometer and six copper cylinders, for temperatures up to 1800° F. complete, with description and table of corrections..... $ 40.00

2626t. **Salleron's Colorimeter,** for temperatures between 300 and 1100° F., complete, with instructions..... 35.00

2627n. **Wiborgh's Air Pyrometer,** for temperatures up to 1400° C. as used in the largest iron works and blast furnaces. This instrument has lately been improved, and is now considered the most reliable of commercial pyrometers..... 125.00

2628n **Edelmann's Mixing Colorimeter,** for ascertaining constant temperatures of different liquids at the same time..... 85.00

2629. **Colorimeter Double,** for illustrating the difference in the specific temperature of two bodies, complete with two thermometers 50° C. in $\frac{1}{5}$..... 20.00



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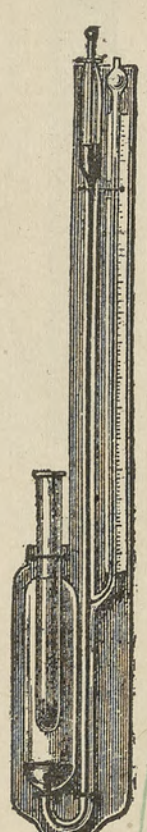

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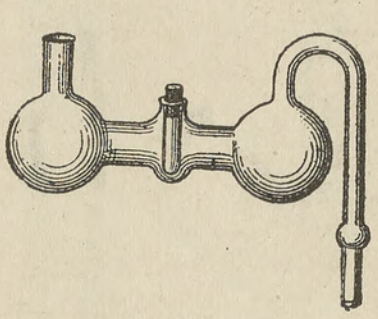

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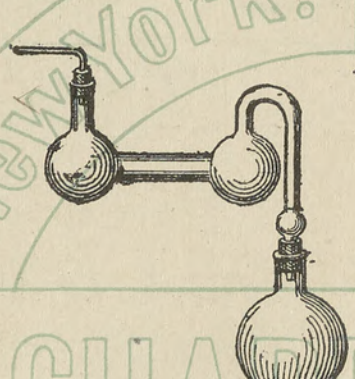

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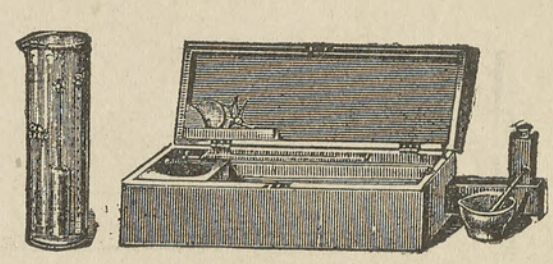

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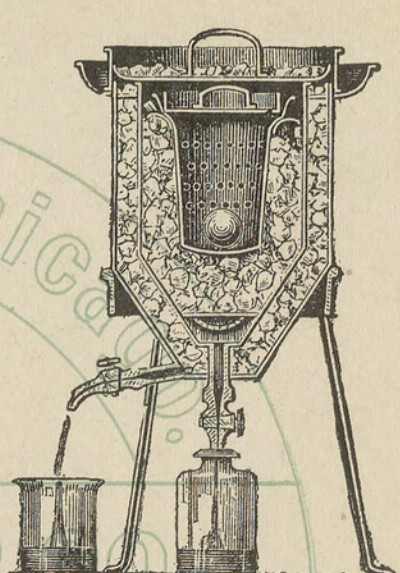


2635

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

No.

2630. **Bunsen's Ice Calorimeter,**

	Sml.	Med.	Lge.
Size	8	16	24 oz.
Each	.75	.90	$1.20

2631. **Bunsen-Reichardt's Ice Calorimeter,** with millimeter scale, on wooden base..... $6.00

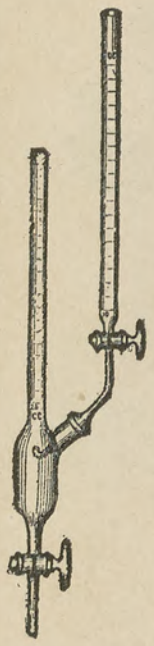
2632. **Carre's Ice Calorimeter, without flask.**..... 2.50

2633. **Carre's Improved Ice Calorimeter, without flask**..... 1.50

2634. **Calorimeter,** Thompson's, complete in Mahogany Case, consisting of Combustion Cylinder, with separate Spring Clutch, Base, 6 Cylindrical Copper Furnaces, 2 snort ditto, Glass Water Cylinder, Thermometer, Scales and Weights, Iron Mortar and Pestle, Sieve, Oxygen Mixture, etc., with instructions for use..... 75.00

2634a. Jars for above, marked at 29010 grains..... 2.00

2635. **Ice Calorimeter,** according to **Lavoisier & Laplace** (Müller-Poillert 1877.)..... 32.50



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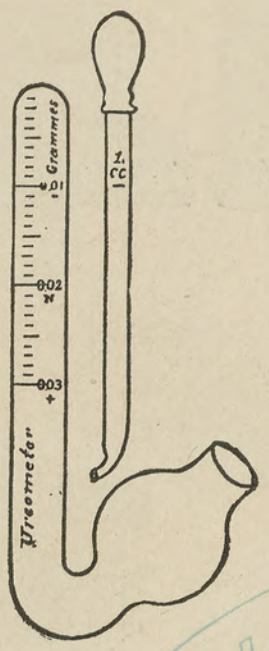

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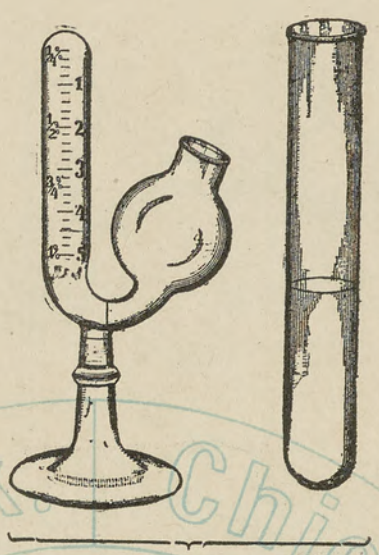

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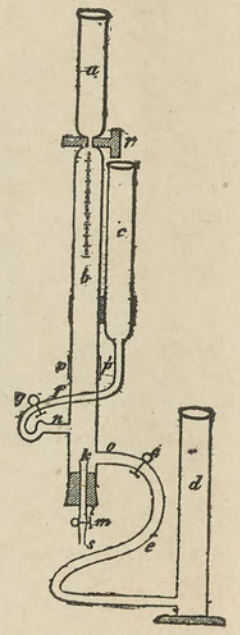


2636

32. APPARATUS FOR URINE ANALYSIS.

No.

2630. **Anderlini's Ureometer,** with level tube..... $ 5.00

2631. **Doremus' Ureometer,** for estimation of urea by means of sodium hypobromite, on glass foot, complete in box with directions..... 1.75

2632. **Draper's Set,** for urine analysis, consisting of support, urinometer with cylinder, watch glasses, test tubes, stirrers, pipettes, alcohol lamp, test paper, and 9 labeled glass stoppered bottles..... 4.50

2633. —— same, fitted with reagents..... 5.50

2634. **Einhorn's Fermentation Saccharometer** for the estimation of sugar in urine, complete with marked test tube, in box..... 1.00

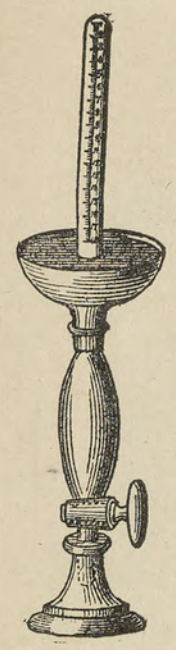
2635. **Esbach's Albumenometer,** for quantitative estimation of albumen in urine..... .75

2635a. Test solution for same, per bottle..... .40

2636. **Frutiger's Ureometer,** for determination of Urea by hydrobromine solution..... 7.50

(Jl. Anal. Chem. 87, P. 453, and Fres. Zeits. Vol. 26. P. 400.)

New York. Chicago. RICHARDS & CO. LTD. Berlin. Hamburg.



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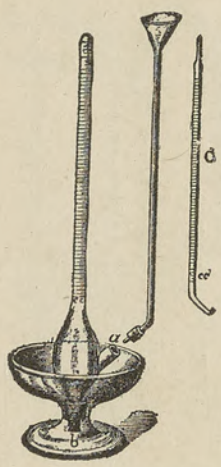

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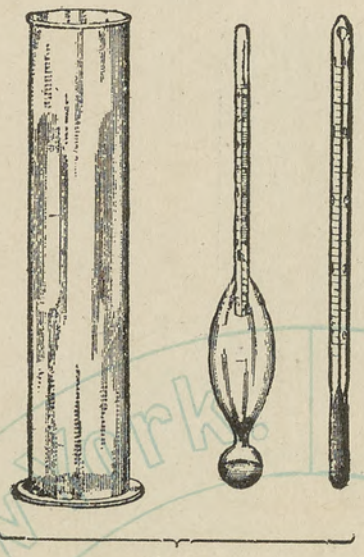

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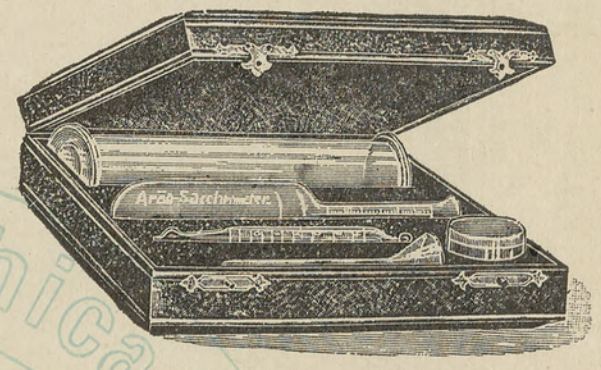


2641

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

No.

2637. **Huefner's Ureometer,** for determination of nitrogen in urea, improved..... $5.00

2638. **Marshall's Ureometer,** a modification of Greene's apparatus..... 3.00

2639n. **Squibb's Urea Apparatus,** for the approximate estimation of urea in urine..... 3.00

2640n. **Squibb's Spec. Gravity Apparatus,** (Urinometer) with thermometer..... 2.50

2640an. Without thermometer..... 1.60

2641. **Schuetz' Ureo-Saccharometer** for quantitative determination of sugar in urine, and for measuring the specific gravity of urea, with thermometer, cylinder and support in case, with directions..... 14.00

2642. **Bartley's Urinometer**..... 1.00

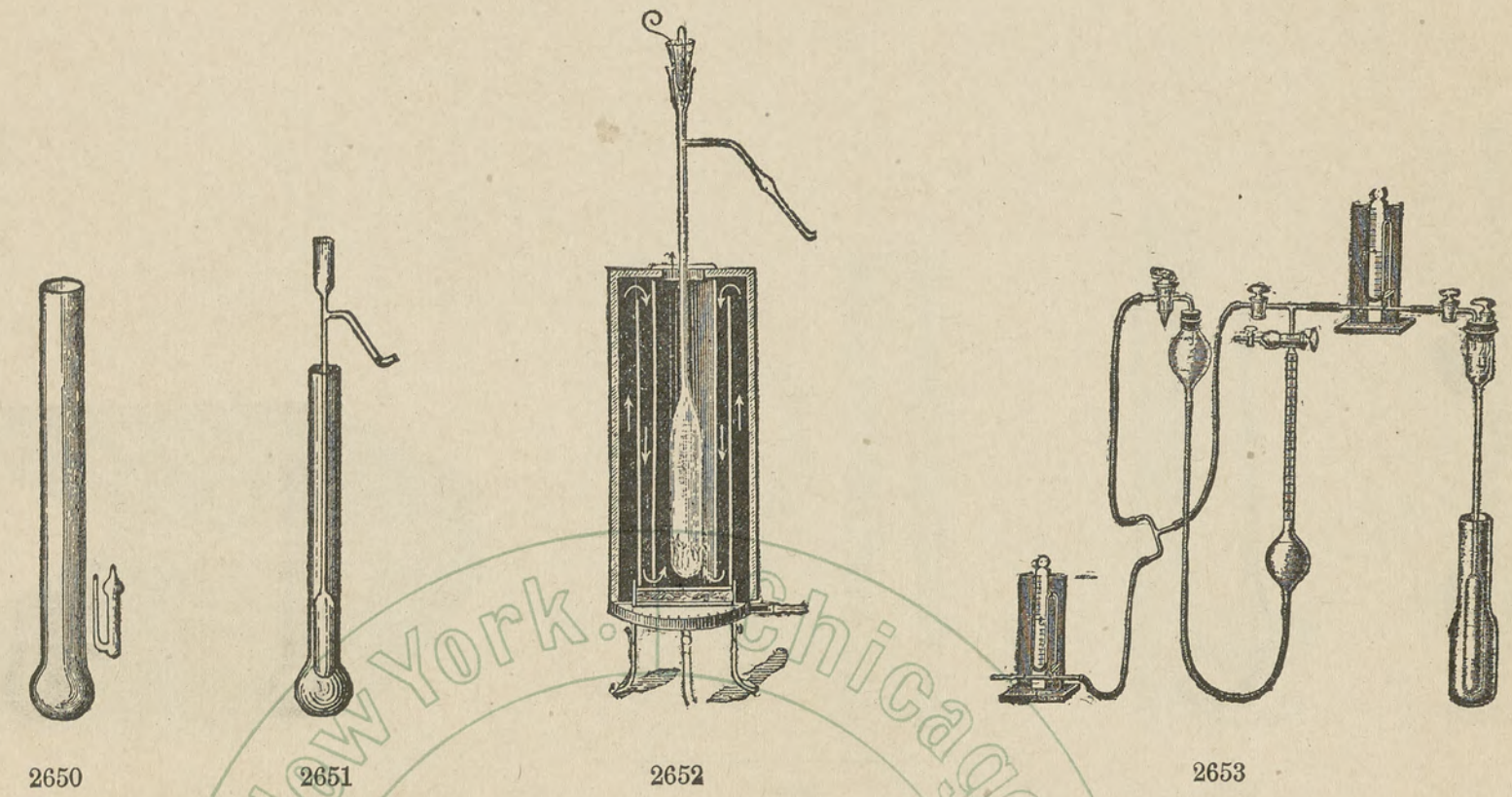
2643. **Fehling's Test Solution,** put up in two glass stoppered bottles, 2 oz. of each element..... 1.00

2644. **Urinometers, sp. gravity scale.** 1,000 to 1,040 or 1,000 to 1,060. With cylinder.....each .50

2645. —— according to **Vogel.** 1,000 to 1,020 or 1,020 to 1,040. With cylinder.....each .60

2646. —— Same as No. 2645 **with thermometer**..... 1.60

See also Part I. Test Glasses and Test Tubes.



2650 2651 2652 2653

33. APPARATUS FOR VAPOR DENSITY DETERMINATION

FOR SUBSTANCES OF HIGH BOILING POINT.

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

No.

2650. **Vapor Density Apparatus,** after **Victor Meyer** (Fres. Zeits. 1878, P. 373.)

2650a. Flask with long neck $1.00

2650b. Inner tube with side neck 1.00

2650c. Small glass stoppered bottles ..... per doz. 1.20

2650d. Bottles without stopper ..... " 1.40

2651. **Vapor Density Apparatus** after **Victor Meyer.** (Fres. Zeits. 1880, P. 214.)

2651a. The outer flask 1.00

2651b. The inner glass vessel 1.00

2651c. Cast iron crucible, to replace glass steam jacket. (Berichte d. Deutsch Chem. Ges. 1886, P. 1861.) .80

2652. **Air Bath with Heating Arrangement,** designed by Prof. Dr. **Lothar Meyer,** for heating the apparatus up to 500° C. 13.00

2653. **Vapor Density Apparatus,** after **Hofmann,** modified by **Schiff,** complete on support 22.50

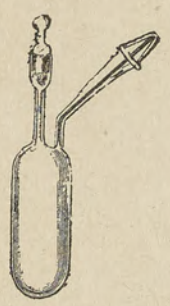
Single Parts for Same.

2653a. Mercury trough of iron, with glass walls, 30 cm. long, 10 cm. wide, with rod 1 meter high 7.75

2653b. Glass parts 6.00

2653c. Bottle with ground stopper ..... .20

2653d. Calibrated inner tube 3.25



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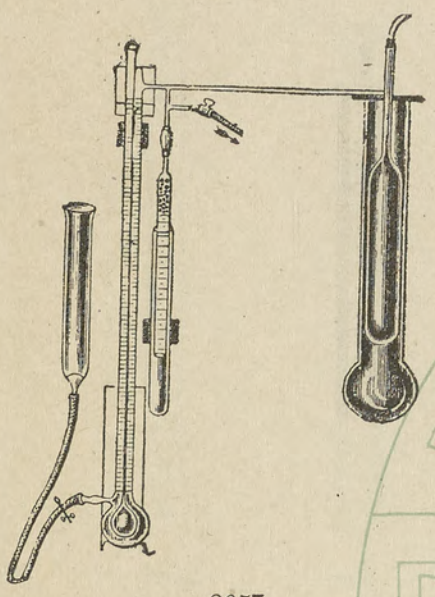

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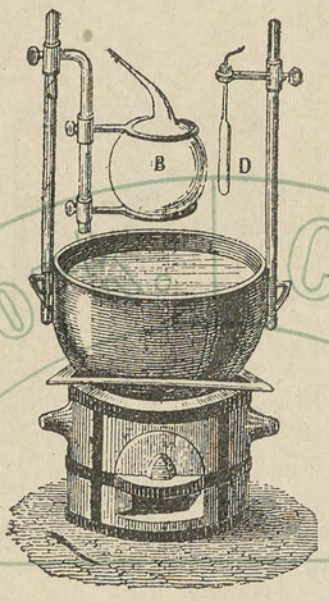

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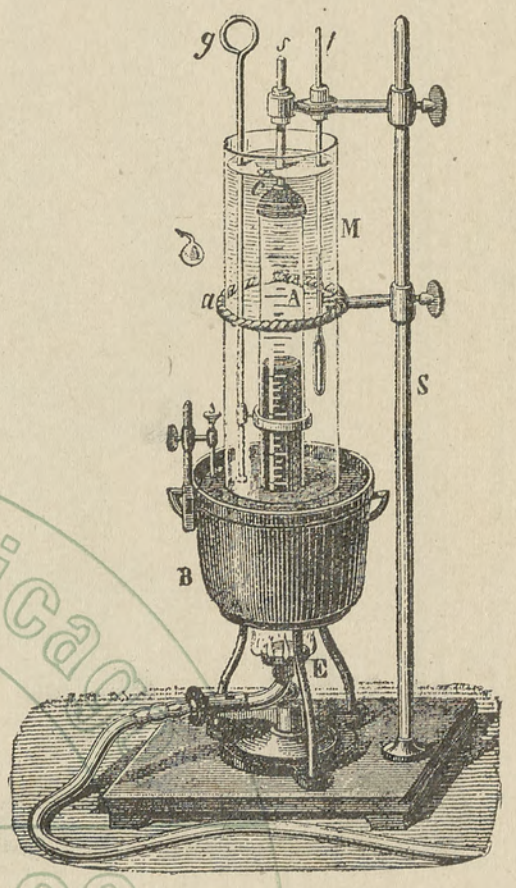


2659

New York Chicago RICHARDS & CO. LTD. Newark. Hamburg.

No.

2654. **Vapor Density Apparatus,** after **W. La Coste,** for the determination in a vacuum of the densities of vapors of substances boiling at high temperature (Berichte der Chem. Ges. 1884, P. 2122), improved by Anschuetz and Evans.

2654a. The glass parts $17.50

2654b. Two manometers with movable scale grad on mirror glass ..... each 6.50

2654bb. Filling up with mercury ..... " 1.00

The following articles are needed with the apparatus and will be furnished when ordered:

2654c. Four supports ..... each 1.00

2654d. Three clamps ..... " 1.50

2655e. One large double clamp ..... " 2.50

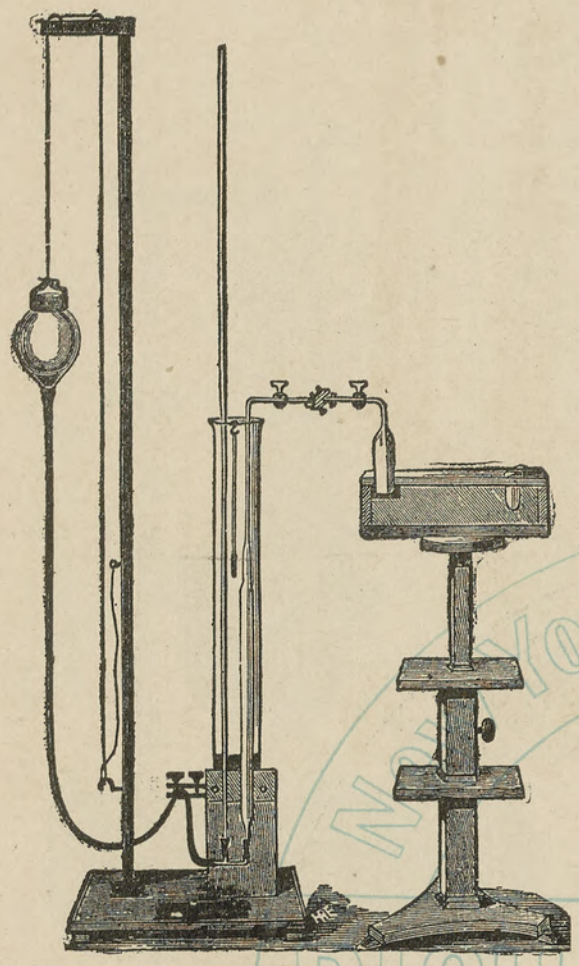
2656f. One support for holding manometer ..... " 1.00

2657. **Vapor Density Apparatus,** after **O. Schall.** (Chem. Central Blatt 1889, p. 305.) 15.00

2658. **Vapor Density Apparatus,** after **Dumas,** consisting of cast iron vessel, with stand for balloon, and thermometer up to 360° C., latest form, complete except heater 25.00

2659. **Vapor Density Apparatus,** after **Gay Lussac,** with thermometer (without burner and tripod) 10.00

2660. **Vapor Density Determination Bottle.** after **Pawlewski.** (Fres. Zeits. 1884, P. 191) 2.40



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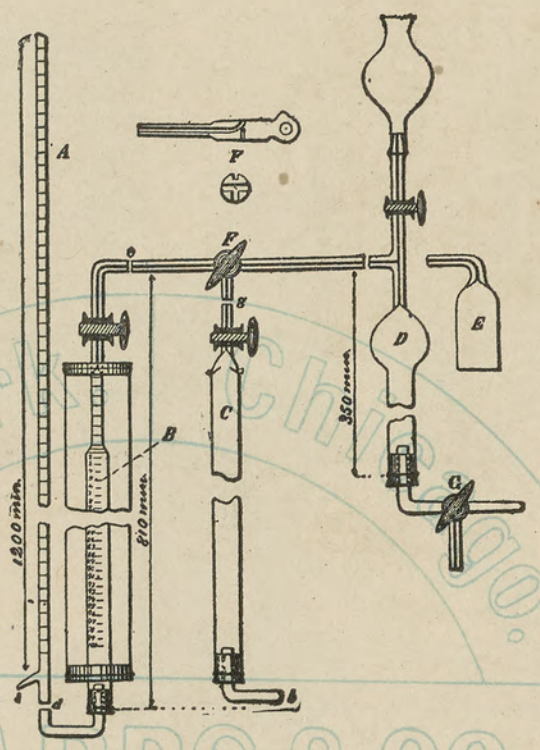

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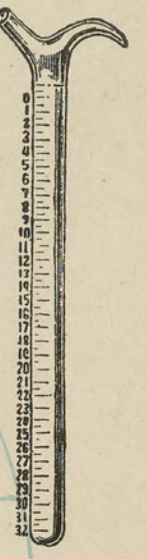

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2664

Newark, Germany
RICHARDS & CO. LTD.

34. APPARATUS FOR WATER ANALYSIS.

No.

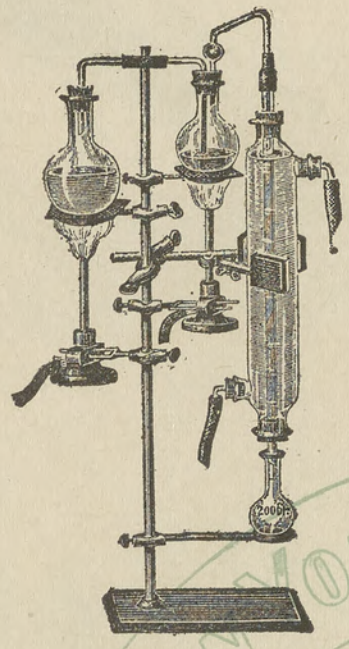
2661. **Frankland's Water Analysis Apparatus,** with oak base, iron support, mahogany mercury trough and stand for same, 2 long graduated tubes with stopcocks, 2 laboratory tubes, large cylinder, thermometers, Gay Lussac syphon barometer, graduated glass reservoir for mercury with steel clamp, canvas lined rubber tubing, rubber stoppers and fittings..... **$100.00**

2662n. **Willard's Water Analysis Apparatus,** consisting of: *a.* pressure tube grad. in mm., *b.* measuring tube, *c.* explosion tube, *d.* absorption tube, *e.* receiver, *g.* three ways stopcock..... **25.00**

(Jl. Anal. Chem. 1889, P. 198.)

2663. **Bourdon & Bourdet's Hydrotimeter,** for determination of hardness of water by means of soap solution. (Elsner 1885, p. 325.) Consisting of burette on foot, with scale of hardness marked on, sample flask for shaking graduation $\frac{10}{10}$ cc. up to 40 cc., boiling flask of 125 cc. with mark, in wooden box, with directions..... **5.50**

2664. **Neugebauer's Titanometer,** for determination of hardness of natural waters by means of soap solution; with hardness scale tables and directions..... **2.50**



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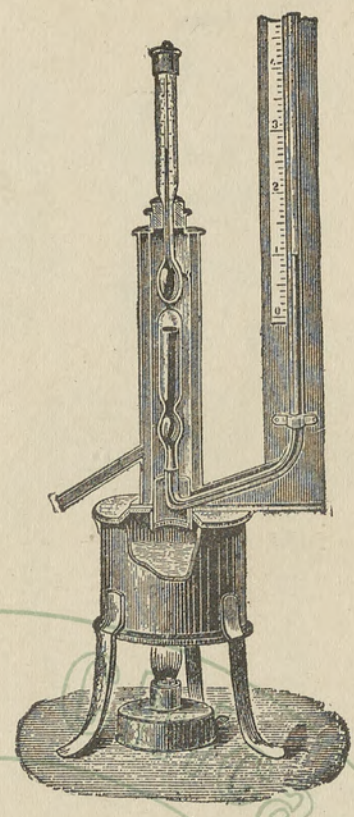


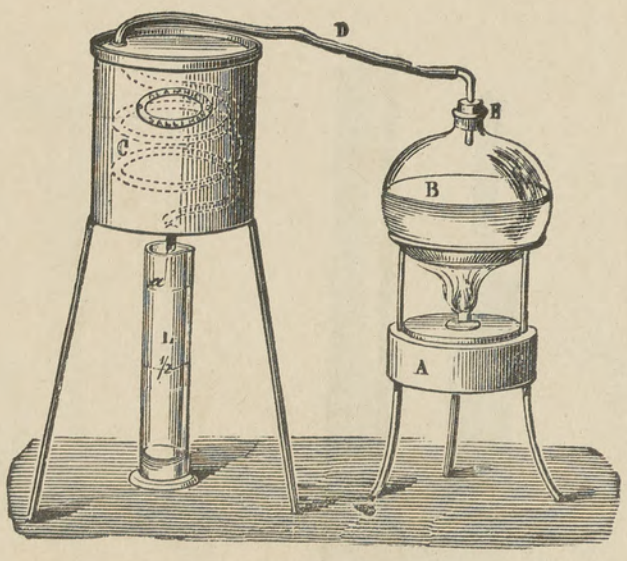
2677

New York. Chicago. Newark. Hamburg. RICHARDS & CO. LTD.

35. APPARATUS FOR WINE ANALYSIS.

A, BARTH'S APPARATUS FOR A UNIFORM METHOD FOR WINE ANALYSIS AS ADOPTED BY THE KAISERL. DEUTSCHEN GESUNDHEITS-AMT.

No.		
2670.	**Guide for same**	$ 1.00
2671.	**Distilling Apparatus for 6 alcohol determination,** consisting of metal shelf with cooling box of zinc, cooling and connecting tubes, boiling flasks, pyknometer and burner, complete with directions..	55.00
2672.	**Distilling Apparatus for determination of volatile acid,** consisting of support with condenser, boiling flasks, glass and rubber connections, and burners as per illustration, complete.....	20.00
2673.	**Reagent Bottles**, graduated for tannin determination.....Each	1.00
2674.	**Glass boats,** for determination of glycerine, with one set numbers from 1 to 6..... "	.50
2675.	**Test Tubes,** grad. 100 cc. for colorimetric, set of 10 with wooden support, complete.....	9.50
2676.	**Glycerin flasks** after **Schmidt**.....	.15
2677t.	**Alcoholometer or Vaporimeter,** after **Geissler,** for estimating the percentage of alcohol of very diluted alcoholic liquids, complete with tables of calculation and instructions for use.....	15.00



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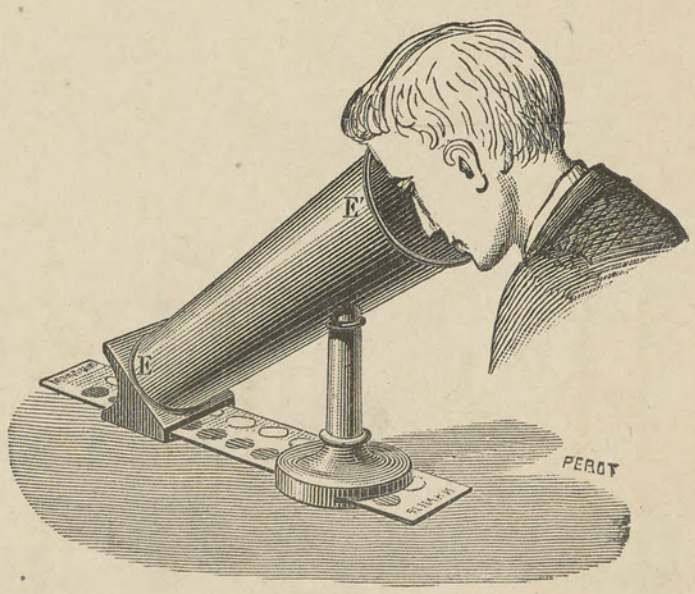

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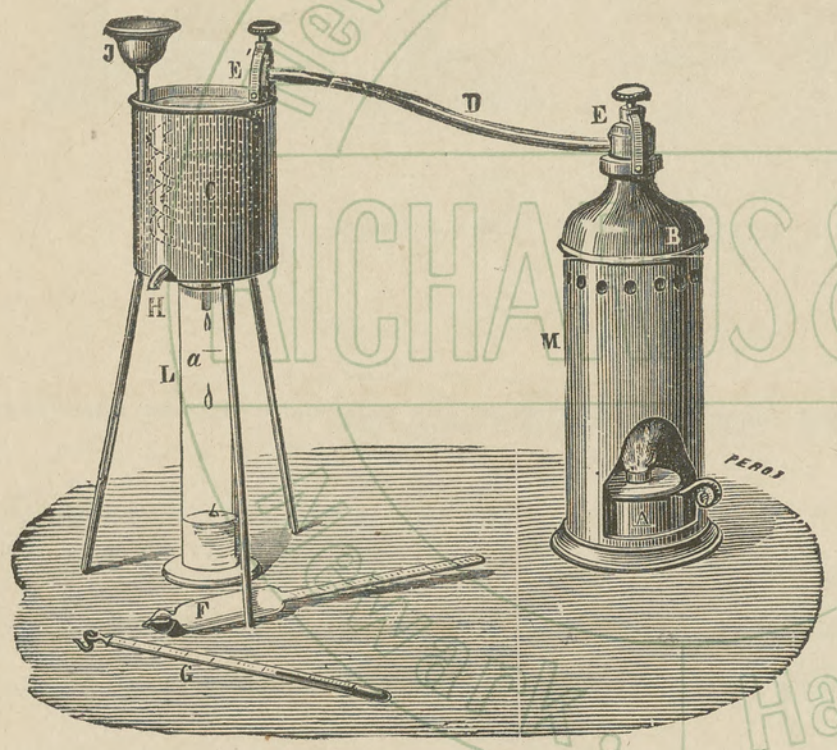

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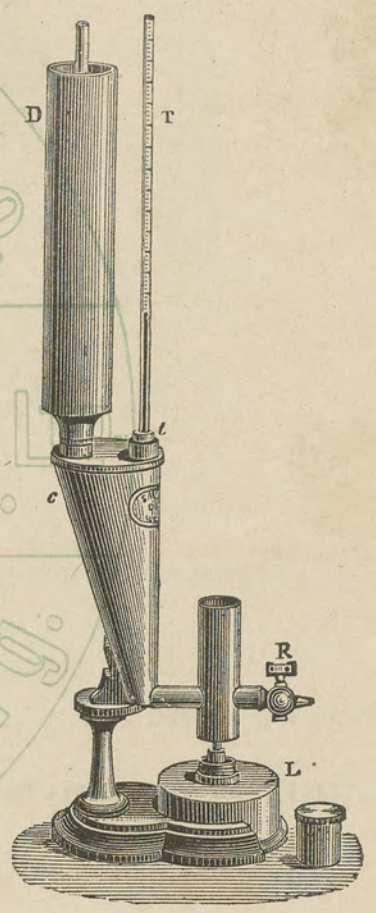
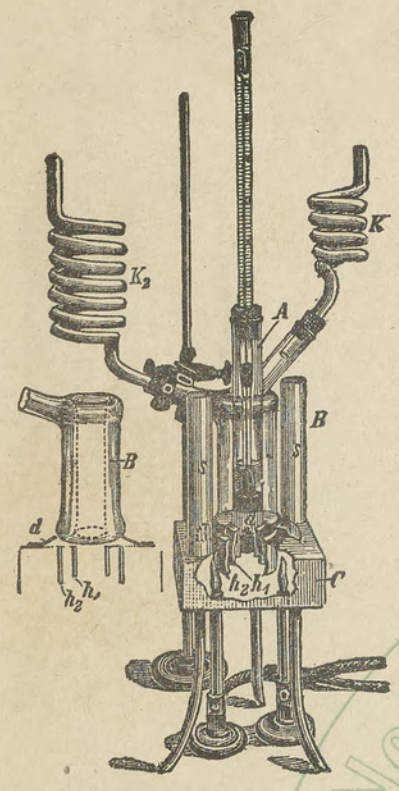


2682

B. SALLERON'S APPARATUS FOR DETERMINING ALCOHOL IN WINES, CIDER AND LIQUORS.

No.		
2680.	**Wine Tester No. 1;** small size, as per illustration	$15.00
2681.	**Wine Tester No. 2;** large size, as per illustration	20.00
2682.	**Ebulliometer,** for the accurate determination of alcohol in wines, beer, etc	35.00
	(NOTE.—This instrument works very rapidly; a determination being obtained in ten minutes. It is used by the French, Italian, Spanish, Grecian, etc., custom houses.)	
2683.	**Vino-Colorimeter,** for measuring the degree of coloring in red and white wines complete	32.50
2684.	**Gysometer-Poggiale's,** for measuring the amount of plaster in wines, as used by the French trade	12.50
2685.	**Rose's Apparatus,** for determining the degree of purity in alcohols	6.00
	See also Polariscopes, etc.	



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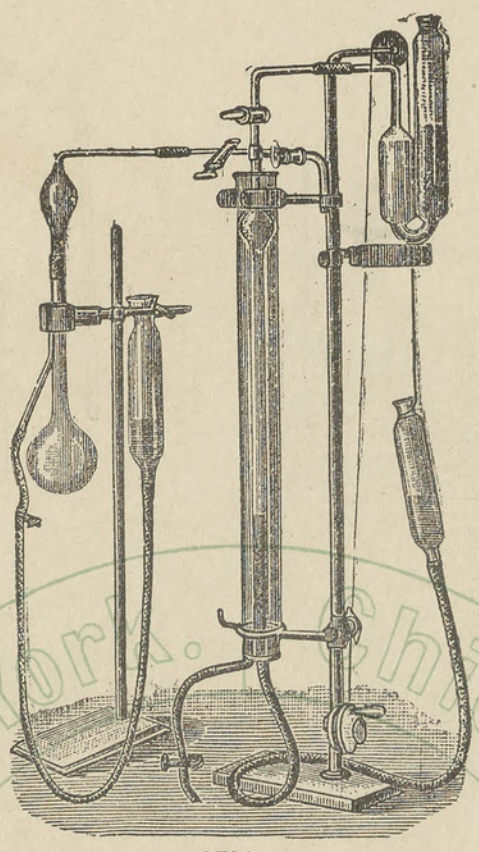

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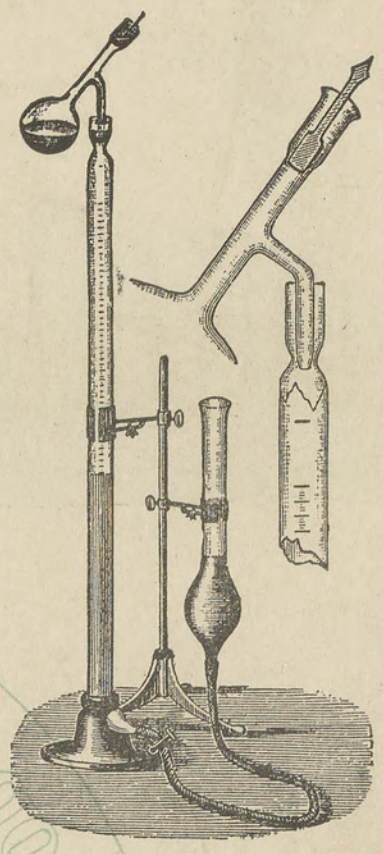

2702



2703

36. VARIOUS APPARATUS.

No.

2700. **Apparatus for Molecular determination by the boiling method**; most recent modification. (Chem. Kal., 1892, P. 187.)

a. Standard Thermometer of Jena Glass, divided into $\frac{1}{100}^{0}$ ..... $ 30.00

b. Heating box of asbestos 3.50

c. Steam Jacket of glass 2.75

d. Steam Jacket of copper 6.50

e. Test tube with sealed in Platinum 2.00

f. Two condensing spirals 1.60

g. Two small Liebig Condensers 2.75

h. Granate stones, solid glass beads, pipette, clay plate, asbestos paper 2.00

2701. **Peterson's Apparatus, for Carbon determination,** latest modification; complete, with support 36.00

2702. **Oertel's Fluorometer,** for volumetric determination of Fluorine 7.50
(Fres. Zeits. 1886. P. 505.)

2703. **Bloch's Feculometer.** for Starch determination 1.20

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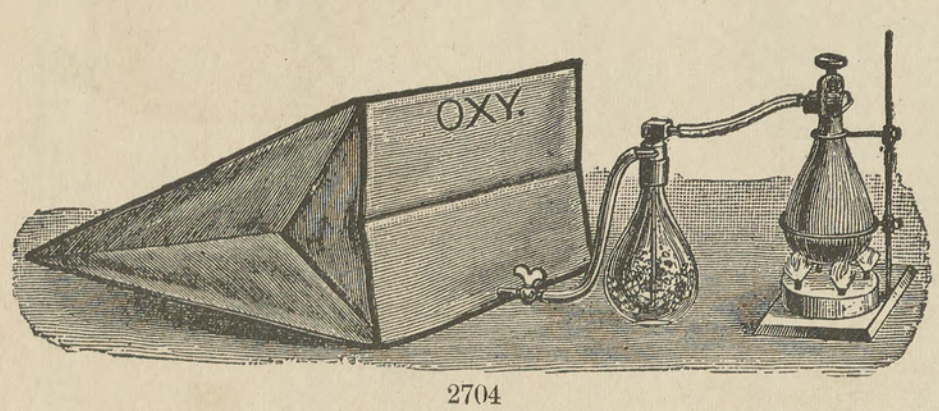

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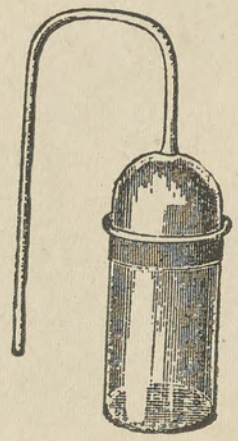

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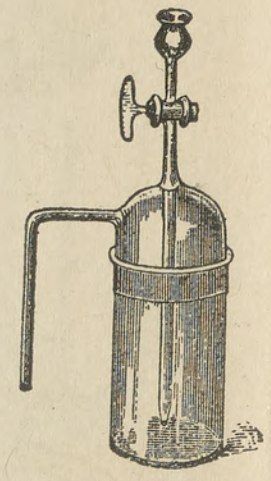

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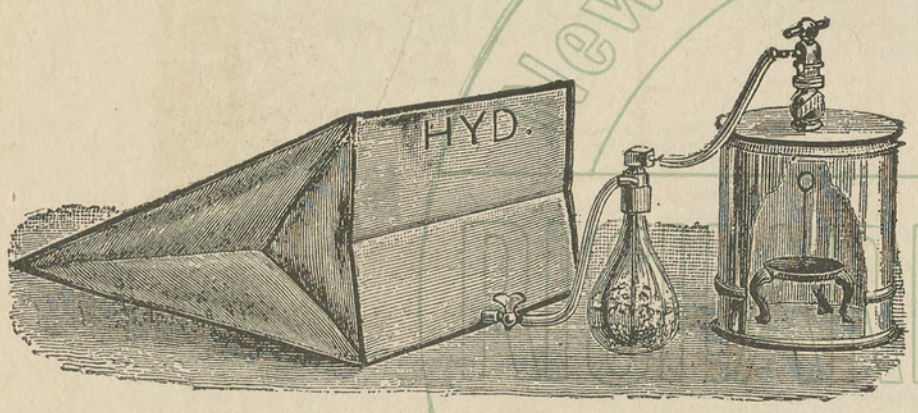

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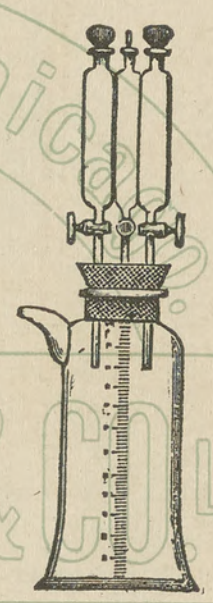

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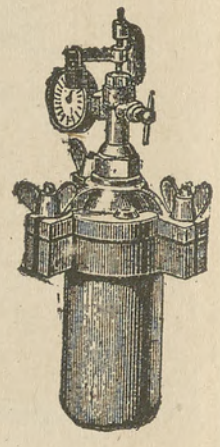

2709

No.

2704t. **Apparatus for Oxygen** Generation, complete, with conical oxygen retort of copper, tripod stand, lamp, wash bottle, 25 gallon bag, etc..... $20.00

2705t. **Apparatus for Hydrogen** Generation, complete..... 25.00

2706. **Kreb's Apparatus for Ozone** Generation, with potassium permanganat and sulphuric acid..... 2.00

2707. **Kreb's Apparatus for Ozone** Generation with barium peroxide and sulphuric acid..... 3.50

2708. **Goehring's Apparatus for Oxygen** generation from hydrogen peroxide..... 10.00
(Chem. Zeitg. 1889, No. 14).

2709. **Digester.** 12,5 in. high, 3¼ in. dia. of copper, with bronze screw ring, cover with safety valve and thermometer tubulure, tested under 14 atmospheres. Working pressure 7 atmospheres..... 40.00

2709a. **Same,** with manometer..... 45.00

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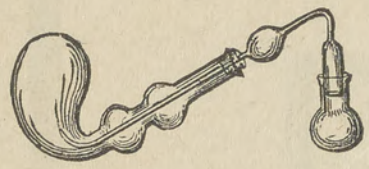

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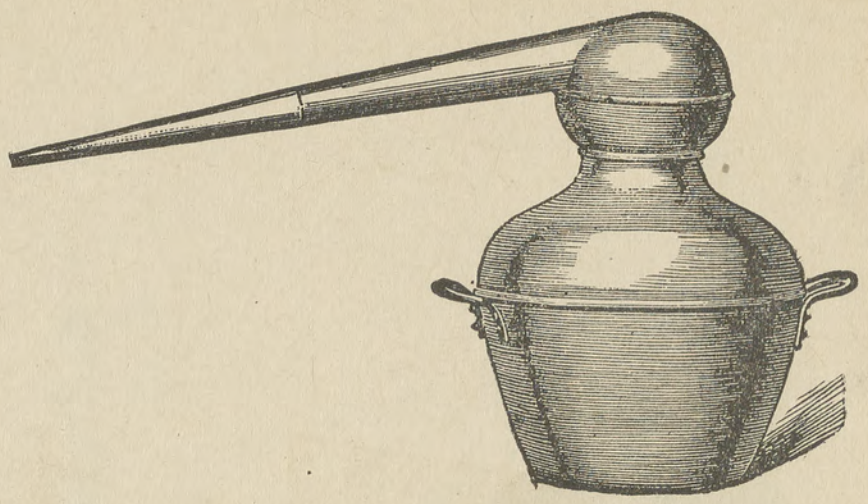

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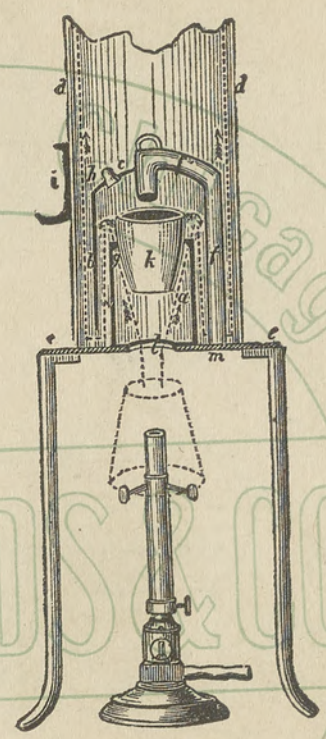

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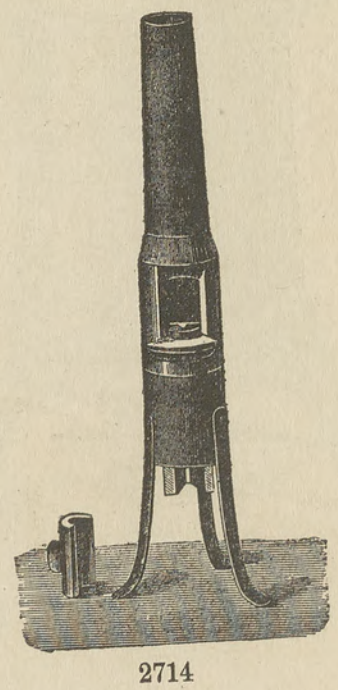

2714

No.

2710. **Retorts, tin lined,** for distilling water and alcohol.

Capacity	½	1	2	3	5 gal.
Each	$5.00	6.00	9.00	10.50	15.00

2711. **Steam Sterilizer,** for physician's offices, hospitals, laboratories and the household.

	Height.	Dia.	Heavy tin. Copper bottom.	All copper.
No. 2	family size	holding nine ordinary nursing bottles	$2.50	$7.00
No. 3	10⅛ in.	9⅜ in.	3.00	8.00
No. 4	11½ in.	10¼ in.	3.50	9.00
No. 5	12½ in.	11¼ in.	4.00	10.00

2712. **Steam Sterilizers,** Oval, for instruments, latest improved style; sterilizing chamber 14 in. long, 7 in. wide, 6 in. deep, with two perforated disks on which to lay the instruments.

a, in heavy tin with copper bottom ..... $ 5.00

b, all copper 12.50

2713. **Hempel's Furnace Melting,** with oxidation arrangement.

a, for crucibles up to five cm. diameter, complete with burner 7.00

b, for crucibles up to eight cm. diameter, complete with four tube burner 15.00

c, clay parts for oxidation 2.50

d, clay parts for reduction and incineration 1.50

2714. **Griffin's Furnace,** for heating small crucibles, on iron legs 4.00

2715. **Bunsen's Apparatus,** for the absorption of **chlorine,** in pasteboard case ..... .80

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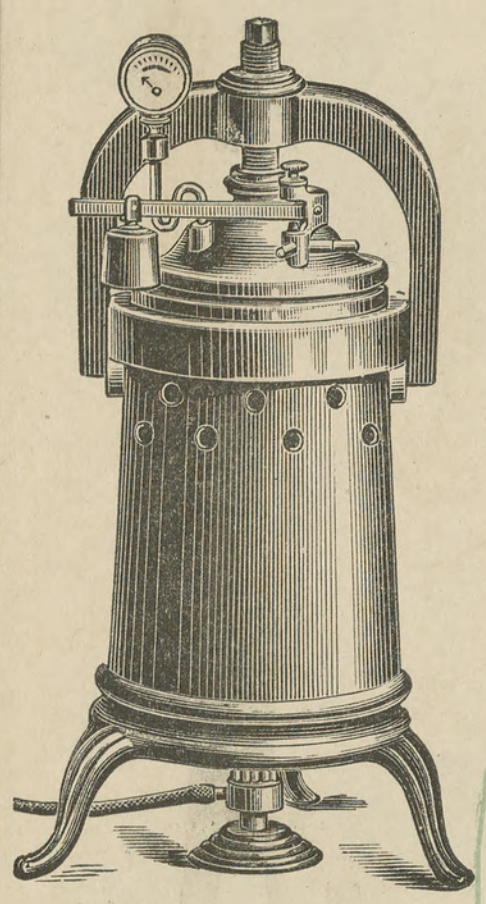

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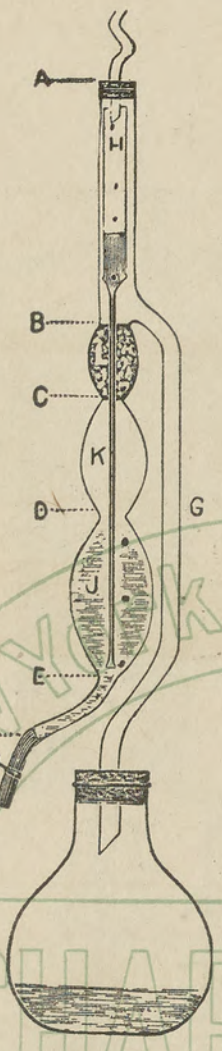

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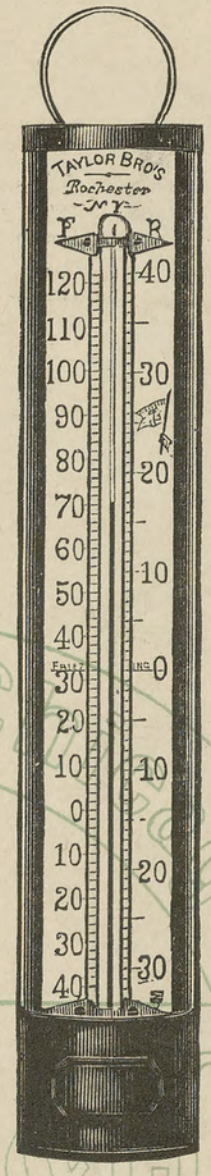

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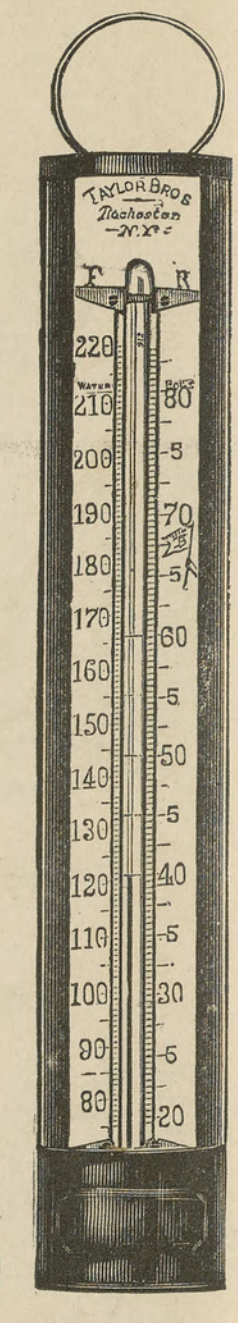

2721

No.

2716n. **Digesters, iron,** well-made and carefully tested, from 100 to 500 lbs. pressure, per square inch, with gauge and safety valve, complete.

Capacity,	1 gal.	2 gal.	3 gal.
Each	$25.00	35.00	50.00

2717. **Wilson H. Low's Extraction Apparatus,** for use in the analysis of fats, oils and soaps..... $ 2.25

(Am. Soap Jl., Vol. IV, No. 2. P. 47.)

2718. **Cowle's Acme Flower Press,** size 12x18, including paper and blotter, (write for descriptive circular).. 2.25

2719. **Brewer's Thermometer, Tin Case, Aluminum Scale, F. & R.,** 12 inch, graduated from 40° below zero up to 120° for taking air temperatures.....each **$1.50.** Doz. **15.00**

2720. **Brewer's Thermometers, Tin Case, Aluminum Scale, F. & R.,** 12 inch, graduated from zero up to 100° F., certified at O—5—10 R, for cellar use.....each **$2.25.** Doz. **24.00**

2721. **Brewer's Thermometers, Tin Case, Aluminum Scale, F. & R.,** 12 inch, graduated from 80° to 220° F., certified at 30, 40, 45, 50, 60 R.....each **$2.50.** Doz. **27.00**

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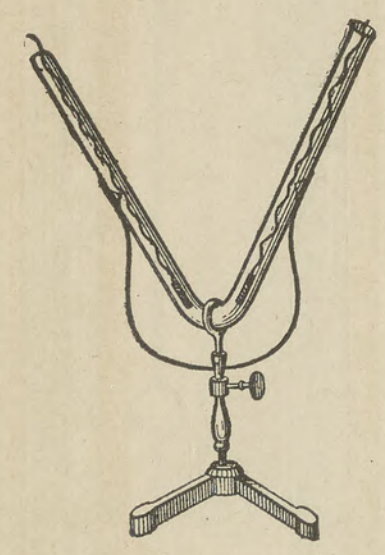

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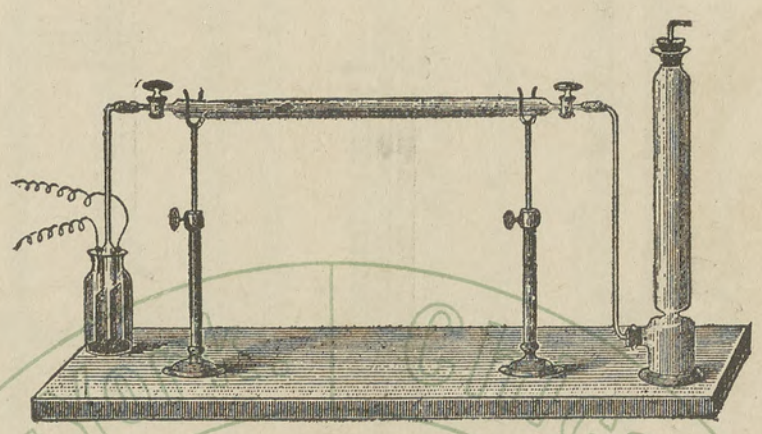

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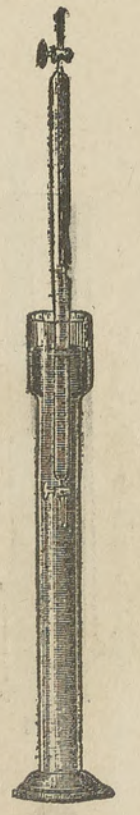

3001

PART III.

LECTURE APPARATUS AND COLLECTIONS.

A. PROF. HOFMANN'S LECTURE APPARATUS.

DESCRIBED IN PROF. A. W. HOFMANN'S "INTRODUCTION TO MODERN CHEMISTRY."

No.

3000. **Apparatus for the electrolytical decomposition of Hydrochloric Acid, Water and Ammonia.**

3000a. The V shaped tube with stout platinum electrodes..... $3.00

3000b. The Support..... 2.00

3001. — **to show that Hydrochloric Acid is produced by the combination of 1 vol. of Chlorine with 1 vol. of Hydrogen,** the apparatus consisting of tube, 2 tube supports, chloride of calcium jar, cylinder with widened mouth and decomposing cell.

3001a. The tube only..... 3.50

3001b. The tube supports only..... 2.50

3001c. The decomposing cell only..... 5.00

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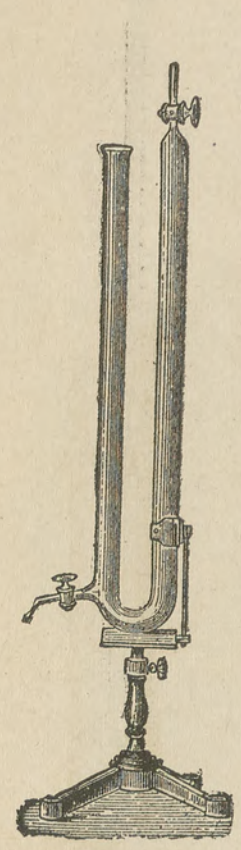

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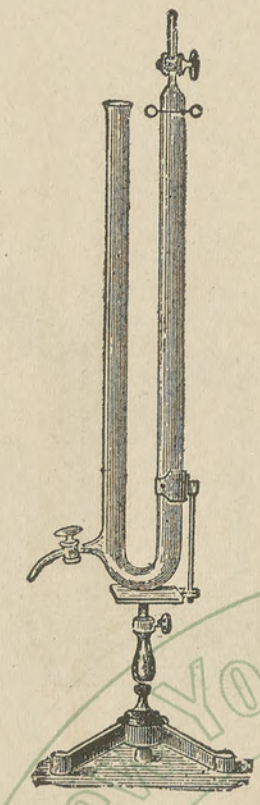

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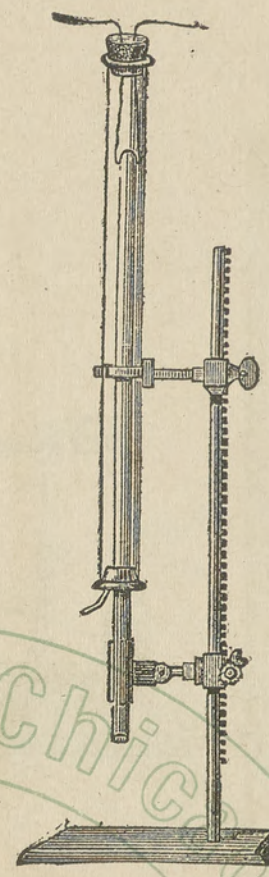

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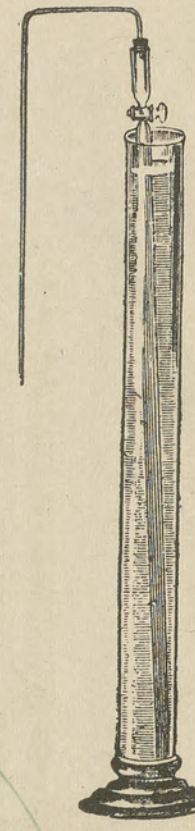

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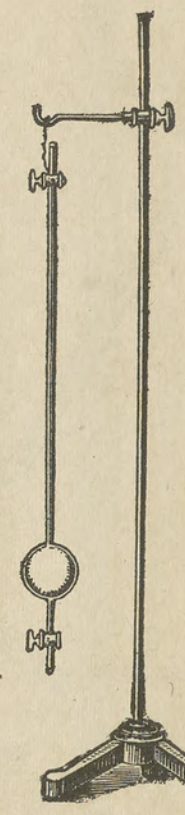

3007

No.

3002. **Apparatus to ascertain the quantity of Hydrogen contained in 1 vol. of Hydrochloric Acid.**

3002a. The tube with two hollow glass stopcocks $3.50
3002b. The support 2.50

3003. — **to show the combination of 3 vols. of Hydrogen with 1 vol. of Nitrogen into 2 vols. of Ammonia.**

3003a. The tube, with 2 glass stopcocks 4.50
3003b. The support 2.50

3004. — **to prove that Water consists of 2 vols. of Hydrogen and 1 vol. of Oxygen.**

3004a. The tube, with platinum electrodes 5.50
3004b. The same, with graduated arms 7.50
3004c. The support, with binding screws for the poles 3.00

3005. — **to prove that 2 vols. of Hydrogen combined with 1 vol. of Oxygen produce 2 vols. of Aqueous Vapor, measured at 100° C.**

3005a. The tube, with jacket 4.50
3005b. The support 20.00

NOTE: The same apparatus serves also to show,

(1) **that 1 vol. of Olefiant Gas yields 2 vols. of Carbonic Acid gas.**
(2) **that 1 vol. of Marsh Gas yields on combustion exactly 1 vol. of Carbonic Acid gas.**

3006. — **to show that Ammonia contains 3 vols. of Hydrogen and 1 vol. of Nitrogen.**

3006a. The tube with stopcock, rubber stopper and connecting tubing 3.50
3006b. The cylinder, 36 inches high, with leaded base 4.50

3007. — **to prove that there is no alteration of volume by the combination of Hydrogen and Chlorine to Hydrochloric Acid, and that consequently 1 vol. of Hydrogen and 1 vol. of Chlorine produce 2 vols. of Hydrochloric Acid.**

3007a. The tube 2.75
3007b. The support of iron 2.00
3007c. Small glass bulbs for sealing up carbon disulphide ..... per doz. .50

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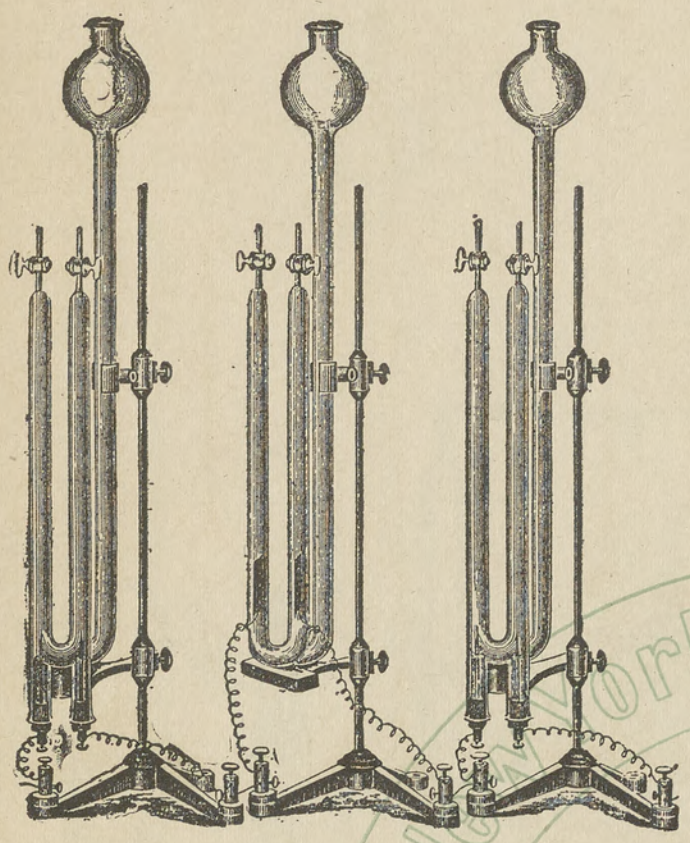

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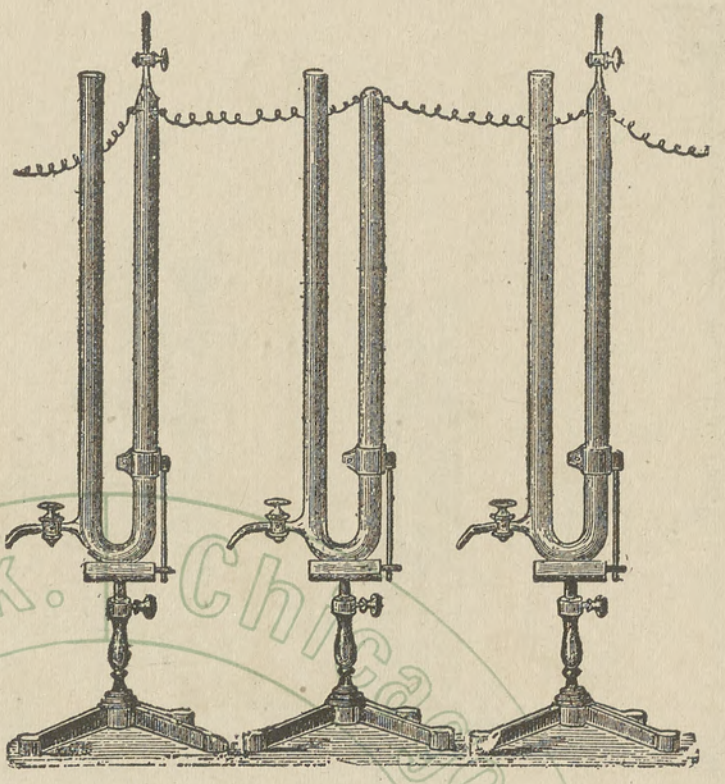

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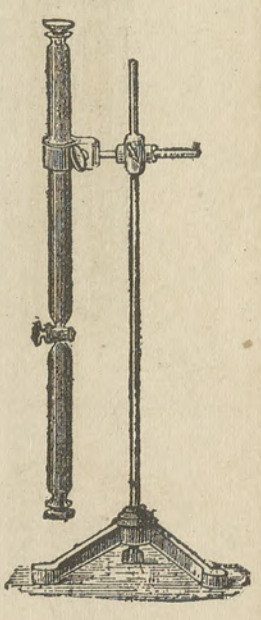

3010

No.

3008. **Apparatus for the simultaneous electrolytical decomposition of Water, Hydrochloric Acid and Ammonia; to show that 1 vol. of Hydrogen is combined with 1 vol. of Chlorine in Hydrochloric Acid, with ½ vol. of Oxygen in Water and with ⅓ volume of Nitrogen in ammonia.**

3008a.	The tube with platinum electrodes	$6.00
3008b.	Tubes with carbon electrodes ..... each	6.00
3008c.	Supports with binding screws for the poles ..... "	3.00

3009. — **to show that Hydrogen and Oxygen are combined in the same proportions as they are liberated from Water by electrolysis.**

3009a.	Tubes with 2 glass stopcocks ..... each	4.50
3009b.	The middle tube with glass stopcock	3.00
3009c.	The supports ..... each	3.00

3010. — **to prove the invariable composition of Hydrochloric Acid.**

3010a.	The tube	2.50
3010b.	The support with collar and holder	2.00

3011. — **to show that 2 vols. of Hydrogen are contained in 1 vol. of Marsh Gas.**

3011a.	The tube	4.50
3011b.	The support	3.00

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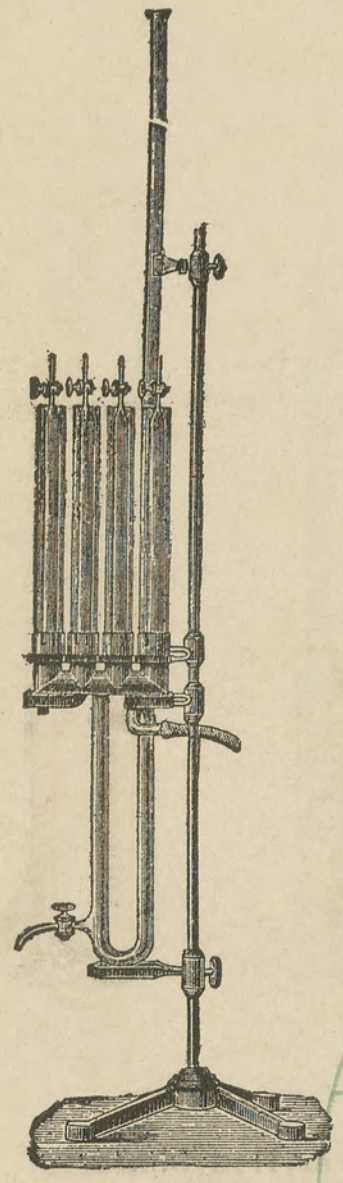

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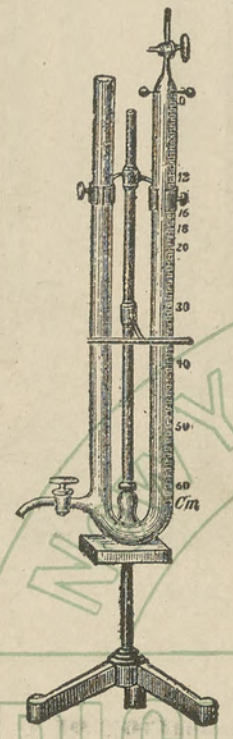

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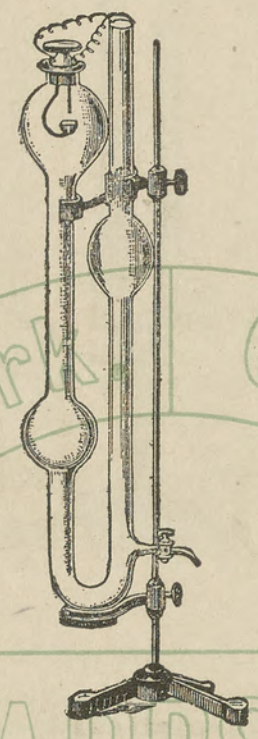

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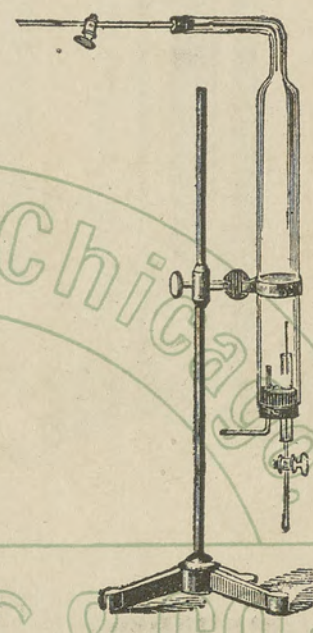

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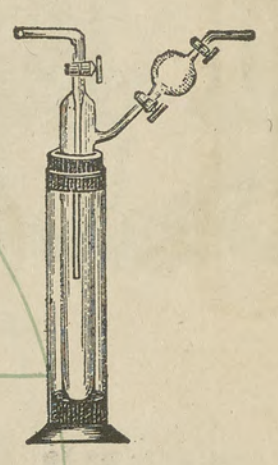

3016

No.

3012. **Apparatus for showing the behavior of Simple and Compound Gases under the influence of temperature and pressure.**

The apparatus of metal, improved form ; the 4 stopcocks and their jackets only are of glass, with support..... **$30.00**

3013. — **Lecture Eudiometer.** (Berichte der deutschen chemischen Gesellschaft, vol. 10, p. 250.)

3013a. The Eudiometer, graduated in cc..... **6.00**

3013b. The support, with double clamps..... **4.00**

3014. — **to show that Oxygen has the same volume as the Carbonic Acid and the Sulphurous Acid produced from it.** (Berichte der deutschen chemischen Gesellschaft 1869, p. 251.)

3014a. The tube..... **6.00**

3014b. The support..... **3.00**

3015. — **for illustrating the Phenomena of Combustion.** (Berichte der deutschen chemischen Gesellschaft 1869, vol. 14, p. 437.)

3015a. The tube complete with platinum burner, 2 glass stopcocks, etc..... **5.00**

3015b. The support..... **2.25**

3016. — **for experiments with Liquid Dioxide.** (Berichte der deutschen chemischen Gesellschaft 1869, vol. 10, P. 262). The apparatus, including cylinder,..... **5.50**

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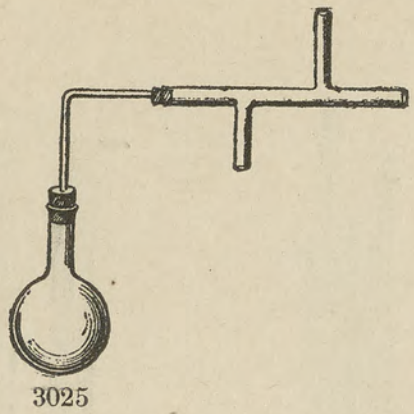

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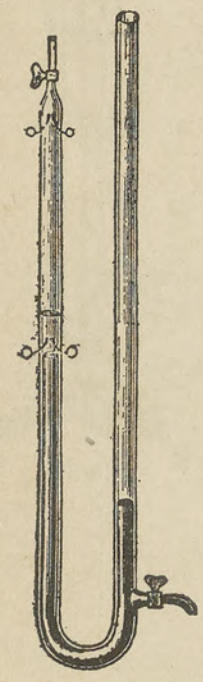

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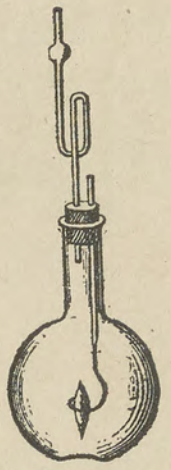

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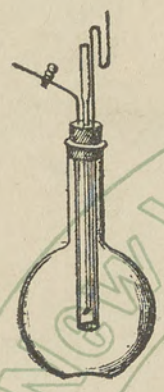

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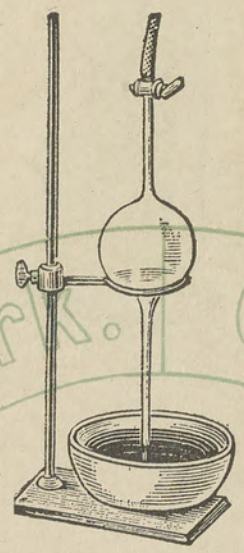

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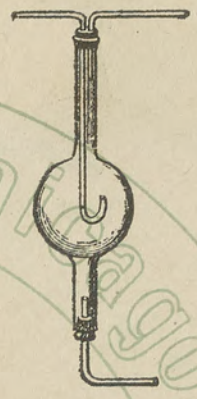

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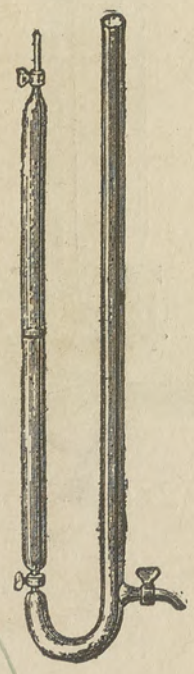

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No.

3017. **Apparatus for the condensation of Cyanogen Gas.** (Berichte der deutschen chemischen Gesellschaft 1870, P. 663) $13.50

3018. — **for demonstrating the structure of flame,** argand burner with glass chimney and wire gauze cap. (Berichte der deutschen chemischen Gesellschaft 1869, P. 254) 6.00

3019. — **for preparing liquid phosphoretted Hydrogen,** complete 8.50

3020. — **to show the oxydation of copper by heat and reduction of the copper oxyde by hydrogen.** (Berichte der deutschen chemischen Gesellschaft 1870, P. 565). The copper crucible, on tripod 2.50

3021. — **for preparing methyl aldehyde, complete with Finkener's pump** 6.00

3022. — **for demonstrating the proportion by volume of the elementary gases obtained by electrolytical decomposition of muriatic acid** 7.50

3023. — **for demonstrating the increase of weight in combustion.** Price of apparatus without mercury 3.00

3024. — **to show that by the combination of hydrogen and chlorine to form hydrochloric acid, there is no condensation.** Price of apparatus complete without mercury .. 2.00

3025. — **to show that steam is lighter than air** 1.50

3026. — **for demonstrating the relations between water in liquid and gaseous form** . 3.00

3026a. Support ..... .50

3027. — **for illustrating the combustion of one gas in another** 1.60

3028. — **for demonstrating electrolysis and synthesis of water** 6.00

3028a. Support 3.00

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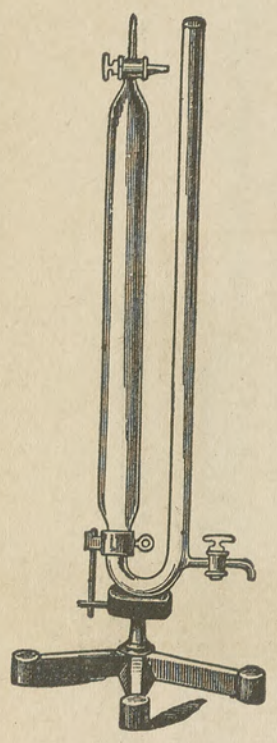

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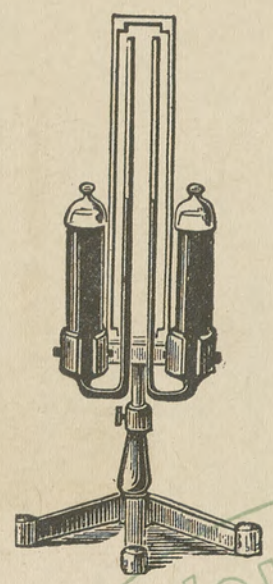

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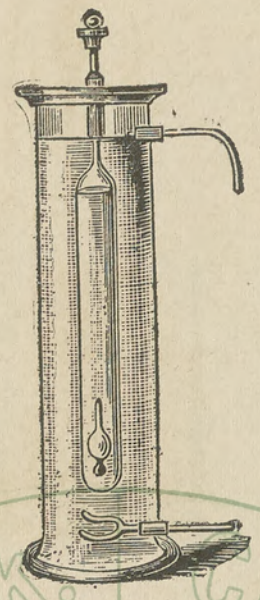

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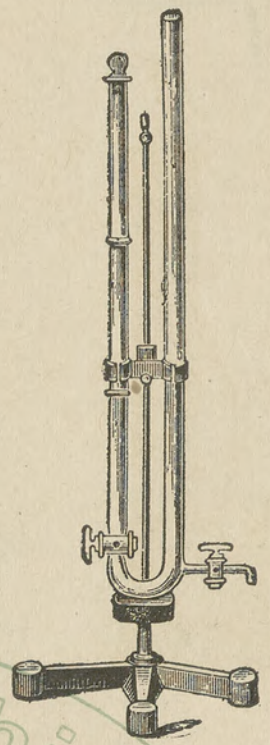

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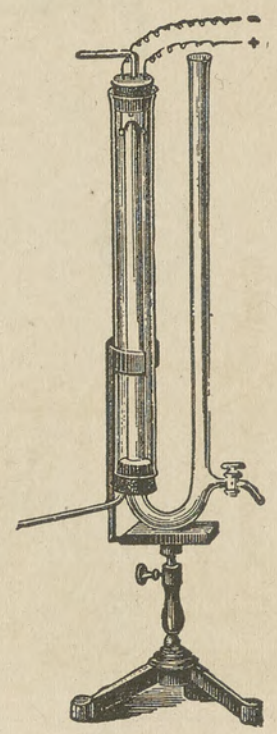

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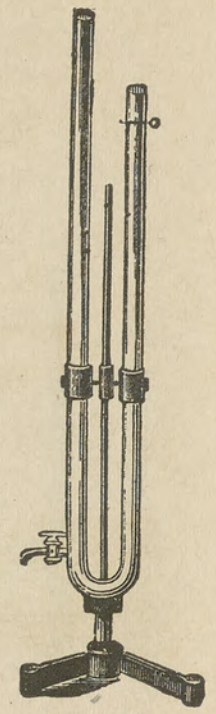

3035

No.			
3029.		**Apparatus for illustrating the manufacture of sulphuric acid**	$ 5.50
3029a.		Support	3.00
3030.	—	**for illustrating "Dulong Petit's law."**	
3030a.		The apparatus without mercury, with 1 pair of lead and zinc cylinders on stand	23.00
3030b.		The copper paraffine bath	9.50
3031.	—	**for illustrating the maximum density of water**	10.00
3032.	—	**for volumetric analysis of ammonia by chlorine and hypobromite of sodium**	5.50
3032a.	—	Support	3.50
3033.	—	**for demonstrating that carbon dioxide has the same volume as the oxygen used for its production**; price, without mercury	2.50
3034.	—	**to show that by uniting hydrogen and oxygen into water a condensation of $\frac{1}{3}$ takes place.**	
3034a.		The tube complete with jacket	4.50
3034b.		Support	3.50
3035.	—	**for illustrating the decomposition of phosphor water by electrolysis**	7.50
3035a.		Support	3.50

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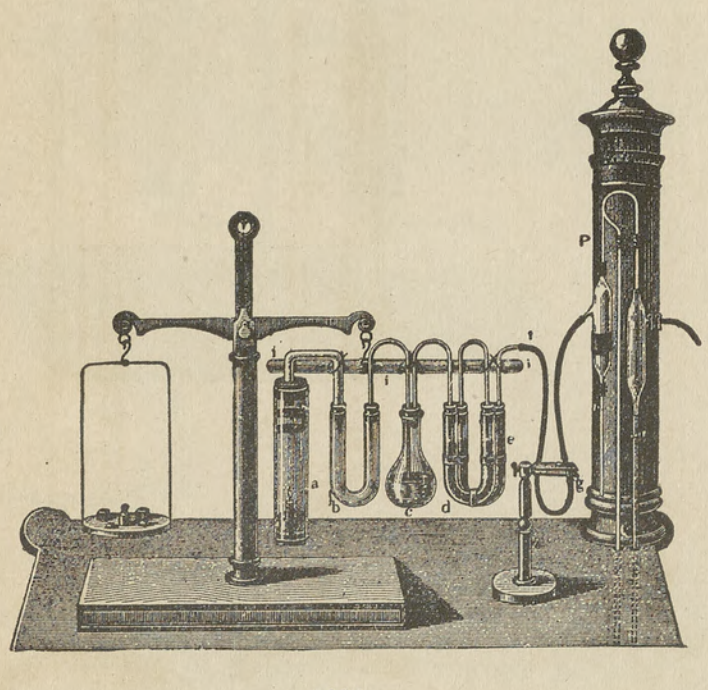

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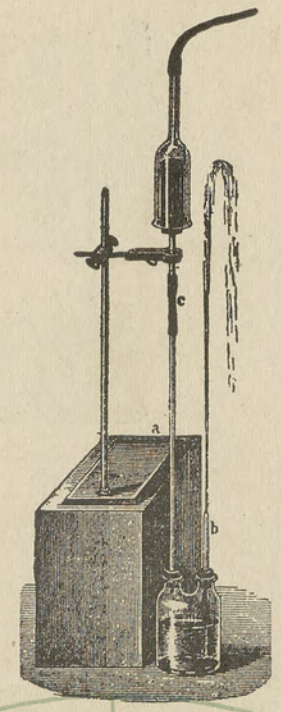

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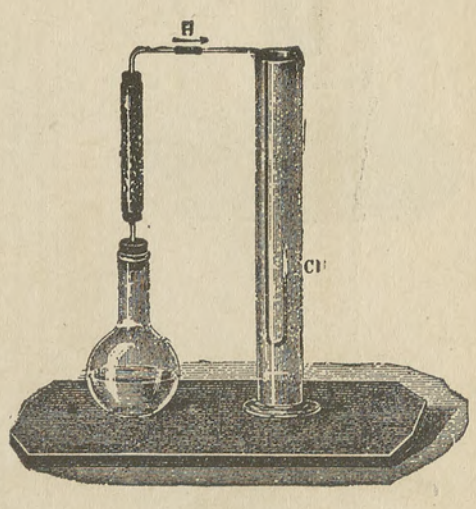

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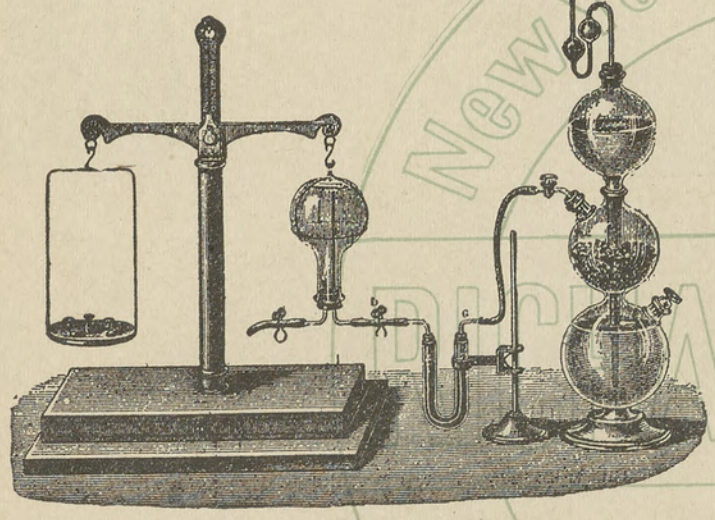

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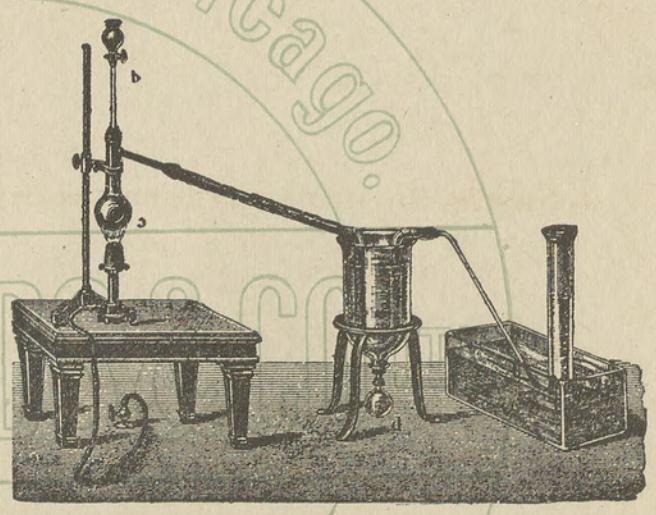
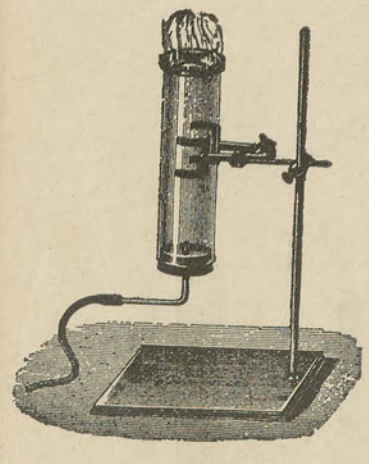


3042

B. PROF. HEUMANN'S LECTURE APPARATUS.

(DESCRIBED IN PROF. KARL HEUMANN'S "ANLEITUNG ZUM EXPERIMENTIREN.")

No.			
3036.	**Apparatus for demonstrating the increase of weight in burning a candle,** complete with Bunsen's pump		$60.00
3037.	—	**for the rapid determination of the specific gravity of hydrogen,** complete	45.00
3038.	—	**for showing the rapid diffusion of hydrogen,** complete	7.50
3039.	—	**Gas Indicator, Ansell's, used in mines as a danger indicator**	16.00
3040.	—	" " **for use in lectures, complete with element and electric bell**	35.00
3041.	—	**for combustion of hydrogen in chlorine gas,** complete	4.00
3042.	—	**for decomposition of nitric acid by heat into nitrous acid** (nitrogen dioxide) **and oxygen, complete, but without platinum flask and burner**	25.00
3042a.		The platinum flask weighing from 60 to 70 grms. per grm.	.60



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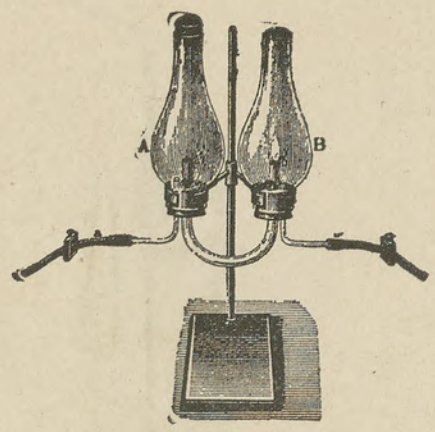

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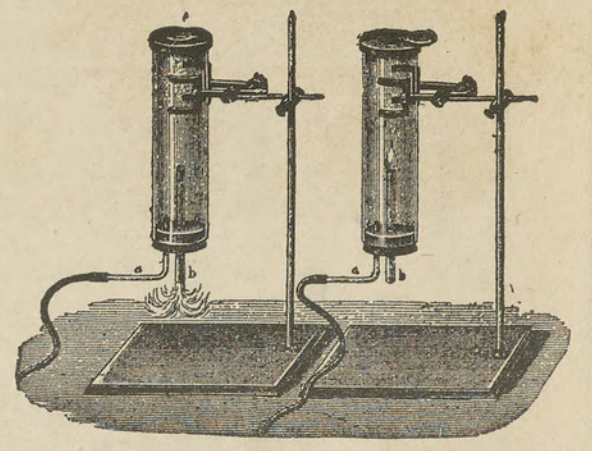

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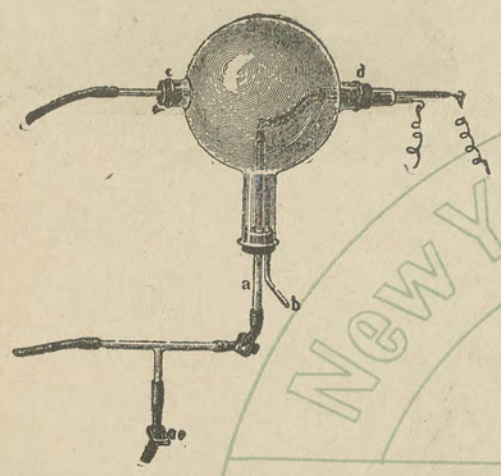

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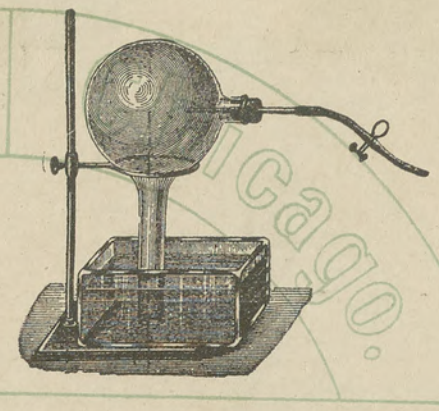

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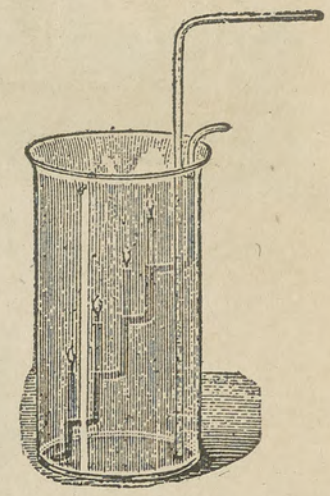

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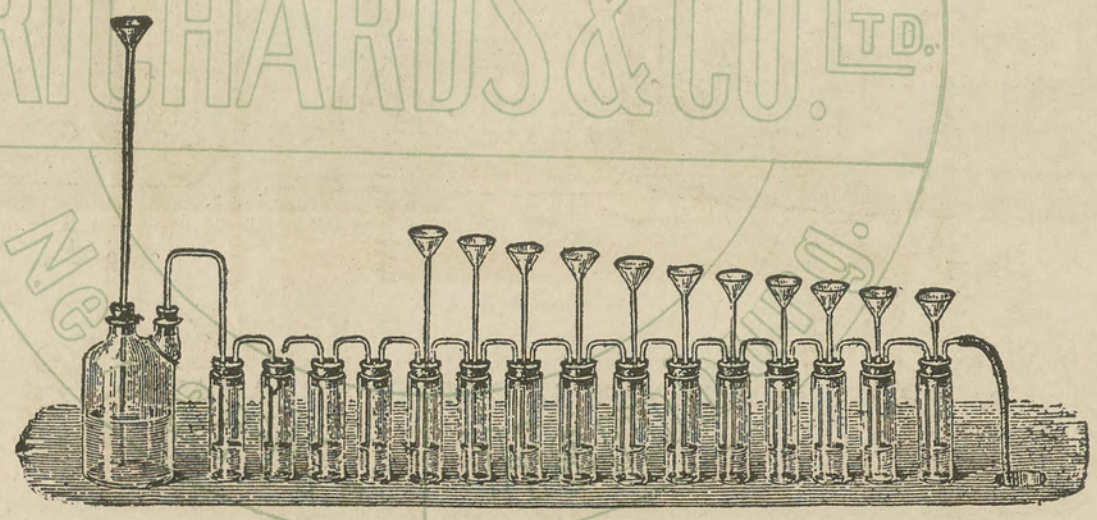
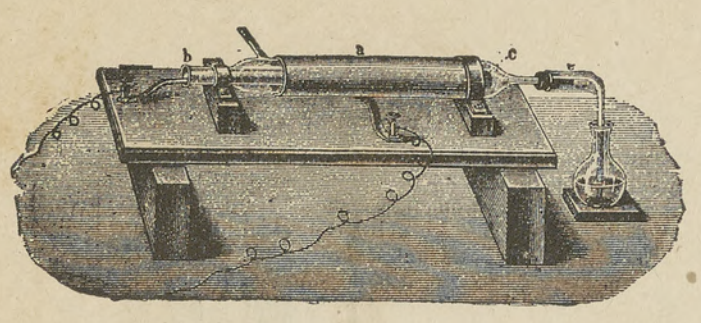


3049

New York. Chicago. RICHARDS & CO. LTD. London. Paris.

No.			
3043.	**Apparatus for showing that the flame is a mantle of glowing gas, cool in the centre,** complete	$	8.50
3044.	——	**for the combustion of oxygen in hydrogen or illuminating gas, without danger, reversed combustion,** complete	12.50
3045.	——	**Simple arrangement for burning air in illuminating gas, also for demonstrating the principle of the Bunsen's burner,** complete	9.00
3046.	——	**Kekule's to explode a gas by electricity in an atmosphere other than air,** complete	9.00
3047.	——	**for oxydation of nitrogen by pure oxygen gas,** complete	9.00
3048.	——	**for showing that carbon dioxide will settle to the bottom of a vessel filled with air,** complete	4.50
3049.	——	**for precipitations of sulphides of the metals by hydric sulphide from salt solutions,** complete	20.00



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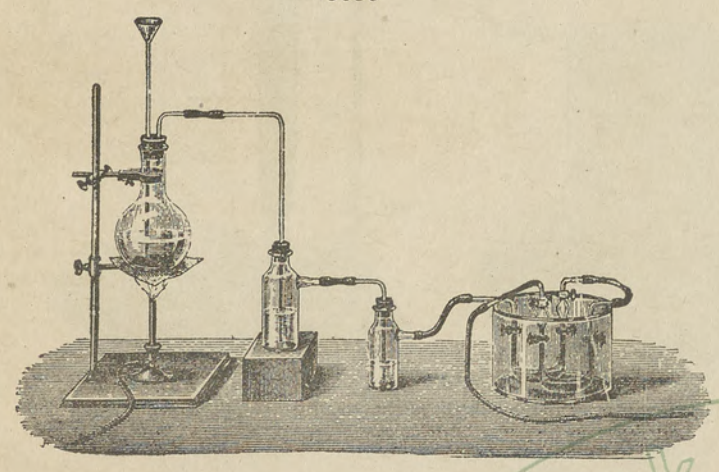

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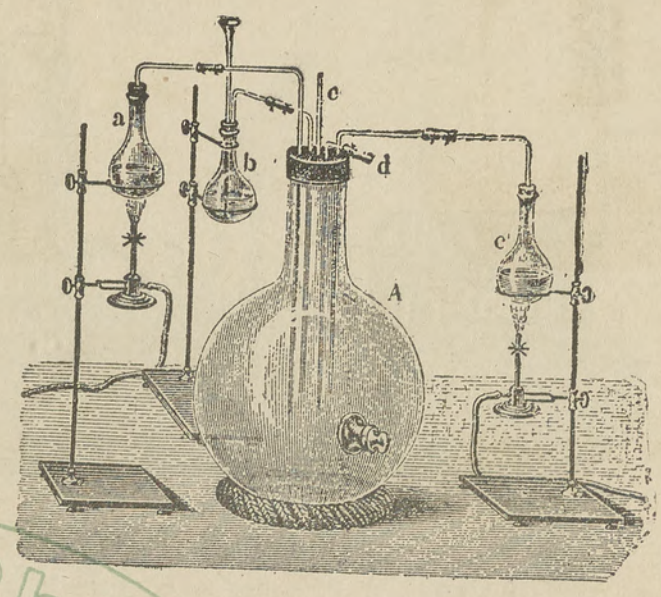

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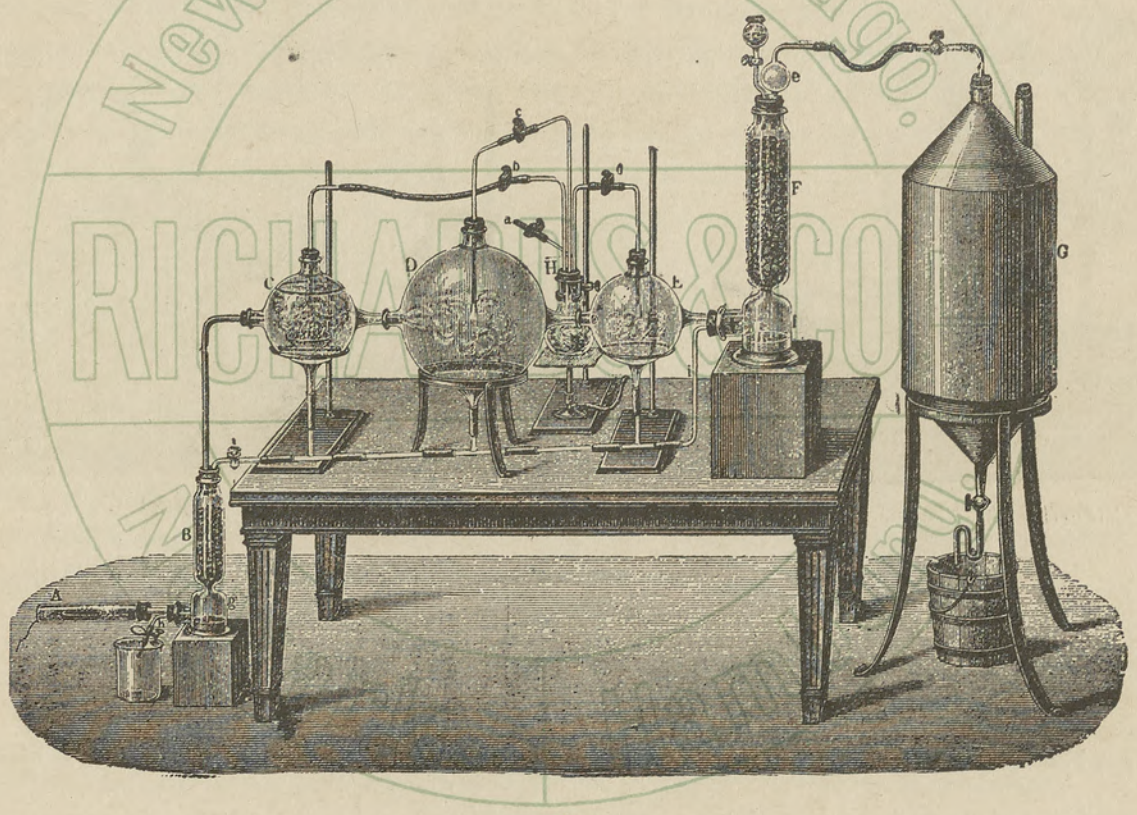


3053

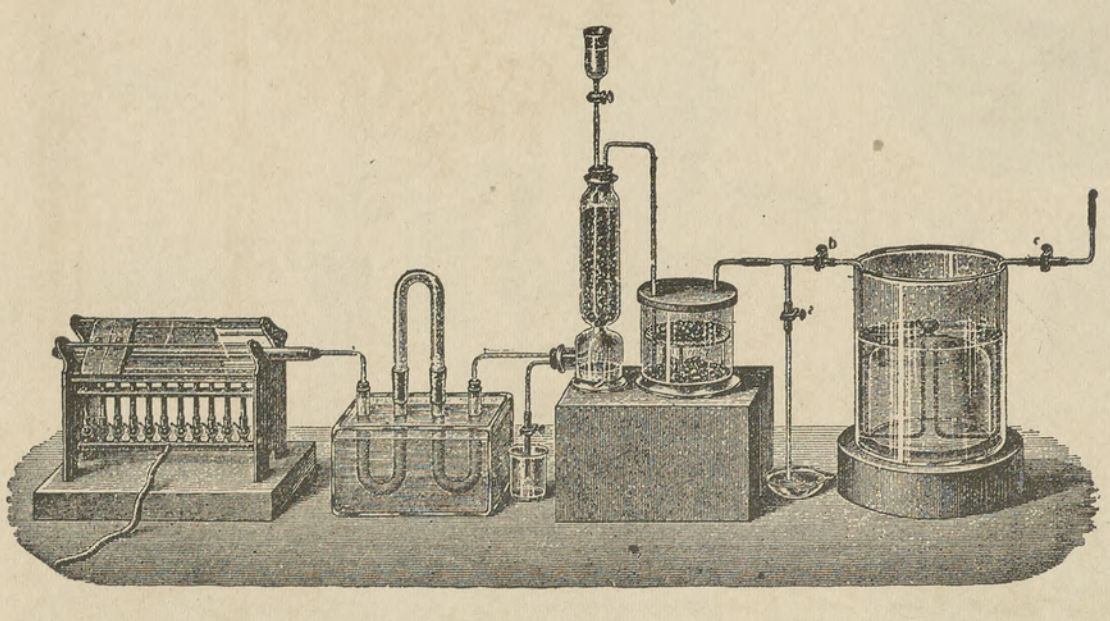
No.

3050. **Apparatus for showing the formation of ozone by the discharge of an electric current in oxygen,** complete..... $ 7.50

3051. — **for preparation of liquid sulphur dioxide,** complete..... 28.00

3052. — **for preparation of sulphuric acid from anhydrous sulphurous acid, nitrogen, air and steam,** complete..... 25.00

3053. — **for showing the manufacture of sulphuric acid on larger scale, with aspirator**..... 60.00



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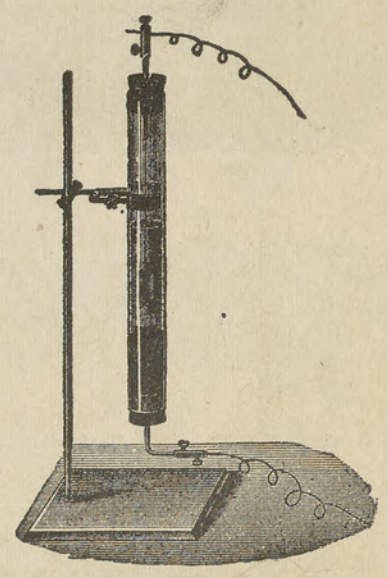

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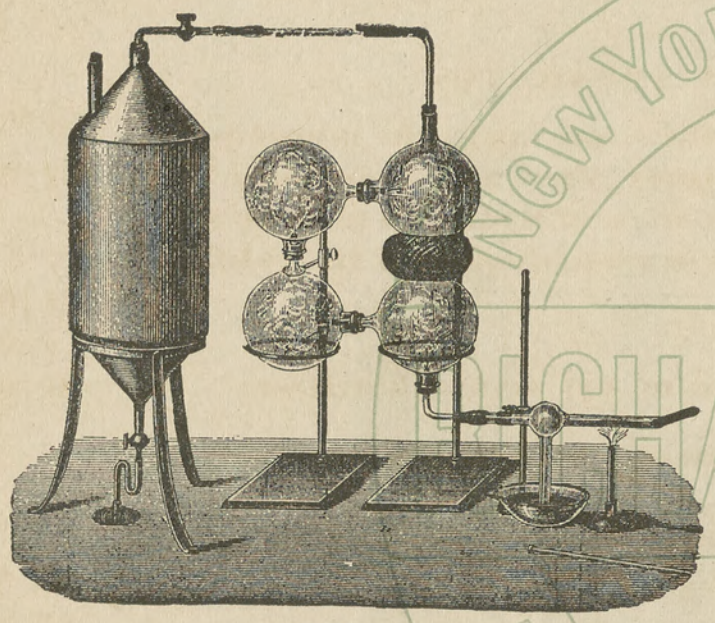

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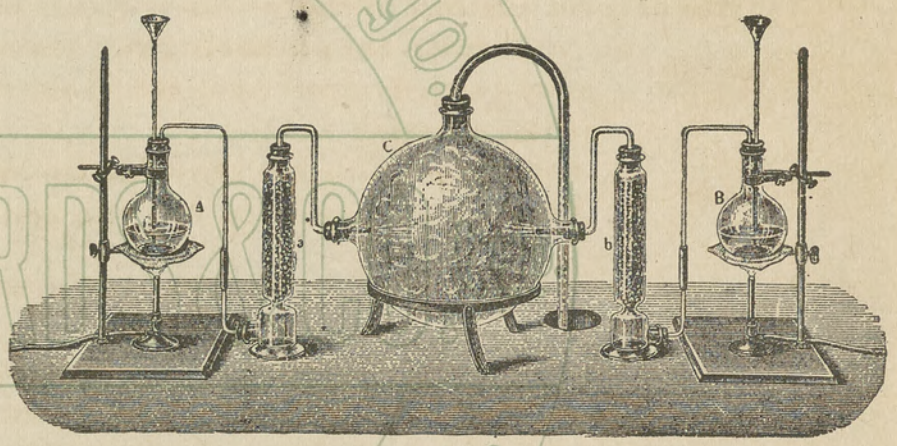


3058

No.

3054. **Apparatus, Hallock's, for illustrating the manufacture of soda ash by the so called ammonia process,** complete $15.00

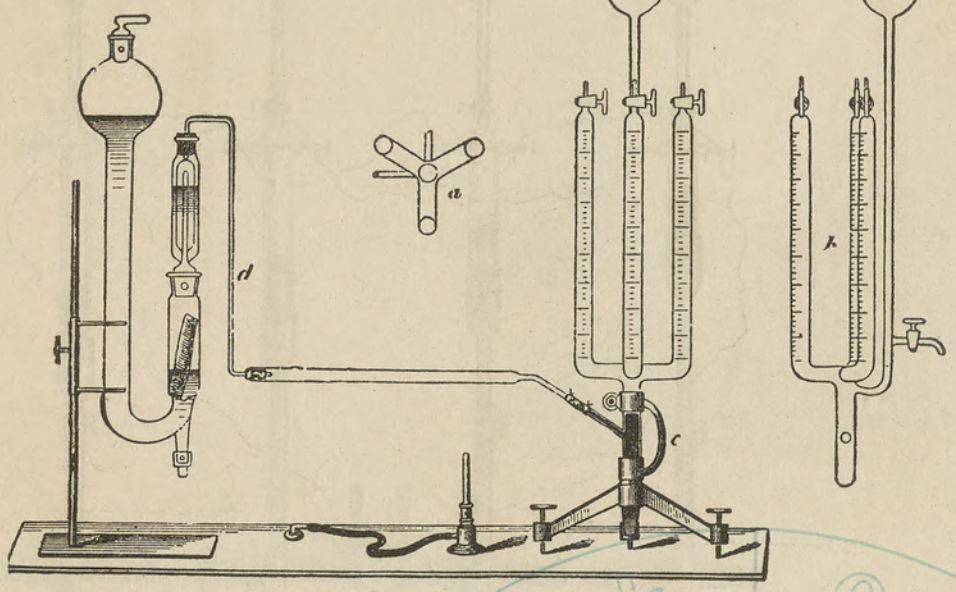
3055. — **for illustrating the manufacture of illuminating gas,** complete with furnace, constructed on the principle of Liebig's Combination furnace for holding two combustion tubes 37.50

3056. — **for preparation of ammonium amalgam by electrolysis of chloride of ammonia,** complete 10.50

3057. — **for roasting arsenic ores,** complete with **aspirator** 35.00

3058. — **for illustrating the manufacture of ammonia** 35.00

New York. Chicago. RICHARD KOHL Newark Hamburg.



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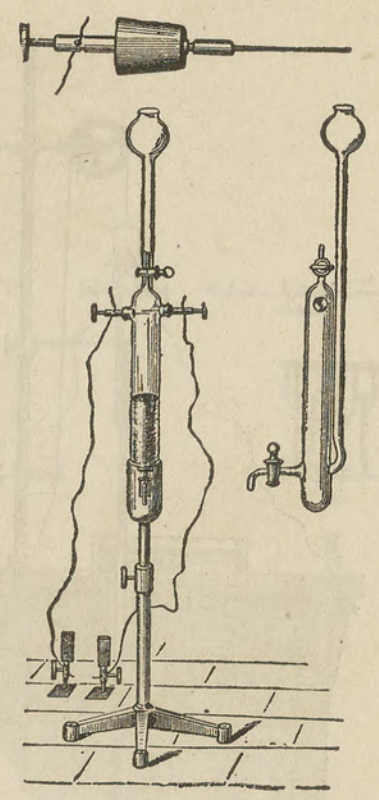


3061

C. PROF. LEPSIUS' LECTURE APPARATUS.

3060. **I. Apparatus for demonstrating the valuation of metals, serving in the same time for the determination of the atom-weights of Thallium, Zinc and Aluminum..... $52.00**

a. Apparatus for gathering the three quantities of hydrogen formed by the above experiment; the relations to each other are equal to the valuation of the applied tables..... 28.00

b. Hard glass tube for glowing the metals..... 4.00

c. Norblad's Apparatus for the generation of dry hydrochloric gas..... 20.00

3061. **II. Apparatus for demonstrating the influence of the electric arch-light on gases and liquids.**

a. Tube for electrical decomposition, with lateral tubulatures for the carbon-electrodes, without jacket, on stand..... 16.00

aa. Complete set of above, 4 apparatus..... 60.00

b. Tube for electrical decomposition, on stand, electrodes inserted through the top, with jacket..... 18.00

These tubes are used for the following experiments:

1, for volumetric transformation of carbonic acid in carbon oxide.

$$CO^2 \times C = 2CO$$
1 vol. 2 vol.

2, for volumetric transformation of oxygen in carbon oxide:

$$O_2 \times 2C = 2CO$$
1 vol. 2 vol.

3, for the volumetric transformation of sulphur dioxide in carbon monoxide:

$$SO \times 2C = S \times 2CO$$
1 vol. 2 vol.

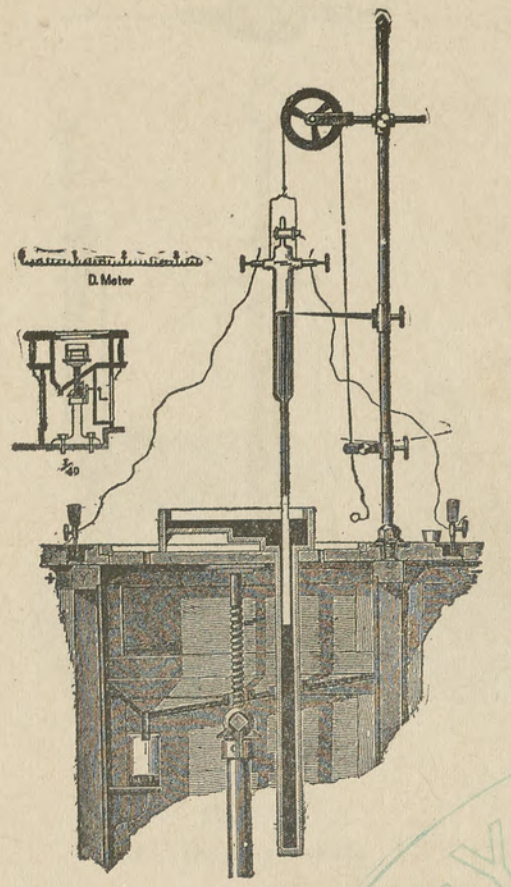
4, for the transformation of hydrogen in acetylene and to show the equality in volume of these gases:

$$H_2 \times 2C = C_2H_2$$
1 vol. 1 vol.

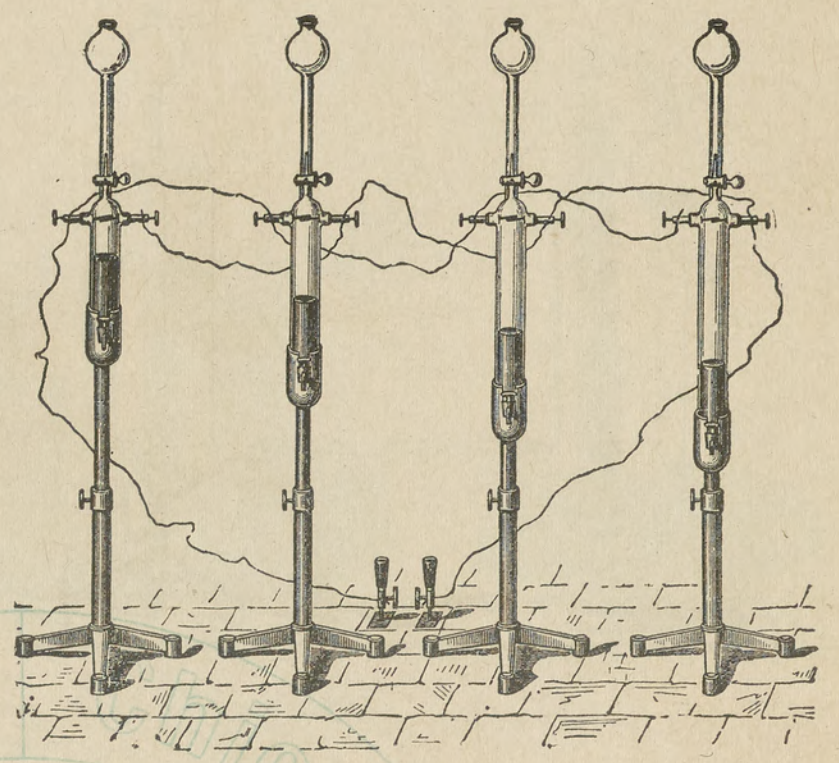
5, for the volumetric transformation of ammonia into nitrogen and hydrogen:

$$2NH_3 = \underbrace{N_2 \times 3H_2}$$
2 vol. 4 vol.

6, for the volumetric transformation of methane:



3061c



3061aa and 3062.

No.
3061. **c. Tube for electrical decomposition, with lateral tubulures for the carbon-electrodes, to be used with the special mercury trough or glass-cylinder with large opening**.....$ 8.00

The Apparatus is intended to serve:

1, for demonstrating the volumetric relations of oxygen, carbonoxide and dioxide of carbon:

$O_2 \times 2C = 2CO$ $\quad 2CO \times O_2 = 2CO_2$ $\quad 2CO_2 \times 2C = 4CO$

1 vol. 2 vol. 3 vol. 2 vol. 2 vol. 4 vol.

2, for the volumetric production and the decomposition of sulphur dioxide:

$O_2 \times S = SO_2$ $\quad SO_2 \times 2C = 2CO \times S$

1 vol. 1 vol. 1 vol. 2 vol.

d, Apparatus for electrical decomposition of gaseous and liquid water, with or without upright condenser, sealed on; with condenser and graduation..... 14.50

Applications:

1, for showing the influence of carbon, glowing by electricity on water and the generation of the so-called "Watergas."

$H_2 \times C = H_2 \times CO$

A very convenient and instructive method of preparing this most important technical gas-mixture during lecture.

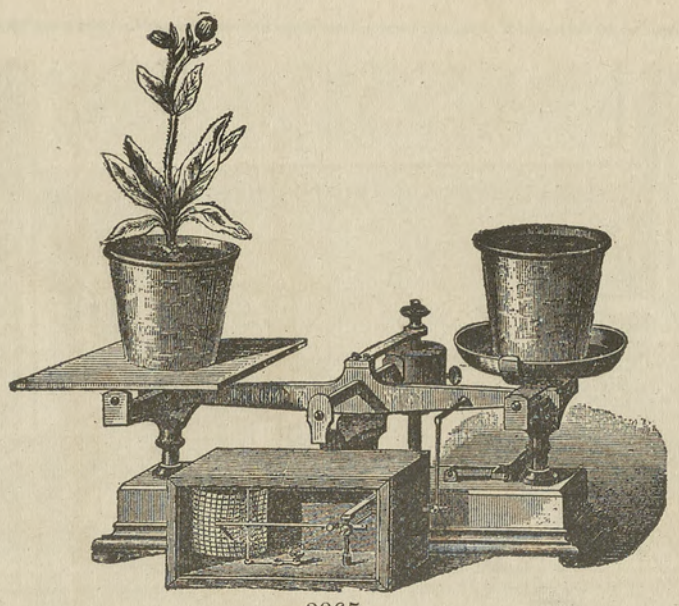
2. For the decomposition of other liquids, like carbon bisulphide, etc.

3062. **Apparatus for demonstrating the valuation by aid of the light arch. The apparatus consists of 4 decomposing tubes, with or without condensing jacket, of different volumes for receiving equal volumina of hydrogeniodide, sulphuretted-hydrogen, phosphorous-hydrogen and methane. By the light-arch the elements jodine, sulphur, phosphorous and carbon are separated and the remaining quantities of hydrogen are proportioned to the values of those elements, viz. 1:2:3:4:**

$2HJ = 2J \cdot H_2$
$2H_2S = 2S \cdot 2H_2$
$2H_3P = 2P \cdot 2H_2$
$2H_4C = 2C \cdot 4H_2$

Making these most interesting light-arch experiments described by B. Lepsius, nobody should forget to glow the carbon electrodes some moments, before beginning the experiment. This is to be done in the apparatus still filled with air, for the purpose of expelling all gases absorbed by the carbon points. This being neglected, the accuracy of volume-measurement, becomes disparaged.

NOTE: *Lepsius's lecture apparatus are described in (Berichte der Deutschen Chem. Ges. 1888, 89, 90 and 91, Zeitsch. fuer Physical und Chem. Unterricht 1890.)*



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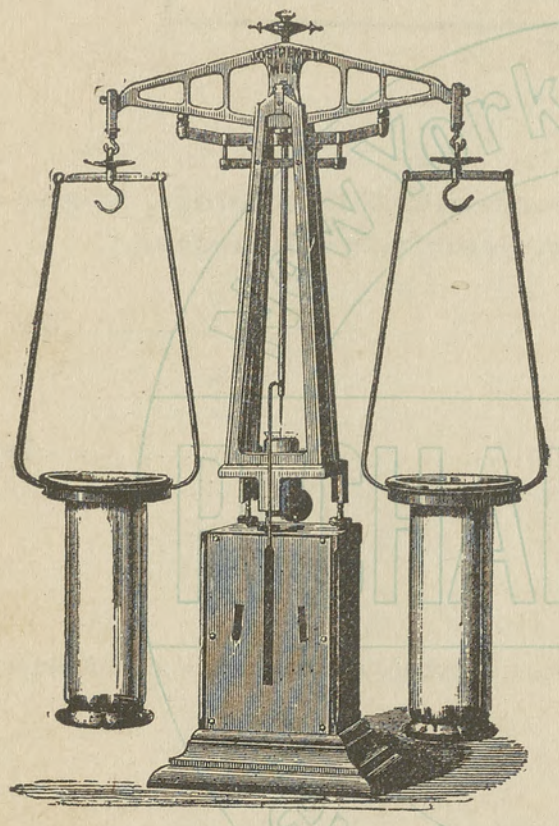

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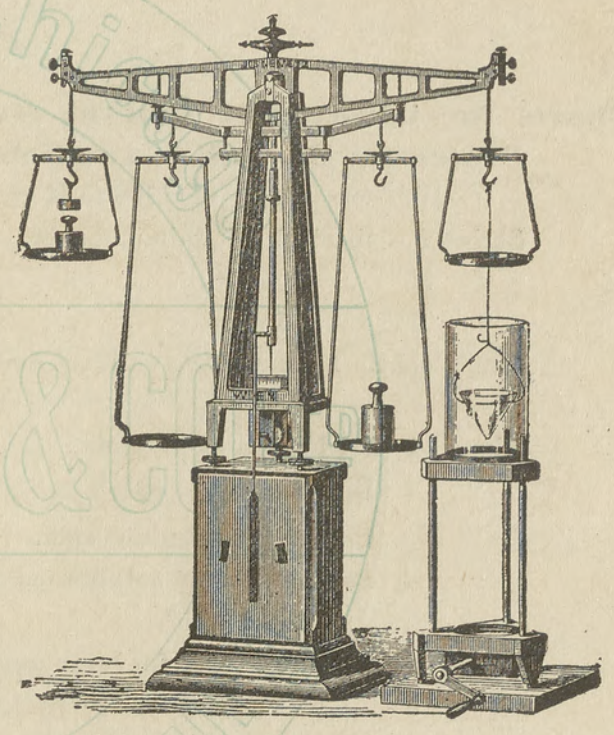


3064

D. BALANCES FOR LECTURES.

3063. **Balance for Chemical Demonstration,** for determining the proportions of weight of atmospheric air, gases, increase of weight by oxidation, etc., etc., with accessories. Can be read by the audience at a distance of 50 meters, showing 10 milligrammes while carrying a load of 5 kilogrammes, in case.. **$120.00**

3063a. Same, with complete outfit, in case..... **150.00**

3064. **Balance for Experimental Physical Lectures,** to demonstrate the theory of the balance for the following experiments: Change of the centre of gravity, increase and decrease of the sensibility by lengthening or shortening of the lever, testing and adjusting of the balance, etc., etc., showing 10 milligrammes at a distance of 50 meters, while carrying a load of 5 kilogrammes..... **210.00**

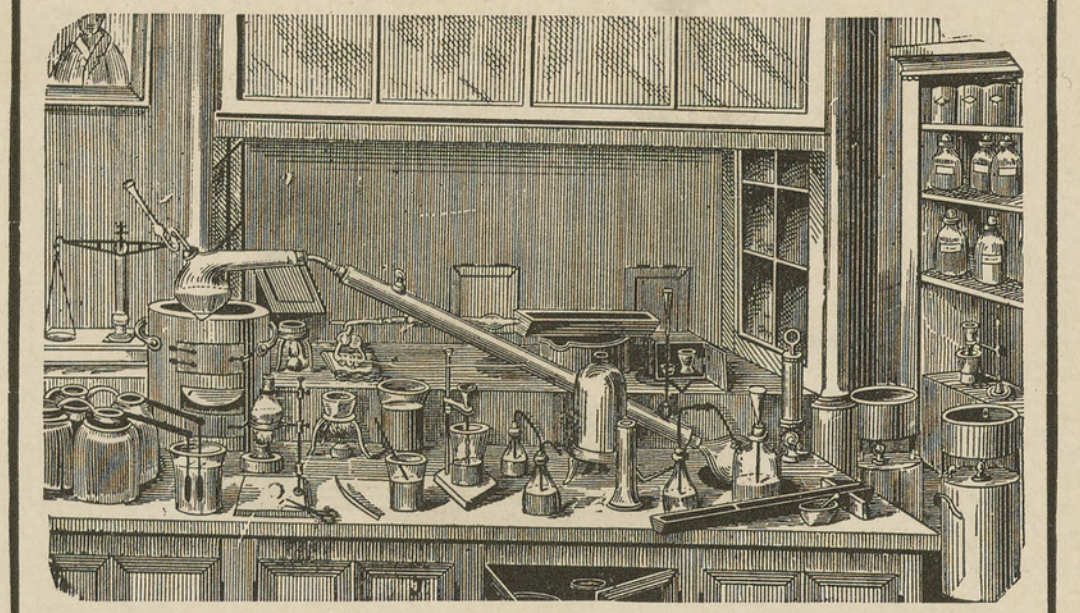
3064a. Lifting Apparatus for Balance, complete with jar, sinking cup and two tare-weights for water and air, to demonstrate the method of taking the specific gravity of solids and liquids..... **18.00**

3064b. Weight of one kilo. and one of ½ kilo..... **8.00**

3064c. Balance as above, plain, without accessories, for a charge of 1 kilo..... **70.00**

3064d. Balance as above, of a more simple form, without accessories..... **30.00**

3065. **Registering Balance,** recording automatically, telling the amount of water that evaporates from plants, complete, as per illustration..... **200.00**



E. CHARTS.

No.

3066. **Charts for illustrating general chemistry and chemical technology,** designed by **Professors Dr. Julius von Schroeder** and **Dr. Georg von Schroeder.**

In black print. Size 108 to 72 cm.

Series I	chart 1—5 plain on paper	Per Set	$3.60
" II	" 6—10	"	3.60
" III	" 11—15	"	3.60
Single charts for mounting on linen and varnishing, extra		Each	1.50

Series I contains:

Chart 1 Production of sulphur.
" 2 Refining crude sulphur.
" 3 Preparation of nitric acid.
" 4 Preparation of sulphurous acid by combustion of pyrites for use in the manufacture of sulphuric acid.
A. Furnace for lump pyrites.
" 5 B. Furnace for fine pyrites.

Series II.

Chart 6 Sulphuric acid factory, ground plan.
" 7 " " " vertical section.
" 8 Details in the process of manufacturing sulphuric acid.
" 9 Concentration of acid.
" 10 Preparation of fuming sulphuric acid.

Series III.

Chart 11 Salt garden.
" 12 Graduation house.
" 13 Salt boiling.
" 14 Soda manufacture.
" 15 Condensation of muriatic acid.

The following series of charts are in preparation and will be published shortly.

Series IV.

Chart 16 Carbonization of wood in charcoal kiln
" 17 Cokefurnace
" 18 Generator and system of regenerative heating
" 19 Hoffmann's ring furnace
" 20 Lime-kiln

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

Series V.

Charts 21 - 25 Preparation of phosphorus, boracic acid, iodine, potassium and sodium

Series VI.

Charts 26 - 30 Manufacture of illuminating gas

Series VII.

Charts 31 - 35 Manufacture of glass and porcelain

Series VIII.

Charts 36 - 40 Manufacture of iron

Series IX.

Charts 41 - 42 Reduction of copper, zinc, lead and silver

Series X.

Charts 46 - 50 Fermentation, and sugar industry

Chart 51 The Periodic system of the elements, after Mendeljeff, size 116 x 87 cm..... $ 2.00

Chart 52 The atomic weights of the elements, 2 charts, each 50 x 90 cm., both..... 4.00

The same, mounted on linen and varnished..... 7.50

Chart 53 Giving the atomic weights with their multiples, for use in the laboratory arranged by Professor Kreussler.....Each .30

Chart 54 Chromographic of the spectrum of stars, by Vogel, 100 x 70 cm., chart I. and II. with text.....Each 4.00

Chart 55 Illustrating the genealogy of the derivates of tar, 66 x 85 cm., mounted on linen..... 10.00

3067. **Charts, Technological Wall Charts, lithographed, size 108 x 72 cm.** They are correct representations of some of the leading works and manufactories and drawn in exact proportions.

No. I. Manufacture of Bessemer Steel, designed by Bergrath A. von Kerpeley, Professor at the Royal Hungarian Mining Academy in Schemnitz.

" II. Manufacture of Sulphuric Acid from pyrites. Apparatus of the "Chemische Fabrik in Aussig," designed by Director M. Schaffner.

" III. Ammonia ice-machine for manufacturing on a large scale, by F. Carré.

" IV. Brewery of Noback Brothers & Fritze, in Prague, designed by G. Noback, Brewing Engineer.

" V. Condensation of Muriatic Acid for a sulphate furnace. System in use at the "Chemische Fabrik in Aussig," designed by Director M. Schaffner.

" VI. Sugar factory, diffusion battery, giving a general idea of the process.

" VII. Diffusor with independent calorisator and apparatus for continuous diffusion, designed by Robert in Seelowitz.

" VIII. Manufacture of Martin Steel by Siemen's regenerator.

" IX. Blast-furnace for coke, production about 50 to 60 tons a day with hot blast apparatus system Whitwell.

" X. Puddling Furnace.

NOTE: Charts VIII., IX. and X. are designed by Oberbergrat Jos. Schmiedhammer, Director of the "Neuberg-Mariazeller Gewerkschaft in Neuberg."

" XI. Sulphur Refinery, Cesena Mine. Designed by Prof. Pasqualini in Forli.

" XII. Manufacture of tiles. Hoffmann's Ring Furnace.

Price of each Chart, with description in German or English.. ..... 8.00

RICHARDS & CO. LD. Newark. Hamburg



F. COLLECTIONS.

A. ORGANIC.

No.

Alkaloid Preparations.

3100. a. 52 specimens, in glass stoppered vials of ½ c.c. capacity ..... $ 24.00
b. 52 " " " 1 " 44.00

Alkaloids and Glucosides.

3101. a. 72 specimens, in tubes of 1 c.c. 54.00
b. 72 " " ½ c.c. 34.00

Anilines or Coal Tar Dyes.

3102. 70 preparations, with samples of cloth dyed, including glasses, in case 50.00

Combinations of Carbon Constituents.

3103. 200 specimens of the different carbon combinations, in handsome stoppered glass cylinders containing 20 c.c. and 100 c.c. of samples 125.00

Fluorescent Substances.

3104. 16 solutions, in fine case 12.00

Opium Constituents.

3105. Collection embracing 23 Alkaloids, etc., according to quantity, upwards from 15.00

Phosphorescent Substances.

3106. 8 preparations of different shades and extraordinary beauty, in flat bottles, incl. case 11.00

Physiological Preparations.

3107. a. 80 preparations from the animal kingdom 24.00
b. 80 preparations from the vegetable kingdom 24.00

Spectroscopic Preparations.

3108. 18 preparations for spectroscopic examination, in glass tubes with platinum wire, viz:
$BaCl_2 \times 2H_2O$; $CuCl_3 \times 2H_2O$; — CsCl; — $CaCl_2 \times 6H_2O$; — KaCl; — In_2Cl_6; — LiCl; — NaCl; — $PbCl_2$; — RbCl; — $SrCl_2 \times 6H_2O$; — TlCl; — Se; — $ZnCl_2$; — $TeCl_4$ and $Di(NO_3)_3$, $Ka\,Mn.O_4$, $Er(NO_3)_3$, the last three ones in solution, in case 10.00

No.

3109. **Blowpipe Collection.**

25 specimens, about ¾ x ¾ in., with list accompanying ..... $ .75
50 " " 1.50
100 " " 3.50
200 " " 7.50

3110. **Scale of Fusibility.**

a. 1. Stibnite; 2. Natrolite; 3. Almandite; 4. Actinolite; 5. Orthoclase; 6. Bronzite. The foregoing six specimens, averaging 1 x 1½ inches, in pasteboard box ..... .75
b. Large cabinet specimens mounted on blocks 2.50

3111. **Scale of Hardness.**

a. 1. Talc; 2. Gypsum; 3. Calcite; 4. Fluorite; 5. Apatite; 6. Orthoclase; 7. Quartz; 8. Topaz; 9. Corundum; 10. Diamond. The foregoing 10 specimens, averaging 1 x 2 inches, together with a specimen of Honestone for testing streak, a native magnet and a file, in a handsome hardwood case 5.50
b. Same, without the diamond 2.00

3112. **Specific Gravity.**

25 specimens, in box 1.25

3113. **Collection of the most important Natural Chemical Compounds.**

280 specimens, size about 7 x 9 cm., composing:

13 specimens Elements.
48 " Sulphur=Arsen=Antimon=and Bismuth Compounds.
32 " Oxygen compounds.
11 " Hydro-oxygen compounds.
12 " Haloid salts.
23 " Nitrate and Carbonate compounds.
44 " Sulphates, Chromates, Molybdates, Wolframates and Uranates.
12 " Aluminates, Ferrates, Borates.
26 " Phosphates, Arseniates, Antimoniates, Vanadates, Niobates, Tantalates.
69 " Silicates and Titanates.
11 " Organic compounds 150.00

3114. **Metals.**

Consisting of 1 each sealed glass tube with: Potassium metal cryst., Sodium metal cryst., in large octahedrons with edges of about 1 — 1,4 cm. Sodium potassium alloy composed of 1 equivalent of Ka, and one equivalent Na., a liquid of striking resemblance to mercury, melting point 8°C. These specimens are sealed up in hydrogen and the price depends upon the perfectness of the crystals, upwards from 12.00

3115. **Metals.**

a. 63 elements: Ag. Al. As. Au. Ba. Be. Bi. Bo. Br. C. (Diamond and Graphite). Ca. Cd. Ce. Cl. Co. Cr. Cs. Cu. Di. Er. Fe. Fl. H. Hg. I. In. Ir, Ka. La. Li. Mg. Mn. Mo. N. Na. Nb. Ni. O. Os. P. Pb. Pd. Pt. Rb. Rh. Rn. S. Sb. Se. Si. Sn. Sr. Ta. Te. Th. Ti. Tl. U. V. Wo. Yt. Zn. Zr. All specimens given above are sealed up in glass tubes of 2 different sizes (quantities up to 50 gr.) in fine case 125.00
b. 65 elements, same as above, including Gallium and Germanium. 150.00

3116. **Metallurgical Collection.**

200 specimens, size about 5 x 6 c. m., of the most important Ores and Metallic compounds, viz:

45 Iron, 17 Lead, 26 Copper, 17 Zinc, 5 Tin, 14 Manganese, 8 Cobalt, 7 Nickel, 3 Cerium and Lanthanium, 6 Titanium, 5 Tantalium, Niobium, 8 Yttrium, 3 Wolframium, 2 Molybdeum, 4 Chromium, 3 Uranium, 8 Antimony, 6 Arsenic, 4 Bismuth, 2 Tellurium, 5 Mercury, 6 Silver, 2 Gold, 1 Platinum, 1 Osmium-Iridium 100.00

No.

3117. **Minerals and Metals.**

64 specimens, among which are 48 metals (fused and powdered), incl. boron, silicon, selenium, tellurium, carbon, etc. The collection represents all the metals discovered up to the year 1875, in case..... $ 80.00

3118. **Minerals.**

Number of Specimens.	In handsome case, and each specimen in paper box. Size 3–4 C. M.	Size 4–6 C. M.	Size 7–9 C. M.
100	$ 7.00	$12.00	$28.00
200	14.00	24.00	66.00
300	28.00	42.00	110.00
500	96.00	156.00	250.00
	Loose.	Loose.	Loose.
1000	240.00	380.00	600.00

NOTE.—The names and localities of the mineral specimens are guaranteed to be correct. The collections are arranged according to Dana's system of mineralogy, but can be arranged to any other system if desired.

3119. **Minerals used in the Ornamental Arts.** (Sculpture, Painting, Porcelain etc.)

15 specimens..... 4.00
25 " 10.00
50 " 30.00

3120. **Minerals used in Agriculture.**

25 specimens..... 4.00
50 " 10.00
100 " 30.00

3121. **General Collection, illustrating the physical properties of Minerals.**

185 specimens, size about 5 x 6 cm., demonstrating as follows:

10 the crystalline, crystallized and amorphous state. 8 the specific gravity. 4 the tenacity. 7 the fracture. 12 the directions of cleavage. 6 the degree of cleavage. 8 the structure. 10 the hardness. 65 the colors. 5 the streak. 5 the transparency. 11 the lustre. 1 double refraction. 2 pleochroism. 1 fluorescence. 9 blending of colors. 1 asterism. 3 phosphorescence. 2 electricity. 6 fusibility. 9 physiological properties..... 87.50

3122. **Special Collections, illustrating the physical properties of Minerals.**

317 specimens, size 5 x 6 c. m.

25 specimens for specific gravity..... 17.50
25 " cleavage..... 10.00
75 " structure, tenacity and fracture..... 40.00
100 " color and lustre..... 60.00
25 " transparency, double refraction, pleochroism, blending of colors, fluorescence and phosphorescence..... 20.00
25 " magnetism and electricity..... 17.50
7 " scale of fusibility according to Prof. Kobell..... 2.50
10 " scale of hardness..... 6.00
25 " physiological properties (taste, odor and feeling)..... 7.50

3113 **Pseudomorphous Minerals.**

50 specimens, size about 5 x 6 c. m..... 20.00
100 " " 5 x 6 c. m..... 50.00

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

No.		
3124.	**Ores and Metallic Minerals.**	
	25 specimens, only the common metals, averaging 1 x 1 inch	$ 1.50
	50 specimens, averaging 1½ x 1½ inches, including an excellent series of ores of both common and rare metals	7.56
	Same collection, specimens averaging 2 x 3 inches	20.00
	Same collection, specimens averaging 3 x 4 inches	30.00
3125.	**Ores of the Rarer Metals.**	
	15 specimens	4.50
	25 specimens	10.00
3126.	**Copper Ores.**	
	15 specimens,	2.50
	25 specimens	6.00
	35 specimens	20.00
3127.	**Gold and Silver Ores.**	
	25 specimens,	6.00
	50 "	10.50
3128.	**Iron Ores and Minerals.**	
	25 specimens,	2.50
	50 specimens	10.00
	100 specimens	30.00
3129.	**Lead Ores and Minerals.**	
	15 specimens	3.00
	25 specimens	6.50
	50 specimens	25.00
3130.	**Zinc Ores and Minerals.**	
	15 specimens	4.00
	25 specimens	10.00
3131.	**Collection Illustrating Color.**	
	25 specimens, averaging ¾ x ¾ inches, in a handsome polished hardwood case	1.50
	50 specimens, in case	4.00
	50 specimens, averaging 2 x 2 inches	10.00
3132.	**Collection Illustrating Lustre.**	
	8 specimens, averaging 2 x 2 inches	1.50
3133.	**Collection of Detached Crystals.**	
	50 specimens	10.00
	100 "	25.00
	200 "	75.00
	300 "	125.00
	600 "	250.00
3134.	**Collection of uncut Gems and Precious Stones.**	
	120 specimens, viz:	
	17 specimens 1st rate precious stones (Gems.)	
	27 " 2d " "	
	11 " 3d " "	
	35 " 4th " "	
	30 " 5th " "	100.00
3135.	**Gems and Ornamental Stones.**	
	25 specimens, in hard wood box	2.50
	50 " "	6.00

New York. Chicago. RICHARDS & CO. LTD. Newark. Hamburg.

No.

3136. **Rocks. Collections according to Prof. Rosenbusch.**

General Collection: size 6½ x 8½ cm.

100 specimens,	$ 20.00
200 "	42.00
300 "	70.00
500 "	140.00
1000 "	350.00

3137. Geognostic petrographic Collections.

150 specimens	30.00
150 " selected	45.00
100 " Student Collection	10.75

3138. Massive Rocks, size 6½ x 8½ cm.

100 specimens	30.00
200 "	70.00
300 "	125.00
500 "	250.00

3139. Slaty Rocks, size at 6½ x 8½ cm.

100 specimens	25.00
200 "	55.00
300 "	100.00
500 "	200.00

3140. Collections for Agricultural Colleges, etc.

Collection of 28 Minerals, 42 Rocks and 36 Soils, for Agricultural Colleges, etc.	32.50
Collection, as above, selected specimens	40.00

3141. Student Collections, according to Prof. Credner.

50 specimens of rocks	7.00
100 " "	10.75

3142. **Thin Rock Sections.**

Collection of 90 specimens of typical rocks, according to Prof. F. Zirkel	55.00
Collection of 350 rock sections of eruptive massive rocks, according to Prof. Rosenbusch	212.50
Student collection of 20 rock sections, according to Prof. Zirkel	12.50

3143. **Fossils.**

General collection, arranged according to the formation.

100 specimens	10.00
200 "	28.00
300 "	50.00
500 "	110.00
1000 "	350.00

3144. Collections of special formations.

Number of Specimens	25	50	100	200
Aluvium and Diluvium	$6.00	$15.00	$50.00	$
Tertiary	4.00	10.00	24.00	60.00
Limestone	5.00	14.00	32.00	80.00
Wealden	10.00	30.00	90.00	
Jura	5.00	12.00	30.00	70.00
Trias	6.00	16.00	40.00	110.00
Dyas	8.00	24.00	60.00	160.00
Coal	6.00	15.00	36.00	90.00
Devon	5.00	14.00	32.00	80.00
Silur	8.00	22.00	50.00	120.00

New York Chicago RICHARDS & CO. LTD. Newark Hamburg

C. MODELS.

No.

3145. **Models of Precious Stones**

Collection of 21, of colored and cut glass, in case, containing: Octahedral Diamond, Diamond Triaskis Octahedron, Zirkon, Pyrope, Crysolith, Chrysoberyl, Emerald, Garnet, Sapphire, Tourmaline, Amethyst, Jacinth, Ruby, Rock-Crystal, Topaz, Spinel, Chrysophrase, Aquamarine, Dichroite, Euclase, Corundum..... $ 15.00

3146. **Models of the 15 largest and most famous Diamonds,**

of the finest crystal, in case Comprising, 1) Regent, 2) Polar Star, 3) Orloff, 4) Empress Eugenie, 5) South Polar Star, 6) Koh-i-noor, 7) Nassak, 8) Great Mogul, 9) Florentine or Tuscan, 10) Koh-i-noor in its former shape, 11) Piggot, 12) Sancy, 13) Shah of Persia, 14) Hope, 15) Pasha of Egypt..... 20.00

3147. **Imitations of the 4 largest Diamonds,**

Koh-i-noor, Regent, Orloff, Tuscan, of the finest crystal in case..... 7.50

3148. **Imitations of Gems,**

of the finest colored crystal, and cut in perfect imitation.:

40 specimens in case..... 18.00
60 " " " 32.00
84 " " " 60.00

Crystal Models.

3149. Glass Crystal Models of solid Bohemian glass (Strass.)

Set of 14 models in velvet-lined case, German silver mounted..... 12.00
Set of 25 in velvet-lined case..... 25.00
Set of 50, large size, in 5 velvet-lined cases..... 50.00

3150. Glass Crystal Models, constructed of glass plates, axes indicated by colored silk threads.

Collection of 50 specimens. 95.00
Collection of 100 " 195.00
Collection of 134 " 250.00

3151. Wood Crystal Models.

Set of 368 selected forms of pear wood of great perfection ; 5 c.m. in size..... 150.00

3152. Wood Crystal Models.

Set of 700 selected forms of pear wood of great perfection, after Professor P. Groth, size 5 c.m. latest selection..... 450.00

3153. Wood Crystal Models.

Set of 108 pieces, size 4 c.m., according to Prof. Rose..... 20.00

3154. Pasteboard Crystal Models.

Set of 114 pieces, size 5 x 6 c.m., according to Profs. Naumann and Hausmann, the ground forms and combinations of different colors..... 25.00

3155. Wire Crystal Models.

Set of 17 forms with support, in case..... 24.00

3200. **G. CHEMICAL APPARATUS AND CHEMICALS.**

SET No. 1.

APPARATUS.

1 Alcohol Lamp.
1 Retort Stand, 2 rings.
3 Flasks, pint.
3 " quart.
6 Test Tubes, 5 in.
1 " Holder.
1 Pneumatic Trough.
1 Mortar, porcelain.
2 Evaporating Dishes.
1 Funnel, glass, 3 in.
1 Pack Cut Filters.
¼ lb. Glass Tubing.
3 ft. Rubber Tubing.
6 ft. Iron Wire.
3 ft. Magnesium Ribbon.
1 pc. Copper.
1 pc. Zinc.

CHEMICALS.

1 oz. Arsenious Acid.
1 " Muriatic "
1 " Nitric "
1 " Oxalic "
1 " Sulphuric "
4 " Alum
4 " Ammonia Hydrate.
4 " " Carbonate.
2 " " Chloride.
2 " " Sulphide.
4 " Antimony, Metal.
4 " " Tartrate.

CHEMICALS.—*Continued.*

1 oz. Baryta Caustic.
½ " Bismuth.
4 " Borax.
1 " Cobalt Chloride.
1 " Copper Sulphate.
2 " Fluor Spar.
¼ " Iodine.
4 " Iron Sulphate.
2 Sheets Litmus Paper.
2 " Turmeric "
4 oz. Lead Acetate.
4 " Lime Chloride.
1 lb. Manganese Dioxide.
1 " Mercury.
1 oz. Mercury Chloride.
½ " Nutgalls.
2 " Potash, yellow Prussiate.
1 " " red.
2 " Potassium Caustic.
2 " " Bichromate.
4 " " Chlorate.
1 " " Cyanide.
½ " " Iodide.
¼ " " Metal.
1 " Silver Nitrate.
¼ " Sodium Metal.
2 " " Sulphate.
2 " Strontia Nitrate.
4 " Sulphur.
2 " Wax.
1 Stick Phosphorus.

The above set complete.....**$15.00** net.

SET No. 2.

APPARATUS.

Jeweler's Blowpipe, bulb and mouthpiece.
Deflagrating Spoon.
2 Evaporating Dishes.
Evolution Flask, with delivery tube.
Triangular File.
Funnel, 3 in.
Filter Paper.
Florence Flask, small.
Graduate.
Scale and Weights.
Spirit Lamp.
Pc. Wire Gauze.
½ lb. Glass Tubing.
Gas Bag, with Stopcock.
Lead Dish.
Metric Graduate.
Nest Crucibles.
Pneumatic Trough.
Retort.
" Stand, 3 rings.
Rubber Tubing.
1 doz. Test Tubes.
Mortar, porcelain.
Wooden Retort Support.

CHEMICALS.

2 oz. Acid Arsenious.
1 lb. " Hydrochloric.
1 " " Nitric.
1 oz. " Oxalic.
2 lbs. " Sulphuric.
1 oz. " Tartaric.
2 " Ammonia Chloride.
1 " " Nitrate.
1 " " Sulphide.
4 " " Hydrate.
½ " Antimony.
1 quart Alcohol.
1 oz. Barium Chloride.
1 " " Nitrate.

CHEMICALS.—*Continued.*

2 oz. Bone Black.
1 " Cobalt Nitrate solution.
2 " Chloride Calcium.
4 " Calcium Sulphate.
2 " Copper.
1 " Carbon Disulphide.
2 " Ether Sulphuric.
2 " Ferrous Sulphate.
1 " " Sulphide.
⅛ " Gun Cotton.
⅛ " Iodine.
1 " Lead Acetate.
2 " " Monoxide.
¼ " Litmus.
1 ft. Magnesium Ribbon.
2 oz. Manganese Dioxide.
2 " Mercury.
¼ " " Chloride.
¼ " " Oxide.
½ " " Nutgalls, powdered.
1 " Potassium Ferri-Cyanide.
2 " " Ferro.
½ " " Cyanide.
1 " " Chromate.
¼ " " Chlorate.
1 " " Bichromate.
2 " " Caustic.
2 " " Nitrate.
⅛ " " Iodide.
¼ " " Permanganate.
½ dr. " Metal.
½ oz. Phosphorus,
⅛ " Sodium Metal.
1 " " Biborate.
1 " " Carbonate.
1 " " Sulphate.
⅛ " Silver, Nitrate.
1 " Strontium Nitrate.
1 " Strontium Chloride.
4 " Sulphur.

The foregoing set complete for.....**$25.00** net.

RICHARDS & CO. New York. Chicago Newark. Hartford

SET No. 3.

Apparatus.

Glass Tubing:
1 stick about 3 feet long of No. 1.
2 " " " 2.
1½ " " " 3.
1½ " " " 4.
1½ " " " 5.
2 " " " 7.
1 " " " 8.
1 Tube about 1 foot long, 1 in. inter. dia.
1 Retort, 12 oz., stoppered.
1 Receiver. 8 oz., tub'd.

Bottles:
1 wide-mouth bottle, ½ gallon.
1 " " 1 quart.
1 " " 1 pint.
2 " " 8 oz.
2 " " 4 oz.
2 " " 2 oz.
1 stout pint bottle, 1 in. mouth.

Funnels:
1 Funnel, 4 in. diameter.
1 Funnel, 2 in. diameter.
3 Woulff Bottles, 12 oz. capacity.
1 Glass Flask, 1½ pint.
1 " 8 oz.
2 " 4 oz.
2 " 2 oz.
1 Thistle Tube.
1 Soda Water Bottle, stout.
1 Conical Wine Glass.
6 Test Tubes.
1 Drying Tube.
1 Measuring Glass, 250 c.c. grad.
1 " " 25 "
1 Small Pipette,
1 nest 4 Beakers.
2 or 3 pcs. Glass, 3 in. square.
1 Porcelain Evaporating Dish, 4 in.
1 " " " 2½ in.
1 Deep Dish, 500 c.c. capacity.
1 small iron Mortar.
1 Wedgewood " 4 in. dia.
1 Bunsen Gas Lamp, with blowpipe tube.
1 Small Spirit Lamp.
1 Iron Ring Stand.
1 pc. Iron Wire Gauze, 4 in. square.
5 ft. stout Iron Wire,
4 ft. Piano Wire, iron,
1 pc. fine Brass Gauze, 2½ in. square,
1 Iron Sand Bath, 4½ in.
1 Water Bath.
1 Glassblower's Lamp.
1 small Double Bellows.
1 Mouth Blow-pipe,
1 Triangular File.
1 Round File.
1 pr. Jeweler's Tweezers.
1 pc. Platinum Wire, 4 in.
1 " Foil, 1½ in.
1 Stoneware Pan.
1 Flower Pot Saucer.
1 Hessian Crucible, 8 oz.
1 Lead Pan.
1 Soup Plate.
1 Thermometer.
1 pr. Small Scales.
1 set Gramme Weights, 1 to 50.

Corks, assorted:
1 ft. Caoutchouc Tubing, ⅛ in.
1 " " " 3/16 in.
4 " " " ¼ in.
1 Iron Spoon.
1 pr. Wooden Nippers.
4 Sheets Filter Paper.

Chemicals.

5 oz. Alcohol,
½ " Alum,
6 " Ammonia Aqua,

Chemicals.—*Continued.*

1 oz. Ammonia Chloride,
½ " " Nitrate,
Few drops Aniline,
Small Cryst, " red,
30 grains Antimony metallic,
30 " Arsenious Acid,
A few grains Barium Chloride,
¾ oz, Benzole,
2 " Bleaching Powder,
3 " Bone Black,
⅛ " Butyric Acid,
1 " Bromine,
1½ oz. Calcium Chloride,
Few grains Calcium Sulphate (gypsum)
1-12 oz. Camphor (crude),
¼ oz. Carbolic Acid, cryst,
¼ " Carbon Bisulphide,
½ " Chalk powdered,
1 lb. Chlorhydric Acid,
30 grs. Cochineal,
1½ oz. Copper Filings,
30 grs. Copper Oxide,
30 " Copper Sulphate,
1 oz. Ether,
½ " Fluor Spar,
1 sq. in. Gold Leaf,
½ oz. Gum Arabic,
50 grs. Indigo,
10 " Indigo,
1 oz. Iron Filings,
¼ " " Sulphate,
1 " " Sulphide,
½ " Lead Acetate,
2 " " Oxide,
15 grs. Litmus,
30 " Logwood Extract of,
4 in. Magnesium Ribbon,
1 oz. Manganese black oxide,
Few grains Mercury Chloride,
¾ oz. " red oxide of,
6 " Nitric Acid,
¼ " " " fuming,
½ " Nutgalls,
50 grs. Oxalic Acid,
1 stick Phosphorus, 2½ in. long,
30 grs. Picric Acid,
10 " Platinum, scrap,
2 pcs. Potassium Metal,
½ oz. " Bichromate,
1 gr. " Bromide,
½ oz. " Chlorate,
30 grs. " Cyanide,
¼ oz. " Ferrocyanide,
½ " " Hydrate,
1/16 " " Iodide,
3 " " Nitrate,
6 grs. " Permanganate,
1 oz. " Tartrate,
30 grs. Rosin,
40 " Shellac,
2 pcs. Sodium Metal,
30 gr. " Acetate,
⅙ oz. " Biborate,
¼ " " Carbonate,
1 " " Hydrate,
1 " " Silicate,
1 " " Sulphate,
Few grains Strontium Nitrate,
1 oz. Sulphur, powdered,
4 " " roll brimstone,
3 lbs. Sulphuric Acid,
15 grs. Tin Binoxide,
1½ oz. Turpentine crude,
4 oz. " oil of,
2 " Zinc, scraps,
½ " " filings, or dust,
2 Strips Zinc, sheet, 6 x 2 inches.

The foregoing set complete for.....**$50.00** net.

Any other Apparatus or Chemicals can be had on application.

RICHARDS & CO. LTD. New York. Newark. London.

3201

H. PHILOSOPHICAL APPARATUS.

SET No. 1.

Matter and Mechanics.

Capillary Tubes, set of 6	$1.15
Cohesion Plates, glass	.75
Collision Balls	3.50
Leaning Tower	1.25
Whirling Ring	3.00
Inertia Apparatus	.75
Compound Levers	3.75

Hydrostatics.

Equilibrium Tubes	3.00
Upward Pressure Apparatus	2.00
Lifting Pump, glass	1.50
Forcing Pump, glass	1.50
Syphon	.40

Pneumatics.

Air-pump, 7 in. plate, to work perpendicularly or obliquely	15.00
Receiver	1.00
Hand Glass	1.00
Magdeburg Hemispheres	4.00
Water Hammer	.50
Fountain in Vacuo	5.00
Sheet Rubber	.50
Barometer Tube, with bulb	1.00
Prepared Oil	.50

Heat.

Spirit Lamp	$ .50
Wire Gauze	.30
Ball and Guage Ring	1.75
Conductometer	2.00
Palm Glass	.50
Compound Bar	.90
Principle of Ventilation	3.50

Optics.

Microscope	5.00
Set Lenses	2.50
Zoetrope	2.75
Newtons Dish	2.00
Prism	.50

Electricity.

Holtz Electric Machine, 12 in. plate	25.00
Discharger	1.75
Electrical Flier	1.00
Set Electrical Chimes	1.75
Spotted Tube	3.00
Leyden Jar, pint	1.25
Pith Ball Electrometer	.60
Magnetic Needle	1.50
Bichromate Potash Battery	3.00
Helix and Ring, or Magic Circle	3.00
Electro Magnet	1.50
Bar Magnet	.50
Dancing Images and Plates	2.00
Handles for Shocking, with wires	1.50

The above set complete for ..... $100.00.

SET No. 2.

Matter and Mechanics.

Capillary Tubes, set of 6	$1.15
Cohesion Plates, glass	.75
Inertia Apparatus	.75
Collision Balls	3.50
Leaning Tower	1.25
Whirling Ring	3.00
Gyroscope Top	1.00
Compound Levers	3.75
Screw, *in frame*	2.50
Wedge Hinged	1.50
Illustration of Pulleys	15.00

Hydrostatics.

Equilibrum Tubes	3.00
Upward Pressure Apparatus	2.00
Hydrometer and Jar	1.25
Bottle Imp, in bottle	1.00
Syphon	.40
Lifting Pump	1.50
Forcing Pump	1.50

Pneumatics.

Air Pump, with lever handle, 8 in. plate, and two extra washers	40.00
Receiver	1.00
Hand Glass	1.00
Set Magdeburg Hemispheres	4.00
Guinea and Feather Tube, 3 ft	5.50
Fountain, in Vacuo	5.00
Water Hammer	.50
Mercury Shower with Receiver	3.00
Globe, for weighing air and balances	8.00
Sheet Rubber	.50
Prepared Oil	.50
Barometer Tube, with bulb	1.00

Acoustics.

Violin Bow	$2.00
Diapason	8.50
Glass Plate, for Chladni figures	.75
Screw Press, to hold above	3.50

Heat.

Spirit Lamp	.50
Wire Gauze	.30
Ball and Guage Ring	1.75
App. for specific heat, two metals	1.75
Palm Glass	.50
Conductometer	2.00
Principle of Ventilation	3.50
Compound Bar	.90
Cryophorus	2.00
Glass Flask	.50

Optics.

Convex and Concave Mirror, 5 in	2.75
Prism, 6 in	1.25
Set 6 Lenses	2.50
Newton's Disk, app. for Recomp. Light	2.00
Model of Eye (can be dissected)	5.00
Zoetrope	2.75
Prism	.50
Microscope, double pillar	18.00

Electricity.

Holtz Machine, 12 in. or 20 in. plate machine	25.00
Discharger	1.75
Electrical Flier	1.00
Set Electrical Chimes	1.75
Leyden Jar, quart	1.50
Gold Leaf Electroscope	3.50
2 cells Bichromate Battery	6.00
App. Decomposition Water	2.00
Helix and Ring, or Magic Circle	3.00

RICHARDS & CO. LTD. New York Newark

SET No. 2.—*Continued.*

ELECTRICITY.—*Continued.*

Electro Magnet	$1.50
Bar Magnet	.50
Horeshoe Magnet, 6 in	.75
Wheel Armature	.50
Magnetic Needle, on stand	1.50
Dipping Needle	1.50

ELECTRICITY.—*Continued.*

2 Geissler's Tubes	$2.00
Dancing Images and Plates	2.00
Powder Cup	1.25
Electrometer	.60
Ether Spoon	1.00
Spotted Tube	3.00

The above set complete for.....$225.00.

SET No. 3.

MATTER AND MECHANICS.

Cohesion Plates	$ .75
Capillary Plates	1.50
Capillary Tubes, set of 6	1.25
Inertia Apparatus	.75
Set Collision Balls, with graded arc	6.00
Leaning Tower and other illustrations of center of gravity	6.00
Whirling Machine and accessories	10.00
Compound Levers	3.75
Illustration Pulleys, with capstan, axle, etc	15.00
Wedge and Inclined Plane	3.50
Screw, in frame	2.50
Gyroscope, brass, on gimbals, with sliding weight	5.00
Set Weights, 1 lb. down to 1 oz	3.00

HYDROSTATICS.

Equilibrium Tubes	3.00
Upward Pressure Liquids	2.00
Forcing and Lifting Pump, of brass	10.00
Acid Syphon, with suction tube	.50
Bottle Imp, in bottle	1.00
Hydrometer, for heavy liquids	.75
" " light "	.75
" Jar	.60
Archimedes' Principle	2.75
Tantalus Cup	1.00

PNEUMATICS.

Water Hammer	.50
Air Pump, with lever handle and two extra washers	40.00
Three Receivers	4.00
Hand Glass	1.00
Magdeburg Hemispheres	5.00
Freezing Apparatus, 8 in	3.00
Balance and Globe, for weighing air	8.00
Guinea and Feather Tube, 3 ft	5.50
Rubber Bag, fitted	1.75
Revolving Jet, plain	2.00
Fountain, in Vacuo	5.00
Mercuro Shower App., to fit on hand glass	1.50
Bacchus Illustration	2.25
Prepared Oil	.50
Screw Plug	.50
Sheet Rubber	.50

HEAT.

Spirit Lamp	.50
Fire Syringe	2.00
Ball and Gauge Ring	1.75
Pyrometer	5.00
Compound Bar	.90
Wire Gauze	.30
Palm Glass	.50
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