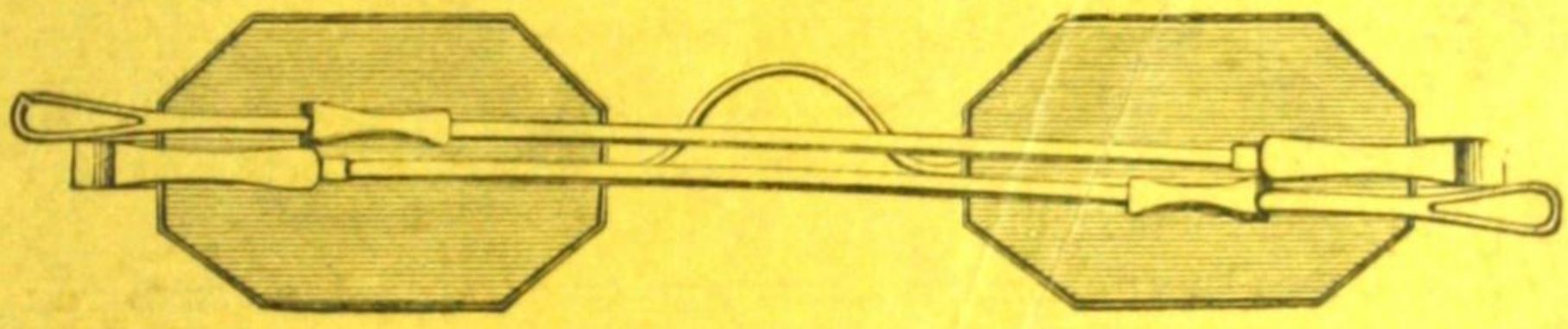
ESTABLISHED IN 1783.

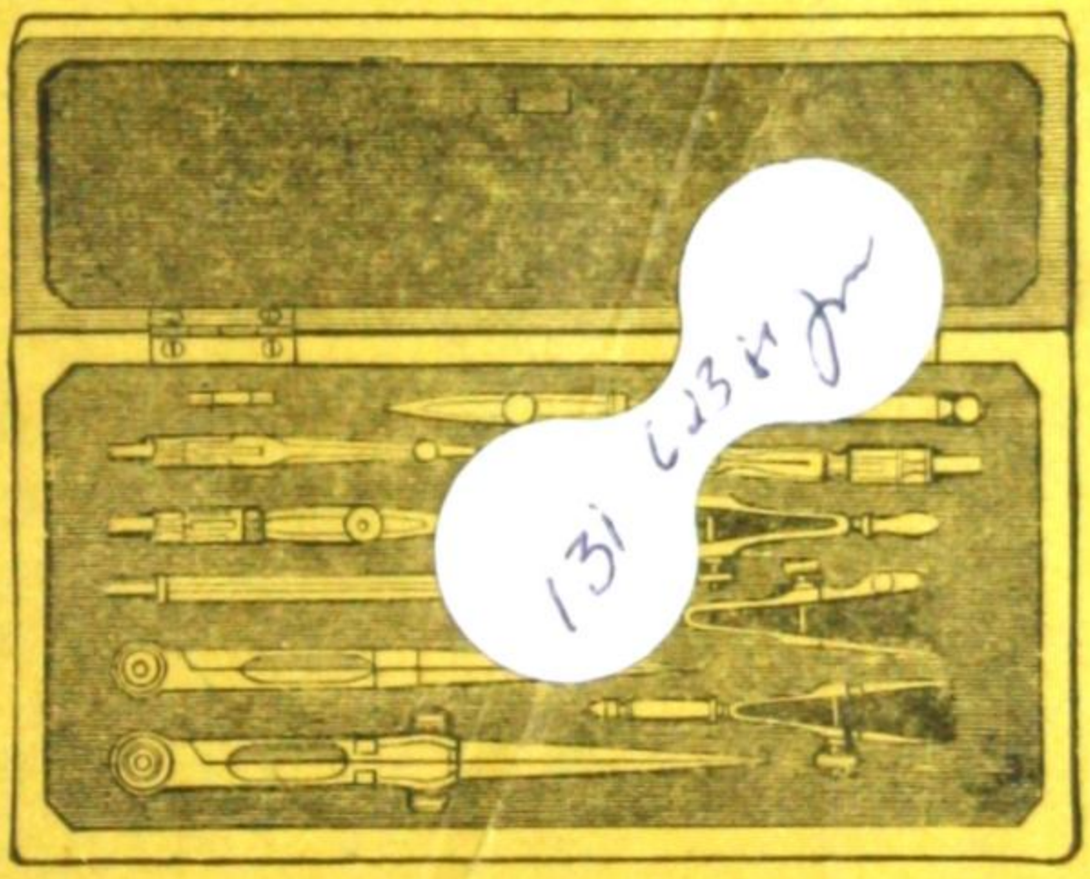
A PRICED AND ILLUSTRATED CATALOGUE

OF

Optical and Mathematical

INSTRUMENTS,





FOR SALE BY

WILLIAM Y. McALLISTER,

OPTICIAN,

728 Chestnut St., Philadelphia.

FEBRUARY, 1878. 46th Edition.

GRANT, FAIRES & RODGERS, Prs., 52 & 54 N. Sixth St

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The best mode of remitting money is by a draft on any banker or broker in Philadelphia or New York, made payable to my order, or by a Post Office money order. If notes are sent by mail, the letter should be registered. Remittances, in all cases, at the expense and risk of the person sending.

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CATALOGUE

OF

Optical & Mathematical Instruments,

FOR SALE

BY

WILLIAM Y. McALLISTER,

728 CHESTNUT STREET,

PHILADELPHIA.

GRANT, FAIRES & RODGERS, PRINTERS, 52 & 54 NORTH SIXTH ST.

This House is a continuance of the business originally commenced by JOHN McALLISTER, Senior, in Market Street, about 1783, and which he in 1796, removed to Chestnut Street, above Second, where it remained until 1854, when it was removed to Chestnut Street, below Eighth, my present location.

W. Y. McALLISTER.

MAY, 1867.

JOHN McALLISTER, Senior, ...	1783 to 1811.
JOHN McALLISTER & SON, ...	1811 to 1830.
JOHN McALLISTER, JR., & CO., ...	1830 to 1836.
McALLISTER, (W. Y.,) & CO., ...	1836 to 1853.
McALLISTER & BRO., ...	1853 to 1865.
W. Y. McALLISTER, ...	1865 to

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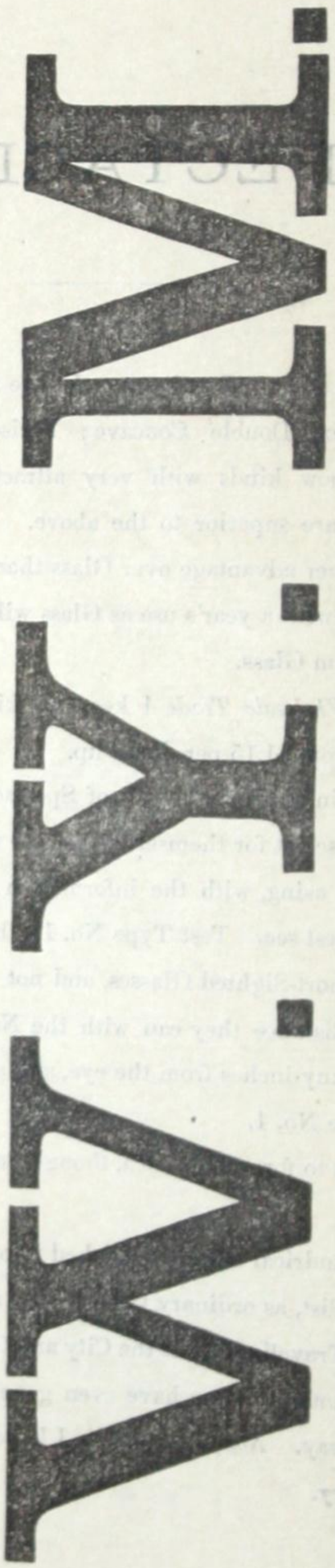


Test Type No. 1.

Jaeger's Test Type No. 8.

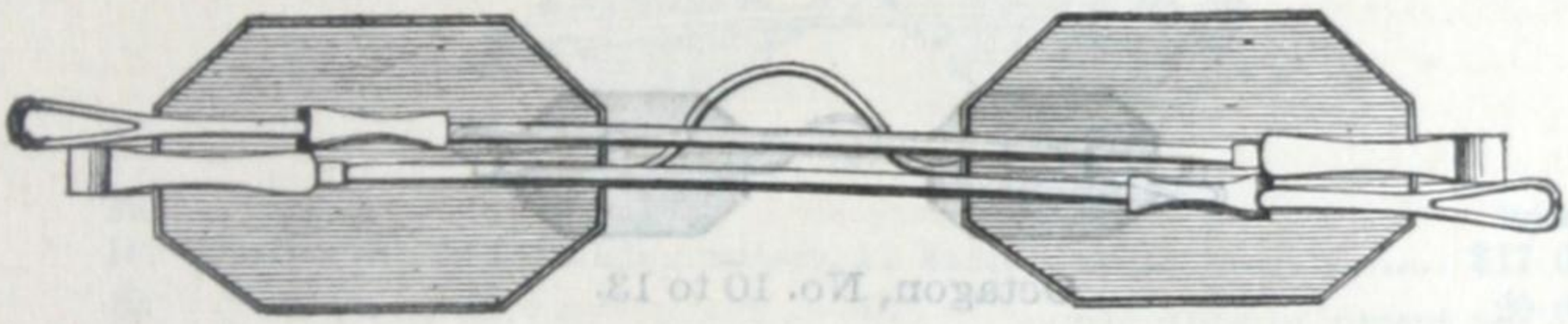
Colonies the surrender of the place. Some of the disaffected and faint-hearted were inclined to open the gates, but were held in check by the mastiff loyalty of Maclean. The veteran guarded the gate with his Highlanders; forbade all communication with the besiegers, and fired upon their flag as an ensign of rebellion. Several days elapsed. Arnold's flags of truce were repeatedly insulted, but he saw the futility of resenting it, and attacking the place with his present means. The

Jaeger's Test Type No. 4.

difficulty stared him in the face. A strong line of walls and bastions traversed the promontory from one of its precipitous sides to the other; inclosing the upper and lower towns. On the right, the great bastion of Cape Diamond crowned the rocky height of that name. On the left was the bastion of La Potasse, close by the gate of St. Johns, opening upon the barracks; the gate where Wolfe's antagonist, the gallant Montcalm, received his death-wound. A council of war was now held. Arnold, who had some knowledge of the place, was for dashing forward at once and storming the gate of St. Johns. Had they done so, they might have been successful. The gate was open and unguarded. Through some blunder and delay, a message from the commander of the Lizard to the lieutenant-governor

CATALOGUE.

Spectacles.

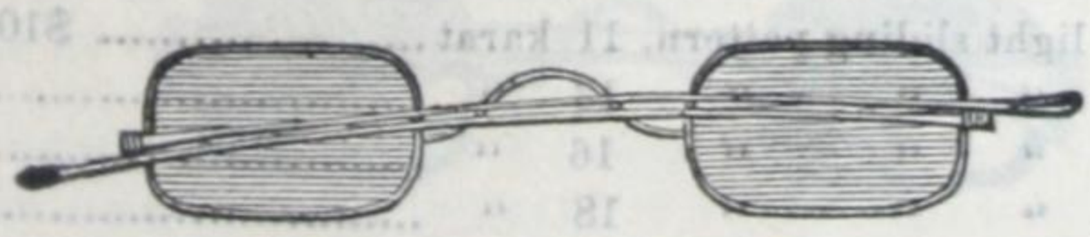


The well known reputation of this house in the Spectacle business since 1799, when it was began by JOHN MCALLISTER, Senior, is still maintained, and the utmost attention given to the Retail as well as the Wholesale customer.

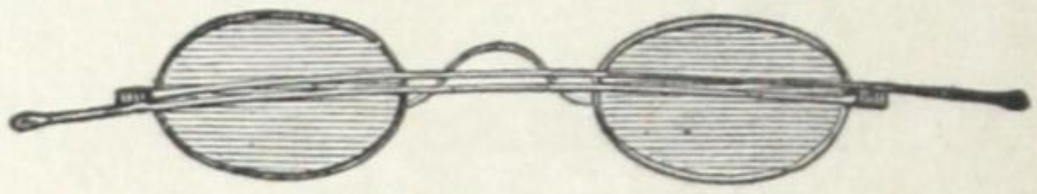
GOLD SPECTACLES, fitted with Convex, Concave, Periscopic, or Colored Glasses, I now sell at the following prices, with Octagon, Square, or Oval-shaped eyes:

LADIES' PATTERN.

Octagon, No. 1 to 5.



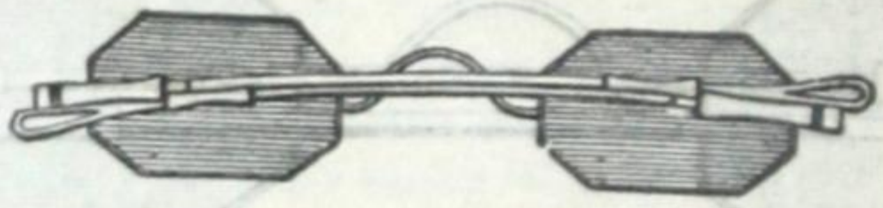
Square, No. 1 to 5.



Oval, No. 1 to 5.

No.		Price.
1.	Ladies' pattern, 13 karat	$ 9 00 & 10 50
2.	" " 16 "	10 00, 12 00 & 13 00
3.	" " 18 "	13 50 & 15 00
4.	" " 11 "	7 50 & 9 00

GENTLEMEN'S LIGHT SLIDING PATTERN.



Octagon, No. 10 to 13.

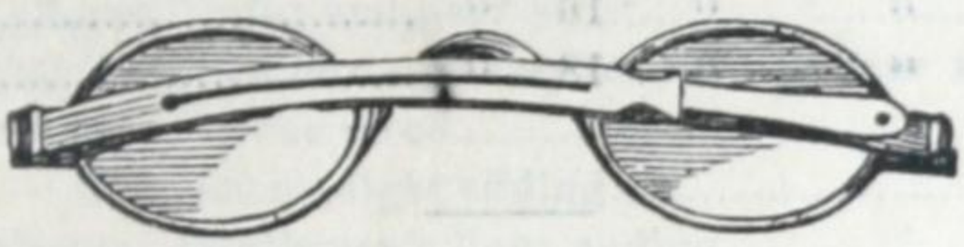
Square, No. 10 to 13.

Oval, No. 10 to 13.

10.	Gentlemen's light sliding pattern, 11 karat	$10 00 & 12 00
11.	" " " " 13 "	15 00
12.	" " " " 16 "	19 00
13.	" " " " 18 "	21 00

GENTLEMEN'S BROAD SLIDING PATTERN.

Square, No. 18 to 20.



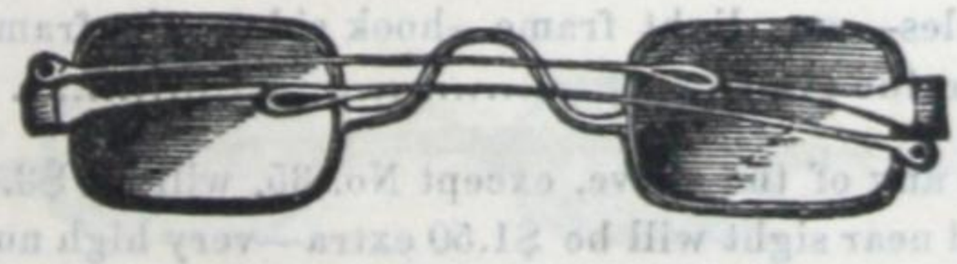
Oval, No. 18 to 20.

Octagon, No. 25 to 28.

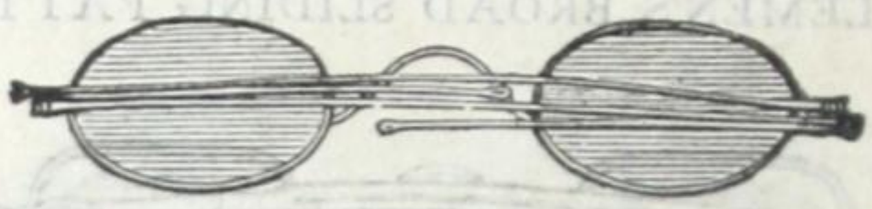
No.		Price.
18.	Gentlemen's broad sliding pattern, 11 karat	$17 00
19.	" " " " 13 "	20 00
20.	" " " " 18 "	30 00

GENTLEMEN'S PATTERN.—TURN-PIN SIDES.

Octagon, No. 25 to 28.



Square, No. 25 to 28.



Oval, No. 25 to 28.

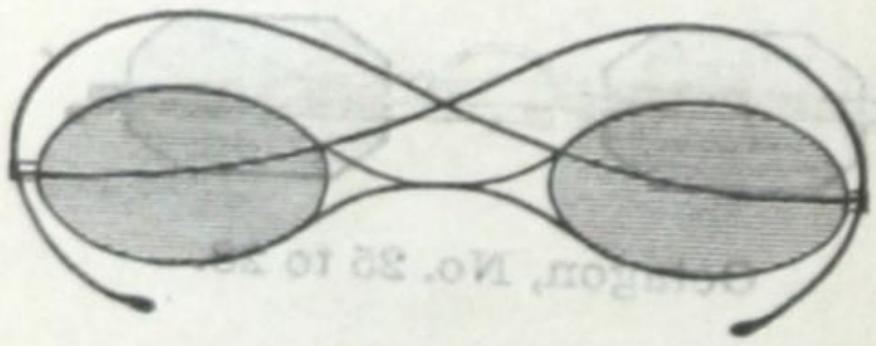
No.		Price.
25.	Gentlemen's turn-pin pattern, 11 karat	$12 00
26.	" " " 13 "	14 00
27.	" " " 16 "	20 00
28.	" " " 18 "	22 00

Pulpit Spectacles.

No. 30.

These enable the wearer to look over them, and are especially useful for public speakers, school-masters and store-keepers; the prices are the same as Nos. 1 to 28.

Hook Sides—Very Light.



No. 35.

35. **GOLD** Spectacles—very light frame—hook sides—the frame set in a groove in the glass, ... $8.00 to $12.00

Pebble Glasses to any of the above, except No. 35, will be $3.50 extra.

Glasses for far and near sight will be $1.50 extra—very high numbers, Concave, will also be higher price.

Fine Silver Spectacles.

Octagon, Square or Oval eyes, fitted with Convex, Concave, Periscopic or Colored glasses.

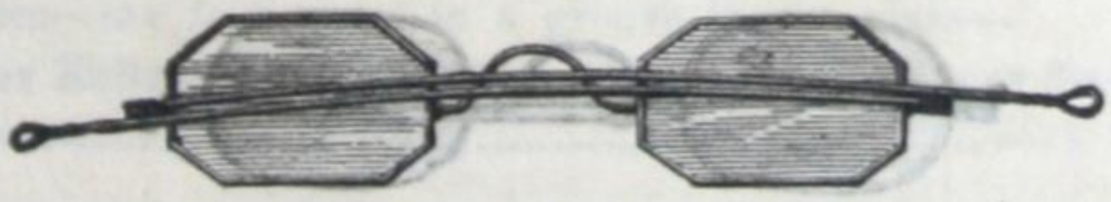
No.		Price.
40.	Ladies' pattern	$2 75
41.	Gentlemen's light sliding pattern	3 00
43.	Ladies' pattern glasses for far and near sight	3 75
44.	Gentlemen's light sliding pattern—glasses for far and near sight	4 00
45.	Pulpit spectacles—sides in one piece	3 00
46.	" " Gentlemen's light sliding	3 25
47.	With Cataract glasses—Gentlemen's light sliding	4 00
48.	With pebbles—Gentlemen's light sliding pattern	6 25

German Silver Spectacles.

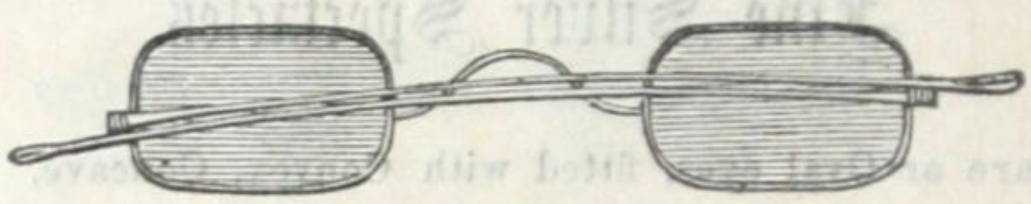
50.	German Silver plated spectacles	75
51.	" " " Cataract glasses	2 00
52.	Millers' or Turners' Spectacles,—common frames, with large eyes, and plain white Glasses, to guard the eyes from chips,	60

Blued Steel Spectacles.

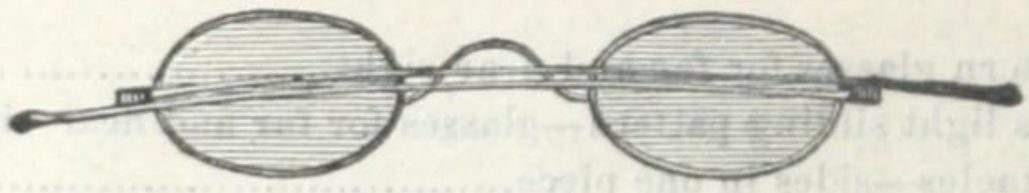
LADIES' PATTERN.



Octagon, No. 60 to 68.



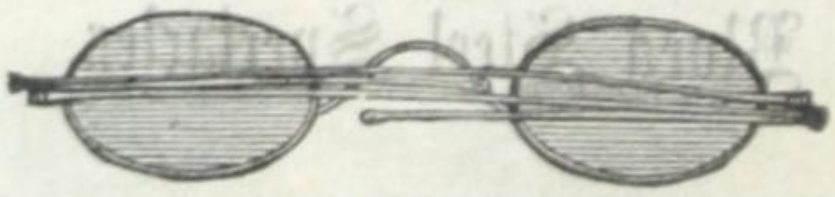
Square, No. 60 to 68.



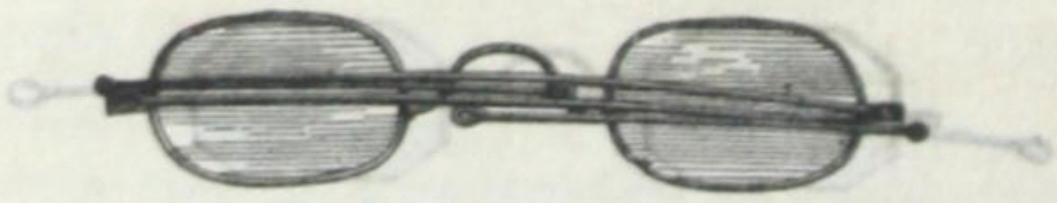
Oval, No. 60 to 68.

No.		Price.
60.	Ladies' pattern—medium quality—Convex or Periscopic glasses.....	$1 25
61.	" " " " Concave glasses—low numbers...	1 25
62.	" " " " " " high numbers..	
63.	" " " " Colored glasses.....	1 25
64.	" " fine quality—Convex or Periscopic glasses.....	2 00
65.	" " " " Concave glasses—low numbers.....	2 00
66.	" " " " " " high numbers.....	
67.	" " " " Blue, Green or Smoke-colored glasses,	2 00
68.	" " " " odd patterns.....	3 00

GENTLEMEN'S TURN-PIN PATTERN.



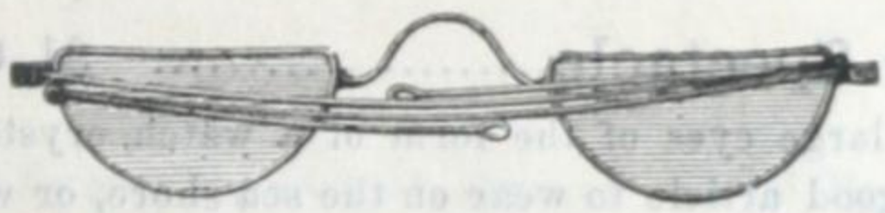
Oval, No. 70 to 78.



Square, No. 70 to 78.

No.		Price.
70.	Medium quality—Convex or Periscopic glasses	$1 50
71.	Medium quality—Concave glasses—low numbers	1 50
72.	" " " " high numbers	
73.	" " Blue, Green or Smoke-colored glasses	1 50
74.	" " Cataract glasses	3 00
75.	Fine quality—Convex or Periscopic glasses	3 00
76.	" " Concave—low numbers	3 00
77.	" " " high numbers	
78.	" " Green, Blue or Smoke-colored glasses	3 00
79.	Medium quality—side glasses—Green, Blue or Smoke-color	1 50

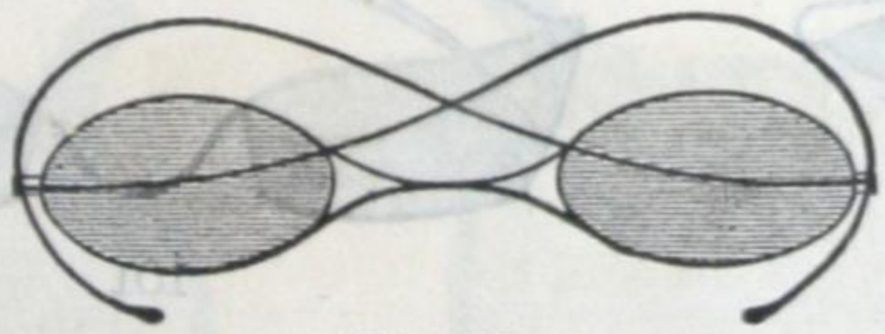
Pulpit Spectacles.



No. 80.

80.	Pulpit spectacles—ladies or gentlemen	1 50

Hook Sides.



No. 81.

81.	Hook sides—the frame, set in a groove in the glass—	2 00
82.	**Coquille or Hollow Glass Spectacles—large eyes—Blue or Smoke Glasses**	1 00, 1 50, 2 25

Blued Steel Spectacles.—Pebble Glasses.

No.		Price.
83.	For Ladies—medium quality	$4 00
84.	For Gentlemen—medium quality	5 00
85.	For Ladies—fine quality	5 50 and 6 50
86.	For Gentlemen—fine quality	6 50

With Glasses for Far and Near Sight.

87.	For Ladies—medium quality	2 75
88.	For Gentlemen—medium quality	3 00
89.	For Ladies—fine quality	3 50
90.	For Gentlemen—fine quality	4 50

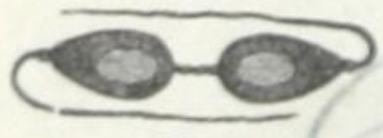
95. **Coquille Spectacle** ..... $1 00, 1 50 & 2 00

These are with large eyes of the form of a watch crystal. Blue or smoke coloured glass, a good article to wear on the sea shore, or when snow is on the ground.

Imitation Steel Spectacles.

96. Imitation Steel Spectacles, for wholesale trade,
Convex Glasses ..... $1 15 & 1 25 per doz.

Goggles—Shades.



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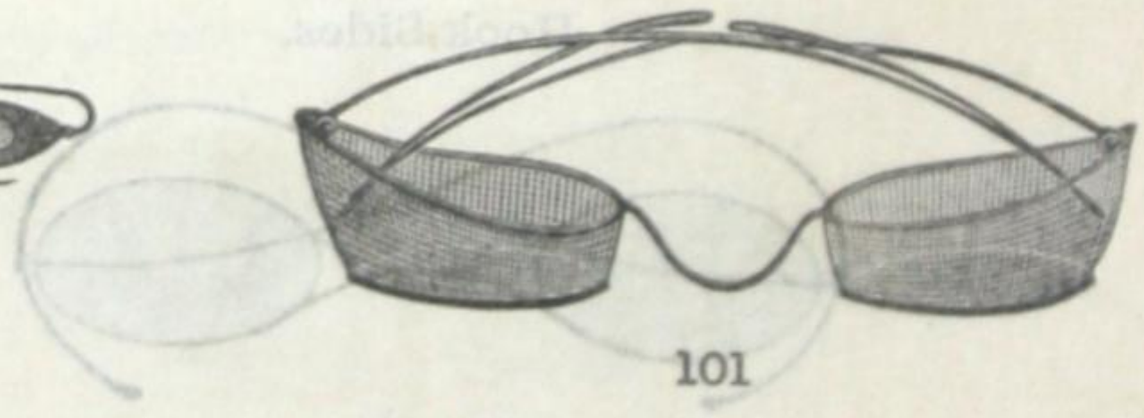


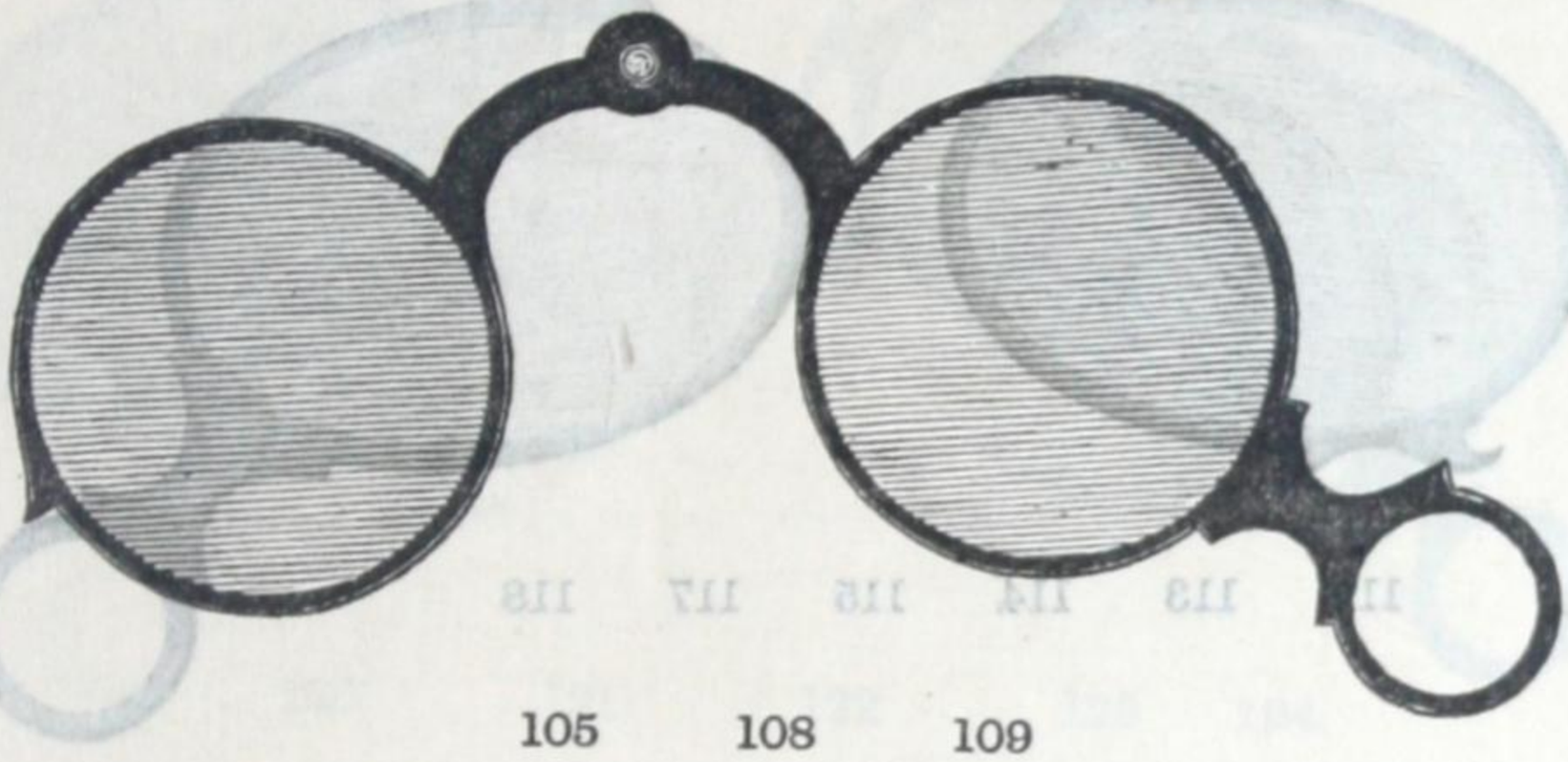
101

100.	Wire Gauze Goggles,	75
101.	" Spectacles	1 25 and 2 50

These are intended to keep sparks and dust from the eyes, and are much used in Europe on the railroads.

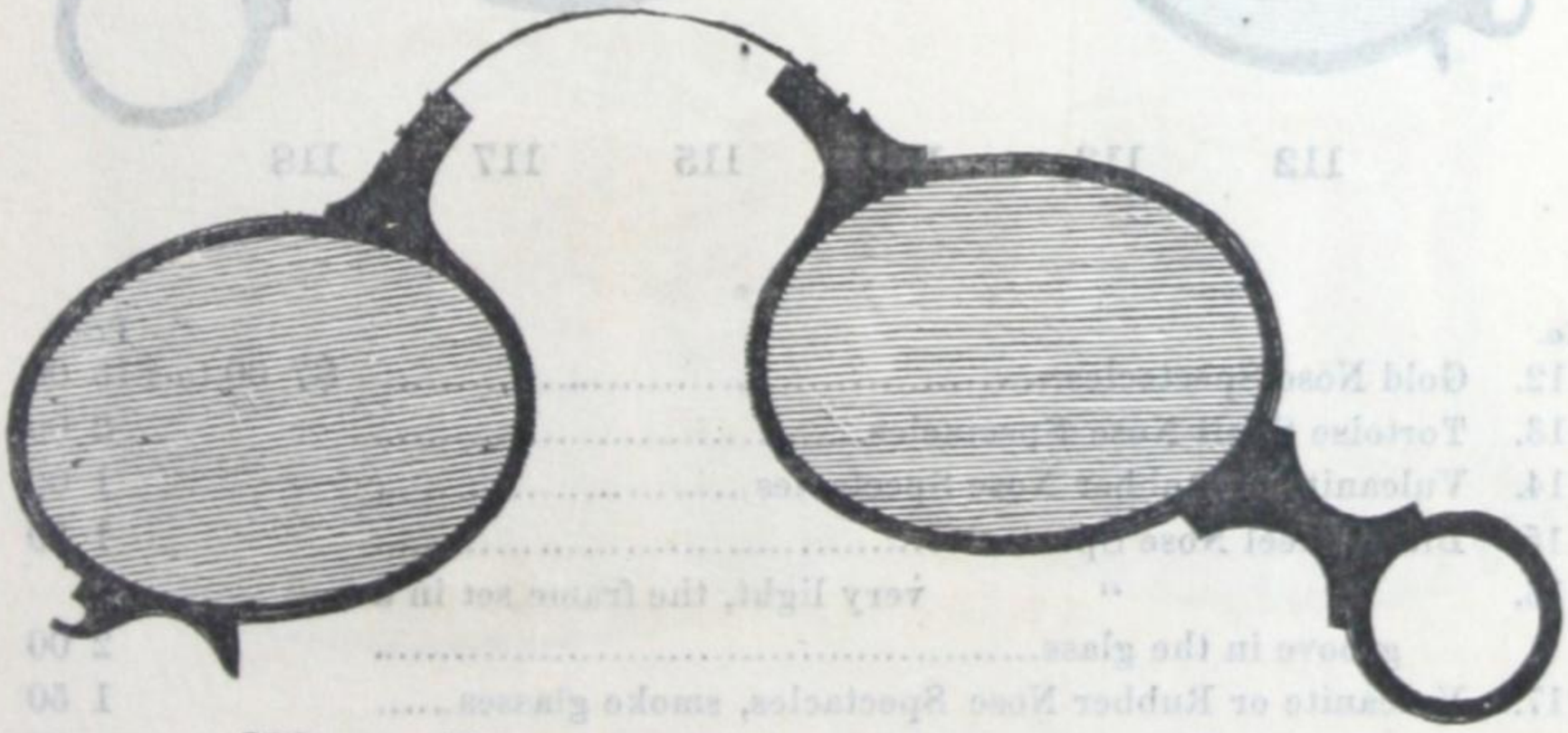
102. Silk Shades—to screen the eyes from light 75

Hand Spectacles.

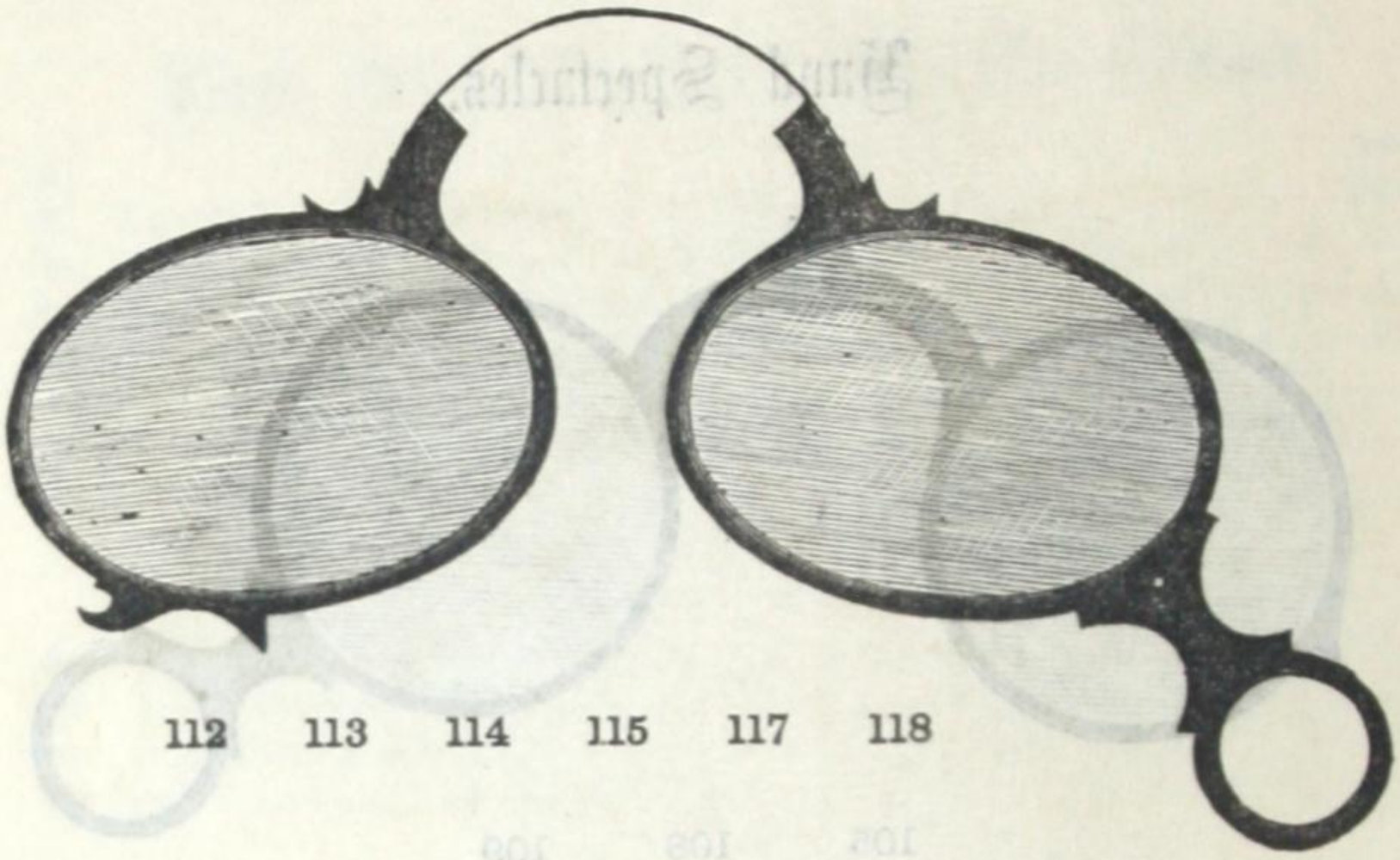


105 108 109

No.		Price.
105.	Gold Hand Spectacles—Round, Octagon or Oval Eyes...	$7 00 to $20 00
106.	" " with spring to open out.....	12 00 to 25 00
107.	" " with solid gold cover.....	30 00 to 50 00
108.	Tortoise Shell, Hand Spectacles.....	2 00
109.	Vulcanite or Rubber Hand Spectacles.....	1 00



112 113 114 115 117 118



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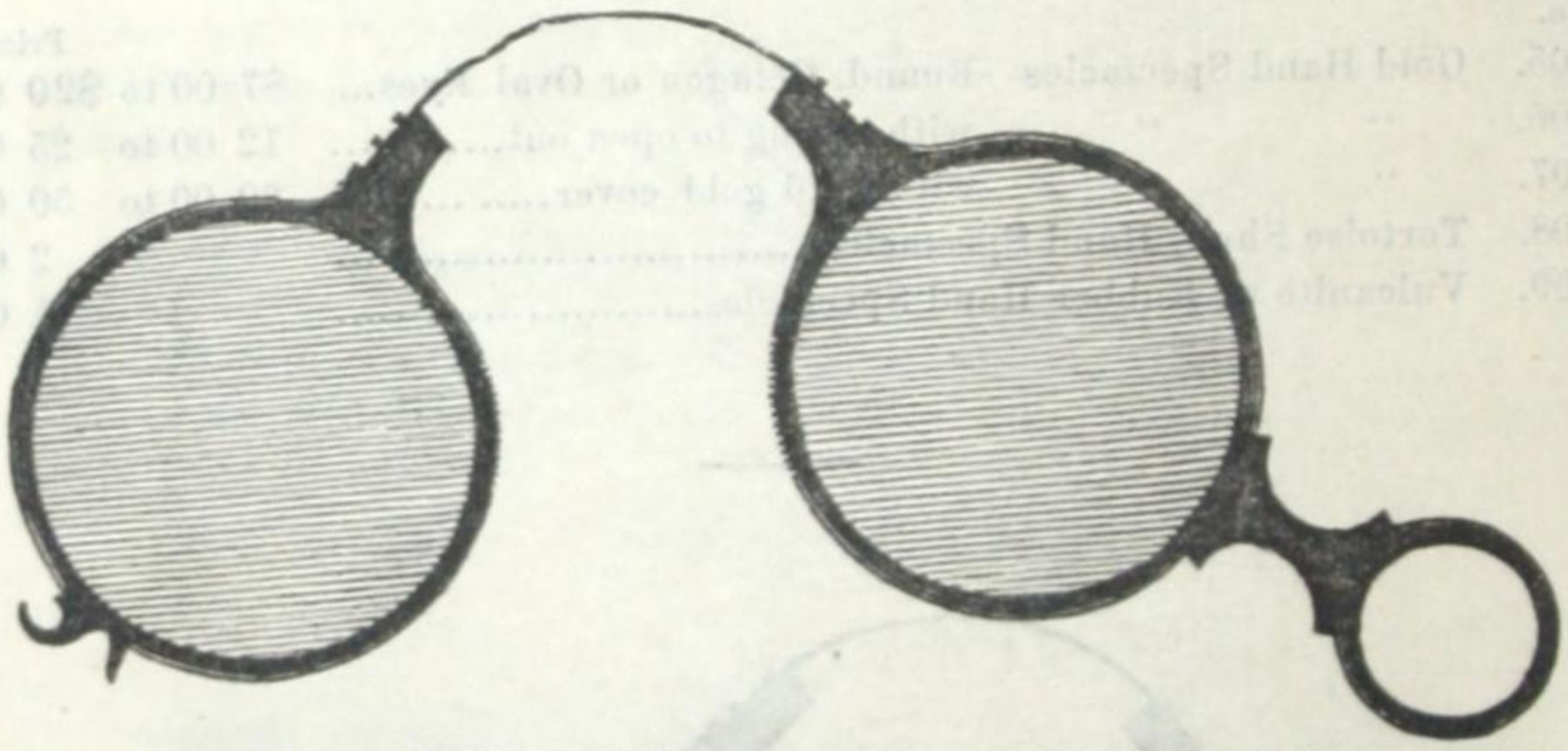
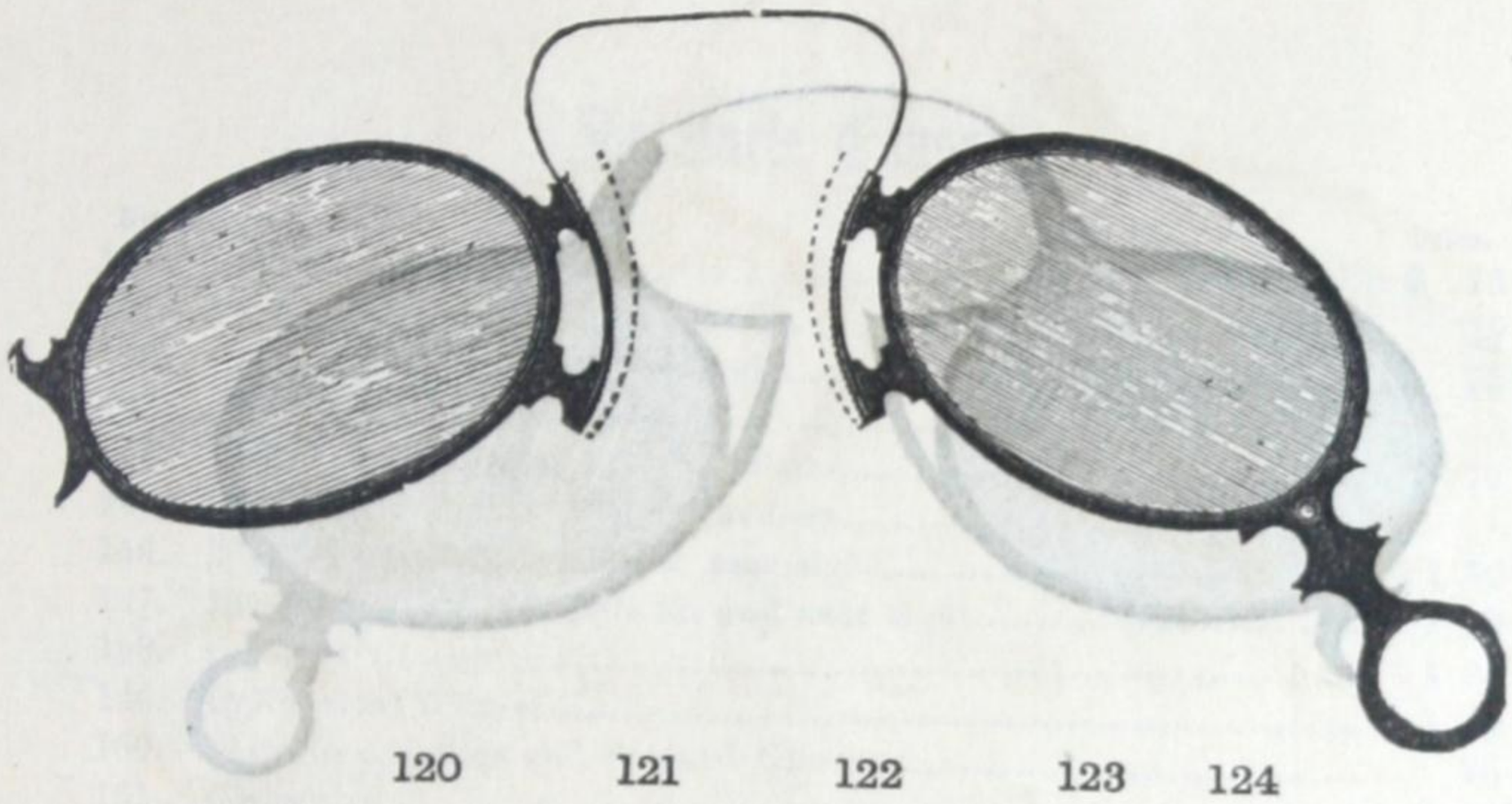


112 113 114 115 117 118

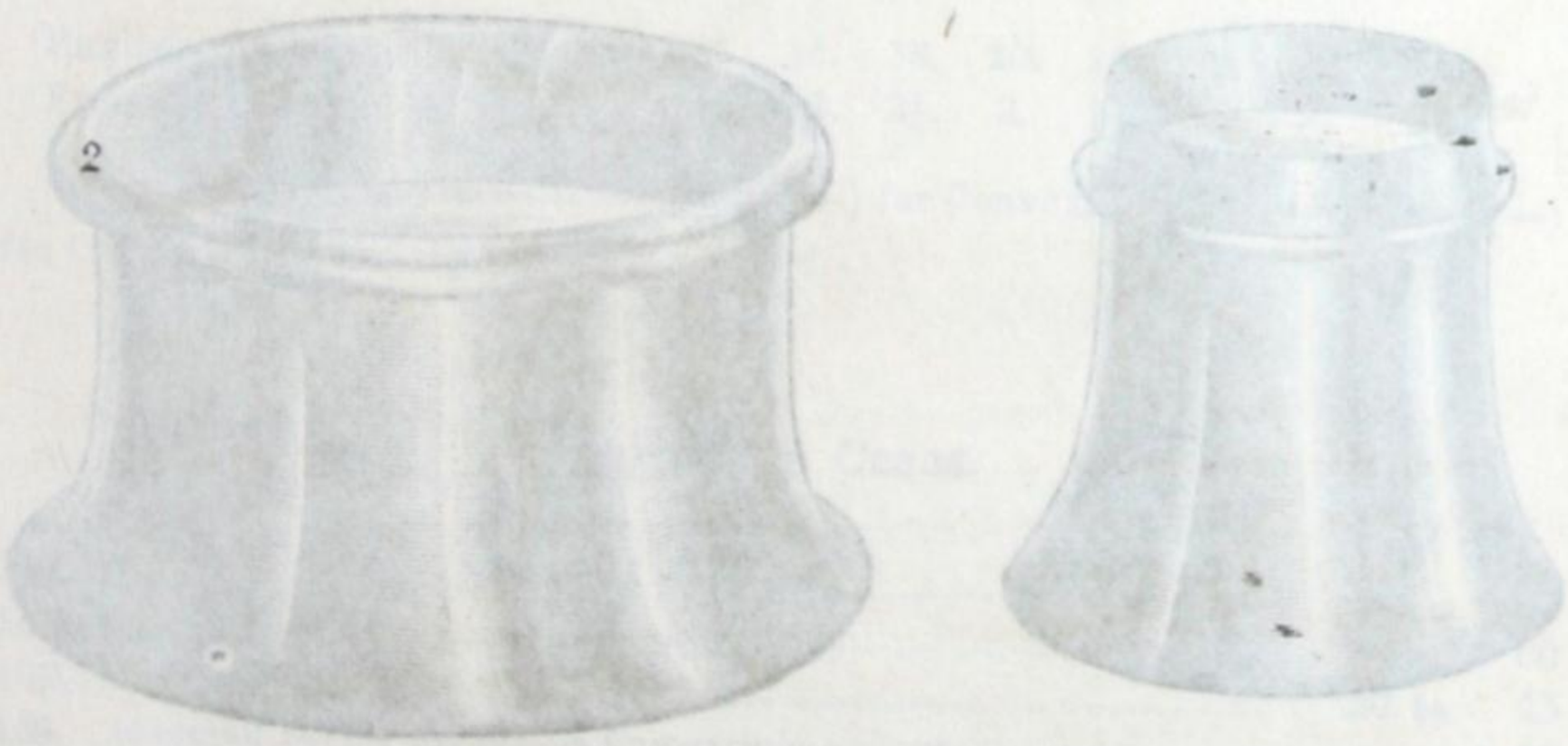
No.		Price.
112.	Gold Nose Spectacles	$7 00 to $15 00
113.	Tortoise Shell Nose Spectacles	2 00
114.	Vulcanite or Rubber Nose Spectacles	1 00
115.	Blued Steel Nose Spectacles	1 50
116.	" " very light, the frame set in a groove in the glass	2 00
117.	Vulcanite or Rubber Nose Spectacles, smoke glasses	1 50
118.	Tortoise Shell Nose Spectacles, smoke glasses	2 50



120 121 122 123 124

No.		Price.
120.	Gold Nose Spectacles	$6 00 to 12 00
121.	Blued Steel Nose Spectacles	1 50, 2 00, 2 50, 3 50
122.	Tortoise Shell Nose Spectacles	2 50
123.	Vulcanite or Rubber Nose Spectacles	1 25
124.	Frameless Nose Glasses, Steel-mounted	2 00
125.	Frameless Nose Glasses, Gold-mounted	6 00

These are neat and pretty, but not strong.



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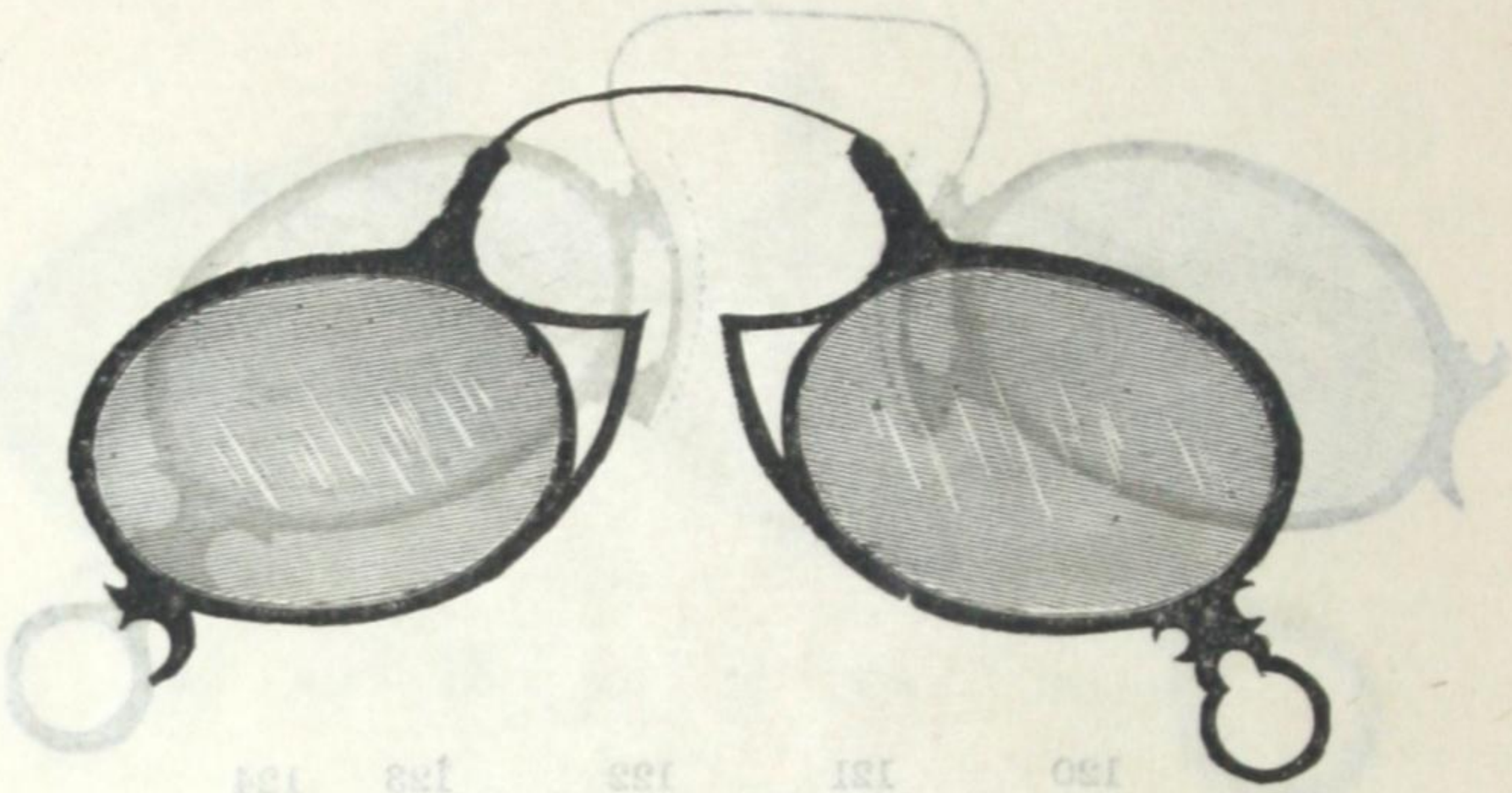
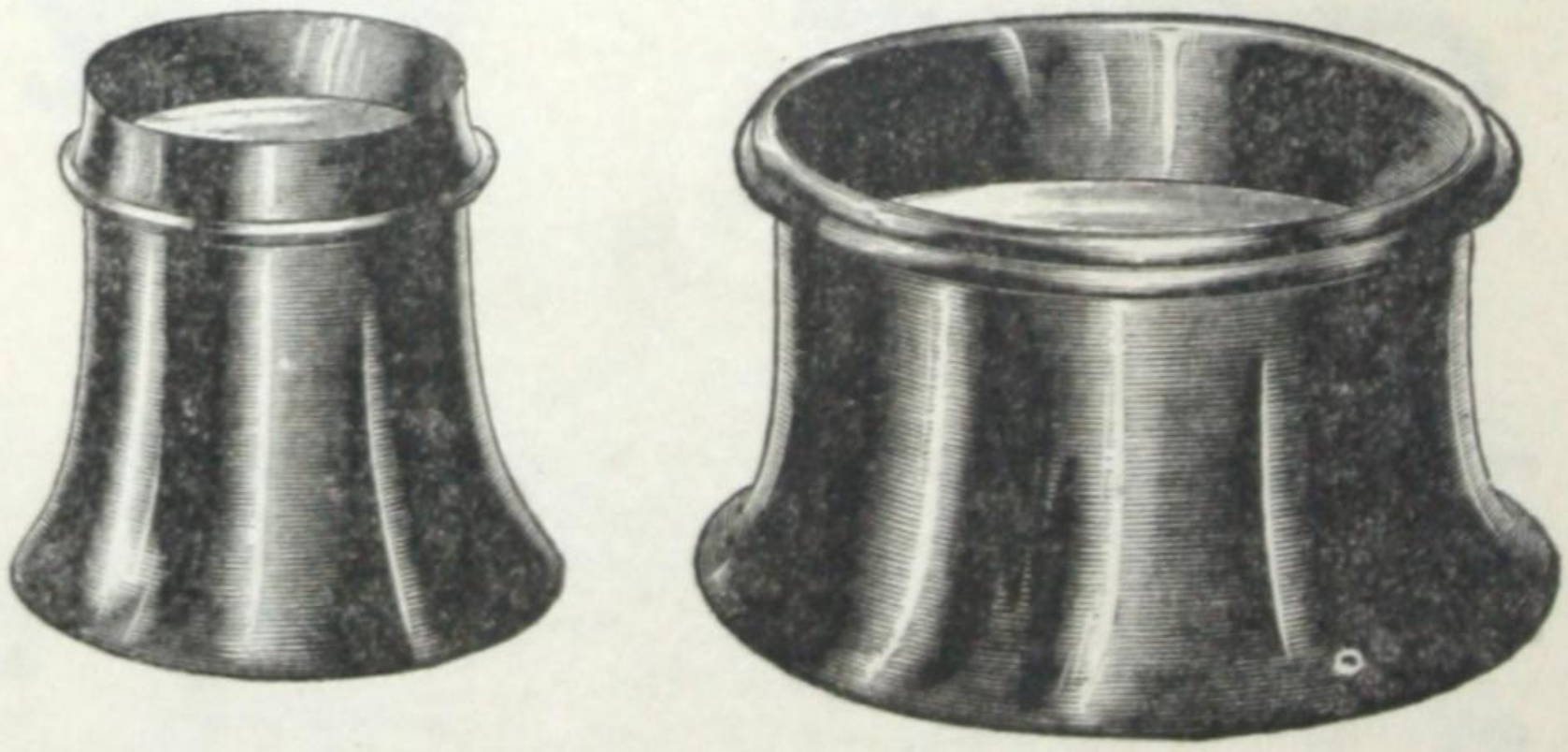


130 131 132

130. Tortoise Shell Nose Spectacles, new pattern..... $2 50
131. Vulcanite or Rubber Nose Spectacles, new pattern..... 1 25
132. Gold Nose Spectacles.....6 00 to 12 00



180 185

Spectacle Glasses.

No.		Price.
140.	Convex, per pair	$ 75
141.	Periscopic, per pair	75
142.	Concave—low numbers—per pair	75
143.	" high numbers, "	
144.	" Periscopic—low numbers	75
145.	" " high numbers	
146.	Divided Glasses for far and near sight	1 50
147.	Double Focus Glasses for far and near sight	1 50
148.	Cataract Glasses	1 25
149.	Cylindrical Glasses	1 50
150.	Plain Green, Blue and Smoked Glasses	75
151.	Convex, " " " " "	1 00
152.	Concave, " " " " "	1 00
153.	Pebbles, Concave or convex	3 00

There are two methods of numbering Concave Glasses. The scale used in this country is that used in England, and runs from No. 1 to No. 40. These numbers are not according to system. The French have a better way: they number Concave Glasses by the focus of a Convex Glass that will neutralize a Concave Glass. The following is a comparison of the two scales:

English, No.	1.	2.	3.	4.	5.	6.	7.	8.	
French, "	34.	26.	18.	15.	12.	10.	8.	7.	Inches.

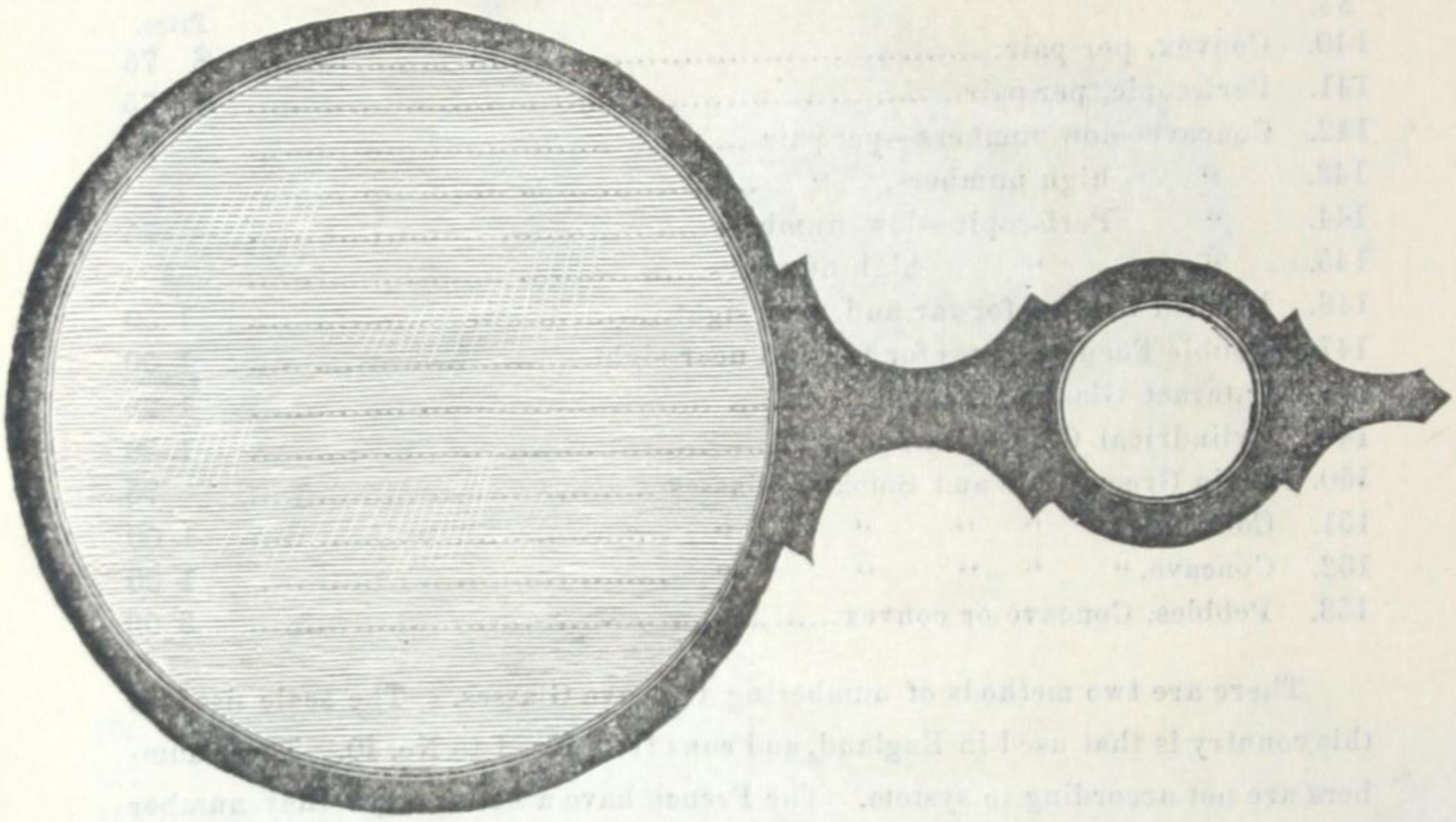
English, No.	9.	10.	11.	12.	14.	16.	18.	20.	24.	28.	30.	
French, "	6.	$5\frac{3}{4}$.	$5\frac{1}{2}$.	5.	$4\frac{1}{8}$.	$3\frac{5}{8}$.	$3\frac{1}{4}$.	3.	$2\frac{3}{8}$.	$2\frac{1}{4}$.	2.	Inches.

And scientists now use the sign plus (+) for Convex, and the sign minus (—) for Concave, and the sign ⊜ for combined.

Spectacle Cases.

160.	Morocco	20
161.	Papier Mache	50 to 1 00
162.	Planished Tin	20 to 25
163.	German Silver plated—a fine article—short	1 50
164.	" " " " " long	1 75

Reading Glasses.

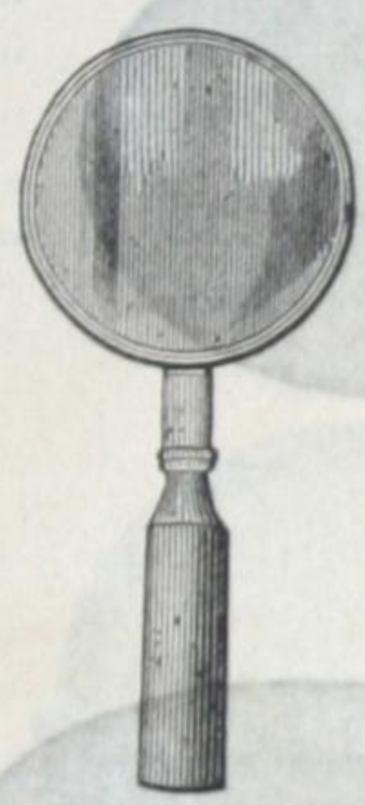


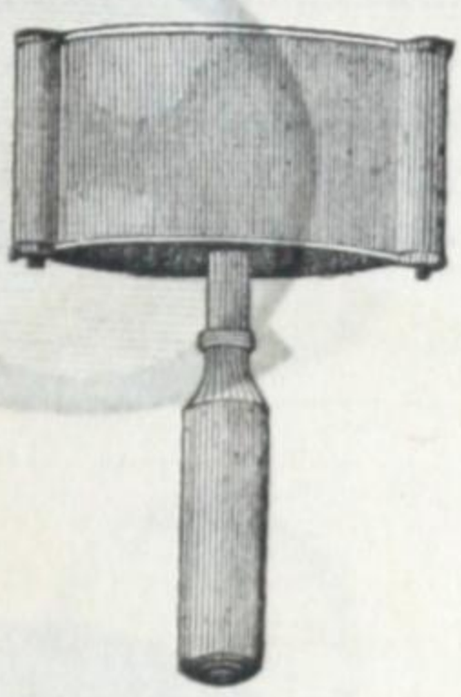
184 185

No.		Price.
170.	Oxidized Metal Frame, Lens 2 in. diam.	$1 00
171.	" " " 2½ "	1 50
172.	" " " 3 "	2 00
173.	" " " 3½ "	2 50
174.	" " " 4 "	3 00

MAGNIFYING GLASSES.

180.	Watch-maker's Eye Glasses—vulcanite frame—glasses of various foci, from 2 to 4 inch	50
185.	Engraver's Glasses, vulcanite frame, Double Plano Convex Lens, 1⅜ inches diameter	2 00
	1⅞ " "	3 00
	2⅛ " "	4 00
186.	Optimeter, used to ascertain what number of Glass will suit the customer	3 00



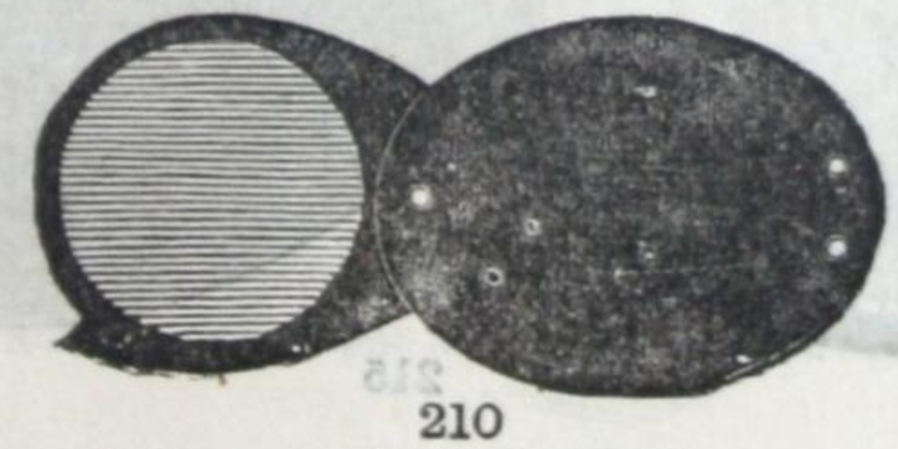


203

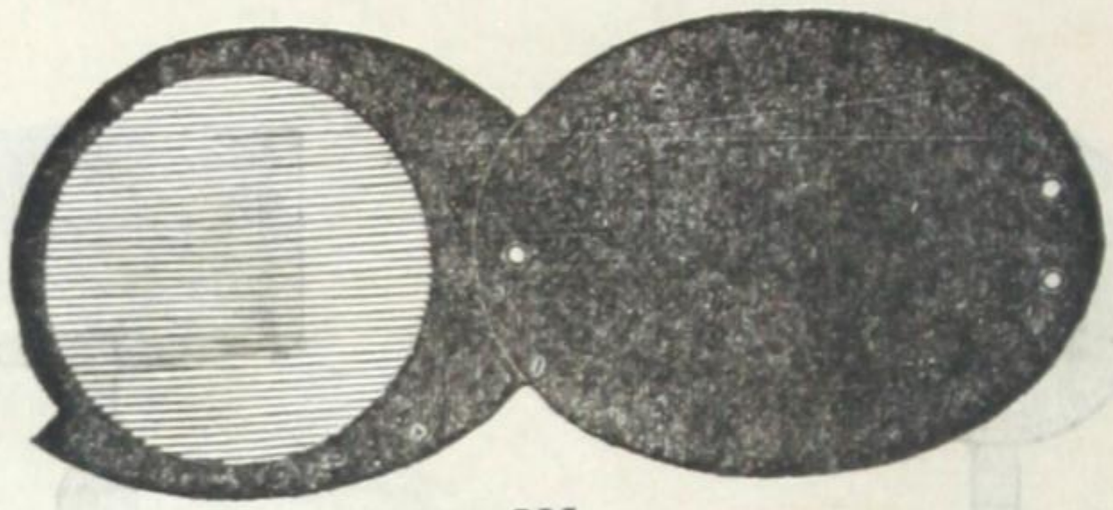
170 to 174, 190 to 201, 204 to 205

190.	Reading Glasses, German Silver Frame, Lens $2\frac{3}{8}$ in. diam.....	$2 00
191.	" " " " " " $2\frac{5}{8}$ "	2 50
192.	" " " " " " $3\frac{3}{4}$ "	3 50
200.	Reading Glasses, Gilt Frame, ivory handle, Lens 3 in. diam.....	3 75
201.	" " " " " $2\frac{1}{2}$ "	2 75
203.	" " Square Frame, German Silver mounting.....	2 00 to 4 00

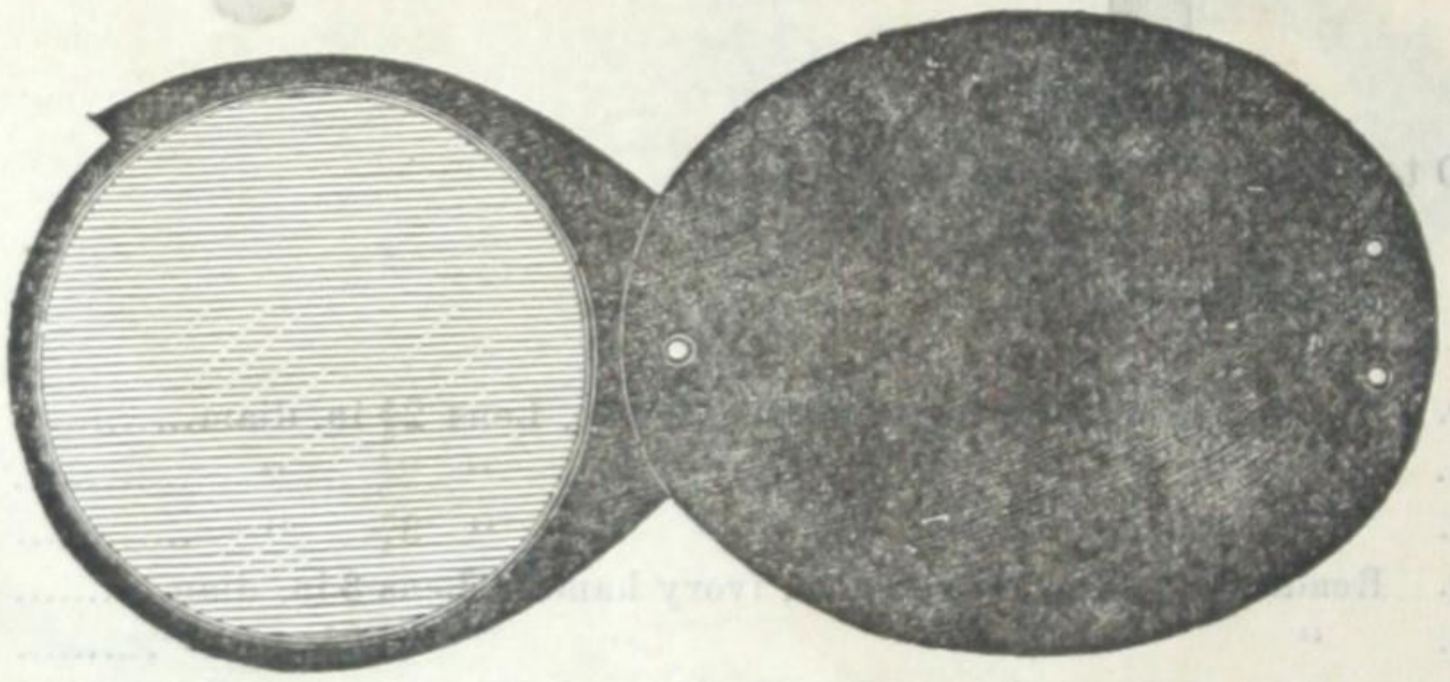
Magnifying Glasses.



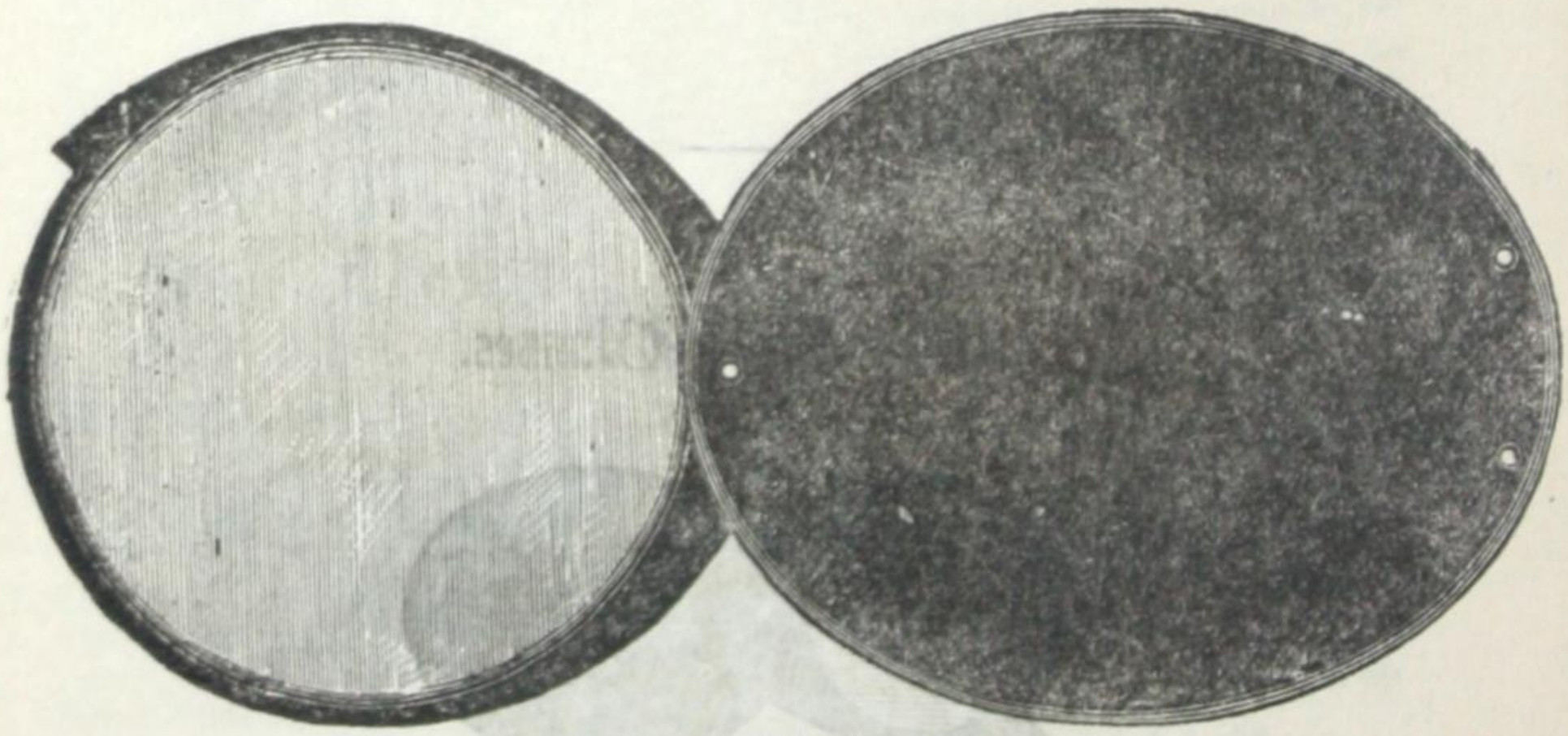
210



211

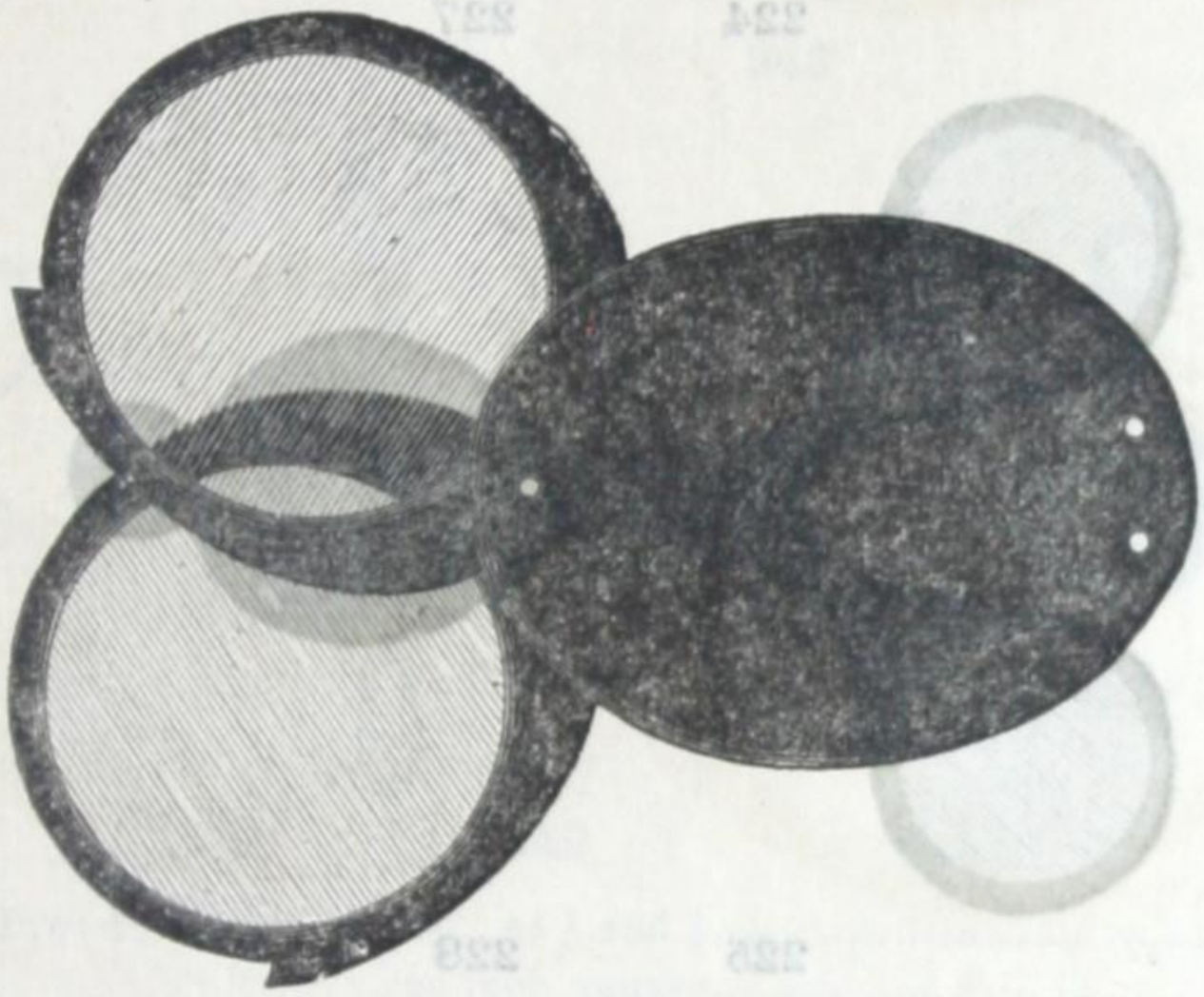


213



215

No.		Price.
210.	Pocket Magnifying Glass, with cover	$ 50
211.	" " " "	75
212.	" " " "	1 00
213.	" " " "	1 25
214.	" " " "	1 50
215.	" " " "	2 00



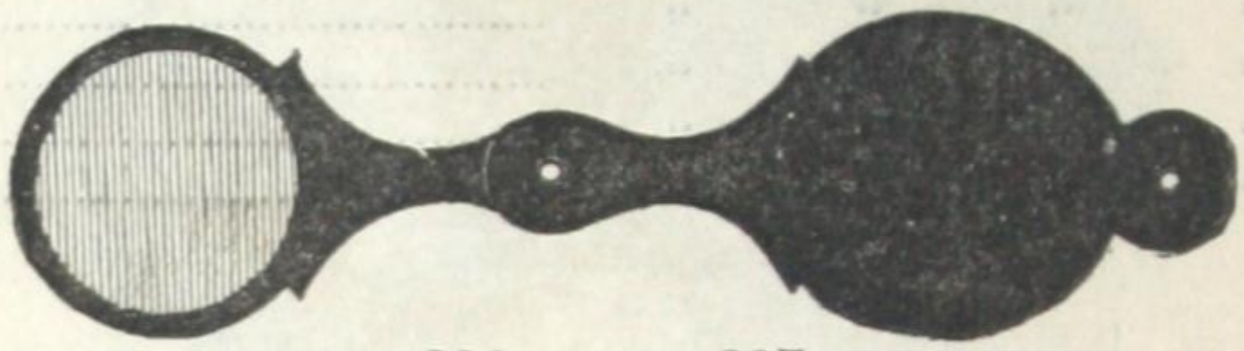
218

218.	Pocket Magnifying Glass, 2 Lens in cover	1 50
224.	" " " 1 " "	75
225.	" " " 2 " "	1 00
226.	" " " 3 " "	1 25
227.	" " " 1 " " mounted in German Silver	1 00
228.	" " " 2 " " " " "	1 50
229.	" " " 1 " " 1¼ inch diameter, mounted in German Silver	1 75

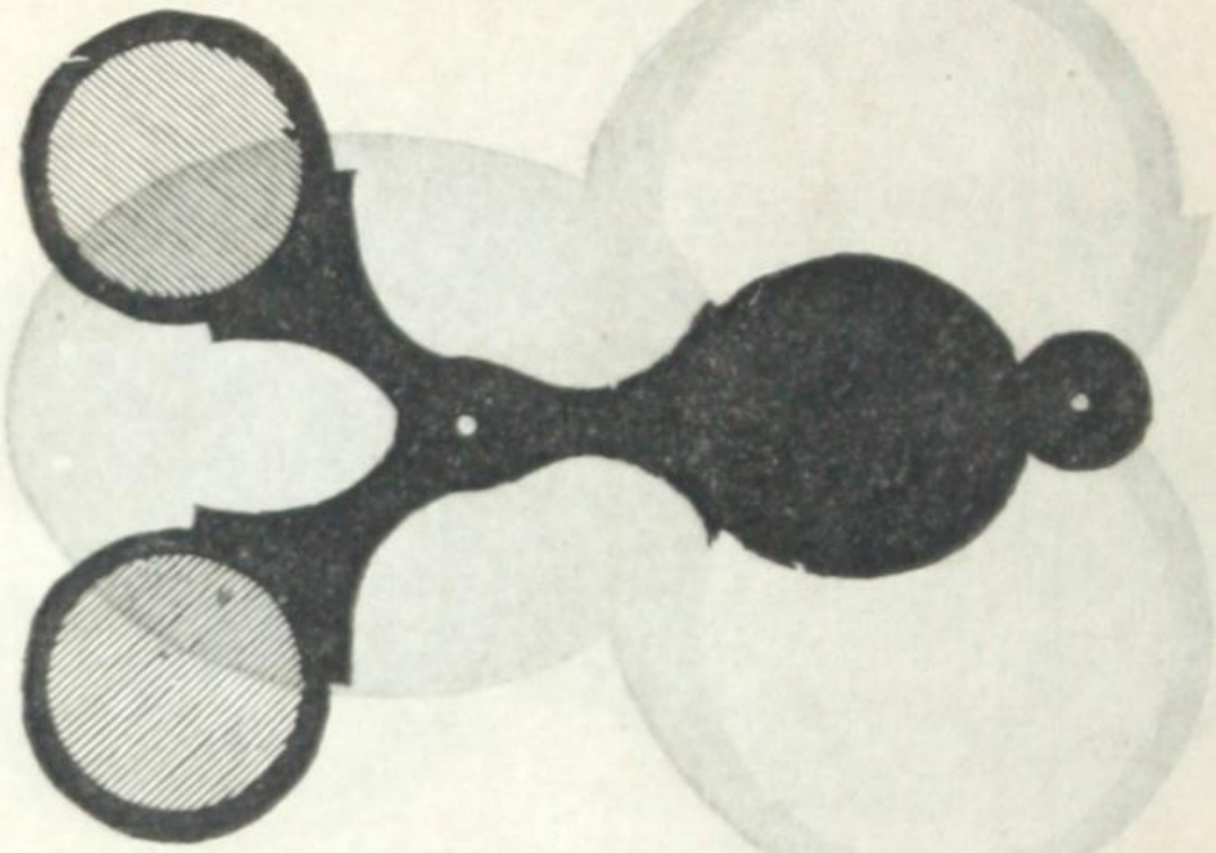
230

230.	Two Magnifying Glasses, of different power	1 50
231.	Same as 230, but larger, and not so high power, but greater field	2 00

Pocket Magnifying Glasses.



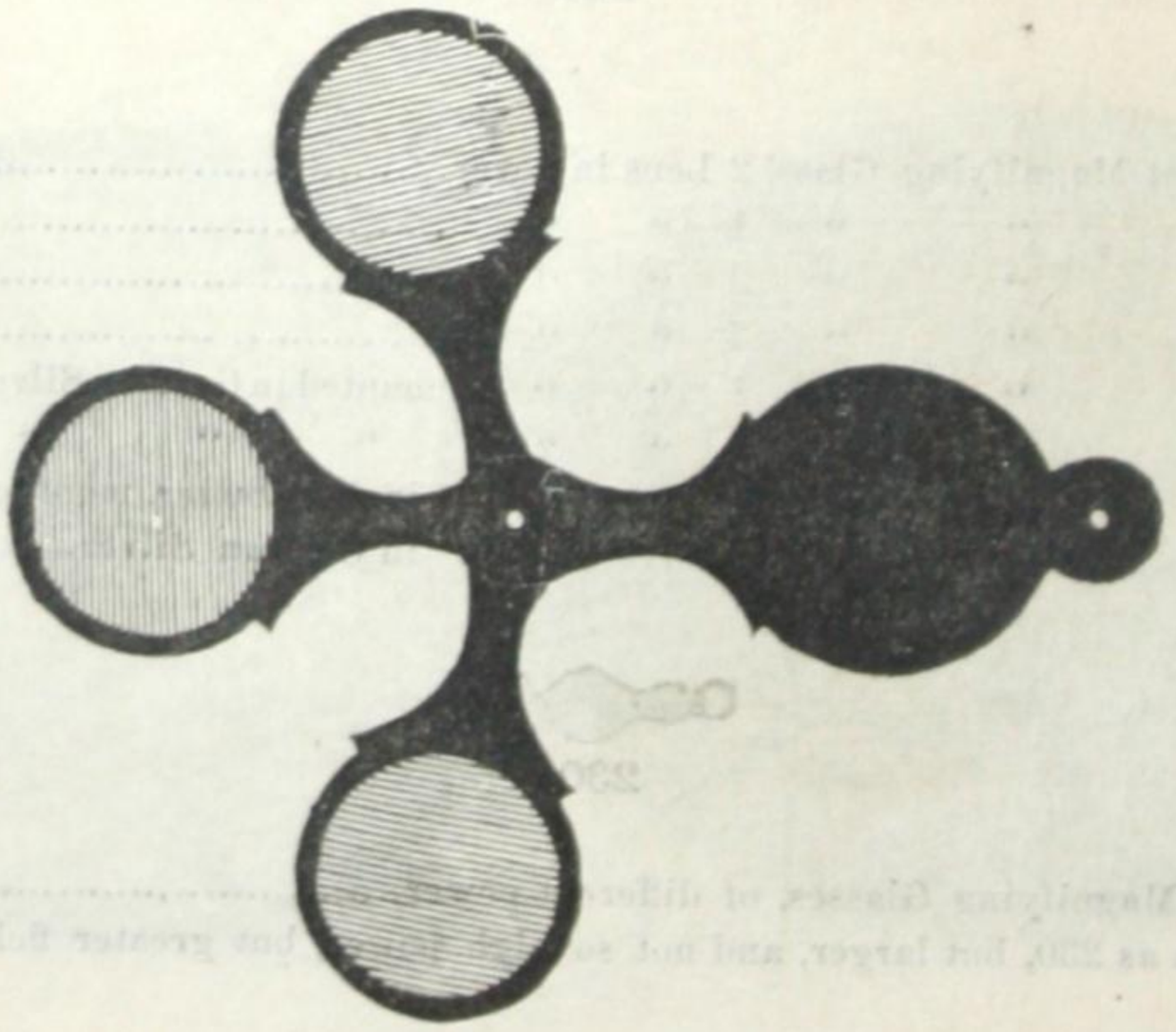
224



225

227

228



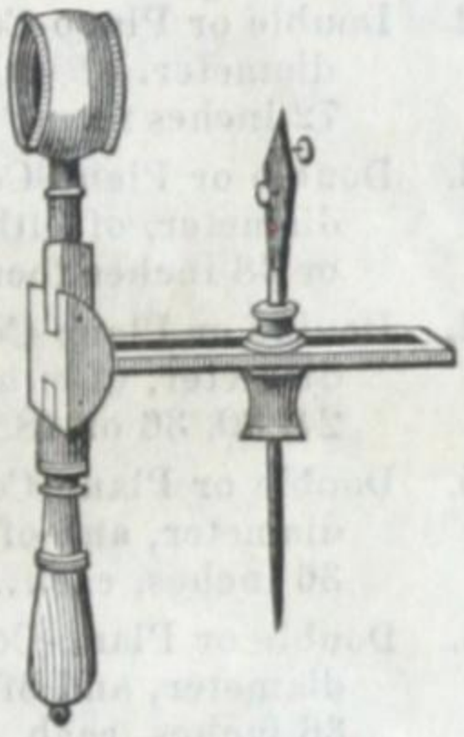
226

242

243

244

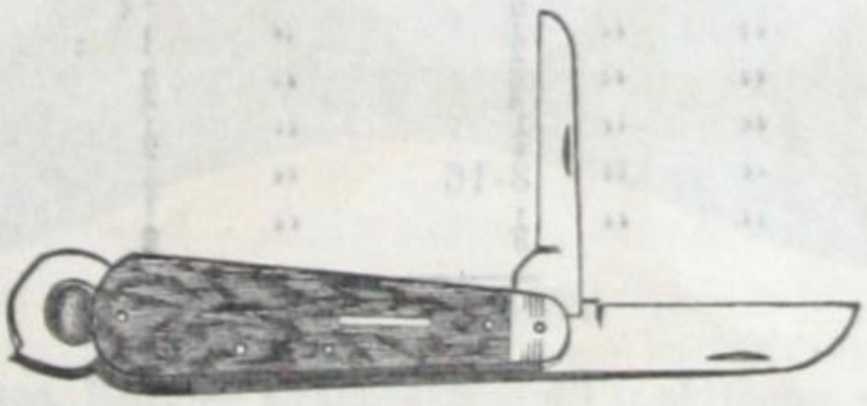
245



248

249

No.		Price.
242.	Linen Prover, vulcanite, ¼ sq., or ¼ and ½	50
243.	" " " one inch square	1 50
244.	Seed Microscopes, on 3 feet	1 00
245.	Stanhope Lens, in frame	1 50
246.	Coddington Lens, " "	2 00
247.	" silver frame, with cover—a very good article for Physicians	4 50
248.	Insect or Flower Pocket Microscope—folds into a case	2 25
249.	Charm Magnifying Glass	50
250.	Pocket Knife, with two Blades, and Magnifying Glass,	1 50



250

Lenses.

298.

No. 298. Demonstration Lenses—a set of six, showing Double-Convex, Double-Concave, Plano-Convex, Plano-Concave, Meniscus or Periscopic, Concavo-Convexo, per set..... $2 50

No. 301. Set of Lenses for Physicians, consisting of 12 Convex, 6 Concave, 6 Cataract, 2 Green, 2 Blue and 2 Smoke, in a morocco box..... 15 00

302. The same, with frame to hold the glasses for trial..... 20 00

305. Apparatus to illustrate the use of spectacles..... 5 00

305.

312. Double or Plano-Convex Lens, 6 inches diameter, of either 24, 30, 36, 48 or 72 inches focus, each.....3 00 to 4 00

313. Double or Plano-Convex Lens, 5 inches diameter, of either 18, 20, 24, 30, 36 or 48 inches focus, each.....2 50 to 3 50

314. Double or Plano-Convex Lens, 4 inches diameter, of either 12, 14, 16, 18, 20, 24, 30, 36 or 48 inches focus, each..1 50 to 2 50

315. Double or Plano-Convex Lens, 3 inches diameter, and of any focus from 12 to 36 inches, each.....1 00 to 1 75

316. Double or Plano-Convex Lens, 2 inches diameter, and of any focus from 6 to 36 inches, each..... 75

317. Double or Plano-Convex Lens, 1¼ inches diameter, and of any focus from 5 to 48 inches, each..... 50

Prisms.

321. Solid Glass Prisms, 5 inch..... 1 00

322. " " " 6 inch..... 1 75

350. Double or Plano-Convex Lens, 1 inch diameter, 2 inches focus..... 75

351. " " " " ¾ " 1½ " 75

352. " " " " ⅝ " 1¼ " 75

353. " " " " ½ " 1 " 75

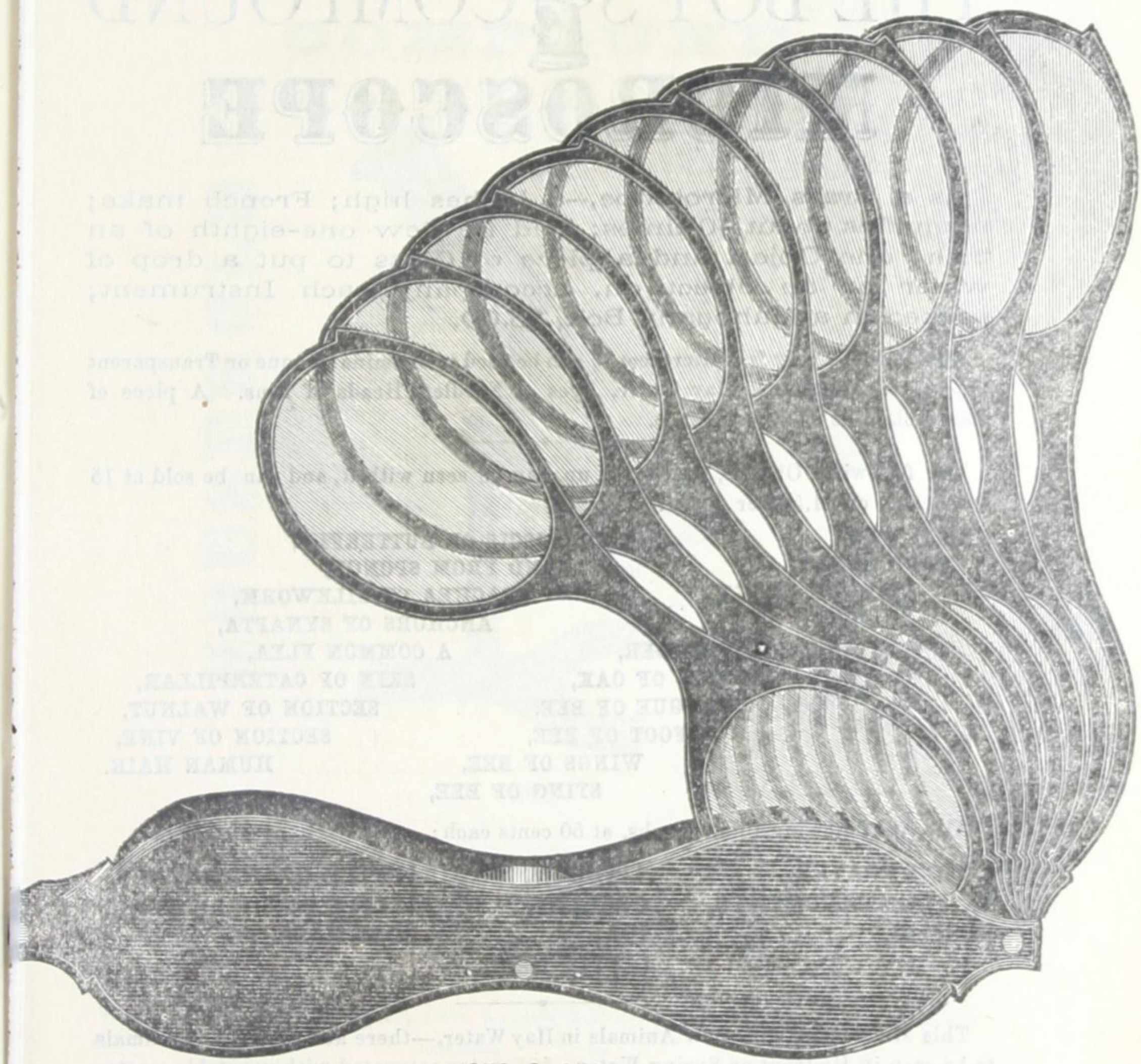
354. " " " " ⅜ " ¾ " 75

355. " " " " ¼ " ½ " 75

356. " " " " 3-16 " ¼ " 75

857. " " " " ⅛ " ⅛ " 75

Trial Glasses.



358 & 359.

No.		Price.
358.	Trial Glasses, Rubber Frames, 5 to 48 inch focus, convex.....	12 00
359.	Trial Glasses, Rubber Frames, 5 to 48 inch focus, concave, French Numbers. No. 12 to No. 1 English Numbers.....	13 00

No. 360.

THE BOY'S COMPOUND MICROSCOPE

Is a Brass Microscope,—6 Inches high; French make; magnifies about 40 times; field in view one-eighth of an inch; one Object and a piece of Glass to put a drop of water or an object on, accompany each Instrument; packed in a Mahogany Box, $3.00.

☞ This is a very fair Microscope; can be used to examine Opaque or Transparent Objects, Animalculæ in Hay Water, Eyes of Needles, Heads of Pins. A piece of Lace looks like a Garden Fence.

The following Objects, neatly put up, can be seen with it, and can be sold at 15 cents each, or $1.50 per dozen:

EYE OF FLY,
FOOT OF FLY,
TONGUE OF FLY,
WING OF FLY,
FOOT OF SPIDER,
SECTION OF OAK,
TONGUE OF BEE,
FOOT OF BEE,
WINGS OF BEE,
STING OF BEE,
PROBOSCIS OF BUTTERFLY,
SAND FROM SPONGE,
TRACHEA OF SILKWORM,
ANCHORS OF SYNAPTA,
A COMMON FLEA,
SKIN OF CATERPILLAR,
SECTION OF WALNUT,
SECTION OF VINE,
HUMAN HAIR.

Also, the following Photographs, at 50 cents each:

LORD'S PRAYER,
TEN COMMANDMENTS,
ROSELLI,
LINCOLN,
GREELEY,
IDA,
LITTLE NELL.
LITTLE GRANDMOTHER,
LITTLE WASHERWOMAN,
ROSE MASSEY

This Microscope will show Animals in Hay Water,—there are seldom any animals to be seen in Hydrant or Spring Water—but water saturated with vegetable matter will have an immense number of animals in a drop the size of a pin's head;—say put a handful of Hay into a Tumbler of Water, and let it stand about a week,—a drop will then contain a great number of animals. Hay, Clover, Weeds, produce different Animals.

☞ I have for sale an Illustrated Book of Microscopic Objects, price 50 cents, that would be very useful with this Microscope.

T. H. McALLISTER'S

COMPOUND

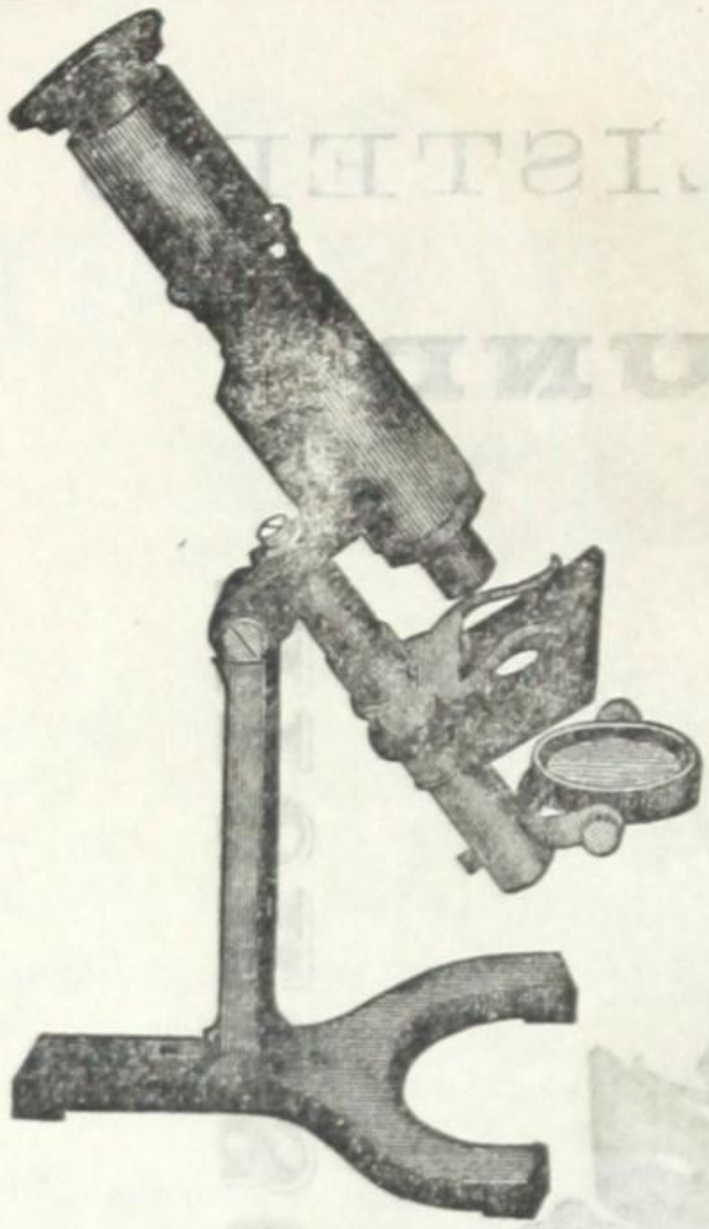
361.

☞This Microscope moves on a joint, so that it can be inclined at an angle, and it has a draw tube, by the use of which the power of the Object Glass can be increased about fifty per cent. Two Object Glasses, of different powers, go with it.

With the low-power Lens and the tube closed,	the power is	25	times,	and the field in view	$\frac{17}{100}$	of an inch.
" " " extended,	"	35	"	"	$\frac{10}{100}$	"
high-power " " closed,	"	66	"	"	$\frac{8}{100}$	"
" " " extended,	"	100	"	"	$\frac{4}{100}$	"

PRICE, $5.00.

One Object only, goes with each Microscope; but I can furnish French Objects at 15 cents each, or $1.50 per dozen.



362.

T. H. McALLISTER'S

ACHROMATIC

Household Microscope.

This is an excellent article—the Lenses are French, the field good and clear. It will show Blood Globules—the stand is on joint to incline at an angle, and the body or Tube consists of two Tubes, one within the other. By extending or drawing out the inner Tube, the power will be increased about fifty per cent. The Object Glass consists of a set of three Lenses, which can be used separately or combined, with the following effect:

ONE LENS,	**Tube closed,—Power**	**50,—Field**	**1-9th**	**of an inch.**
" "	**Tube extended,—** "	**75,—** "	**1-16th**	"
TWO LENSES,	**Tube closed,—** "	**110,—** "	**1-20th**	"
" "	**Tube extended,—** "	**175,—** "	**1-33d**	"
THREE LENSES,	**Tube closed,—** "	**160,—** "	**1-30th**	"
" "	**Tube extended,—** "	**250,—** "	**1-45th**	"

One Object and one piece of plain Glass goes with each Instrument.

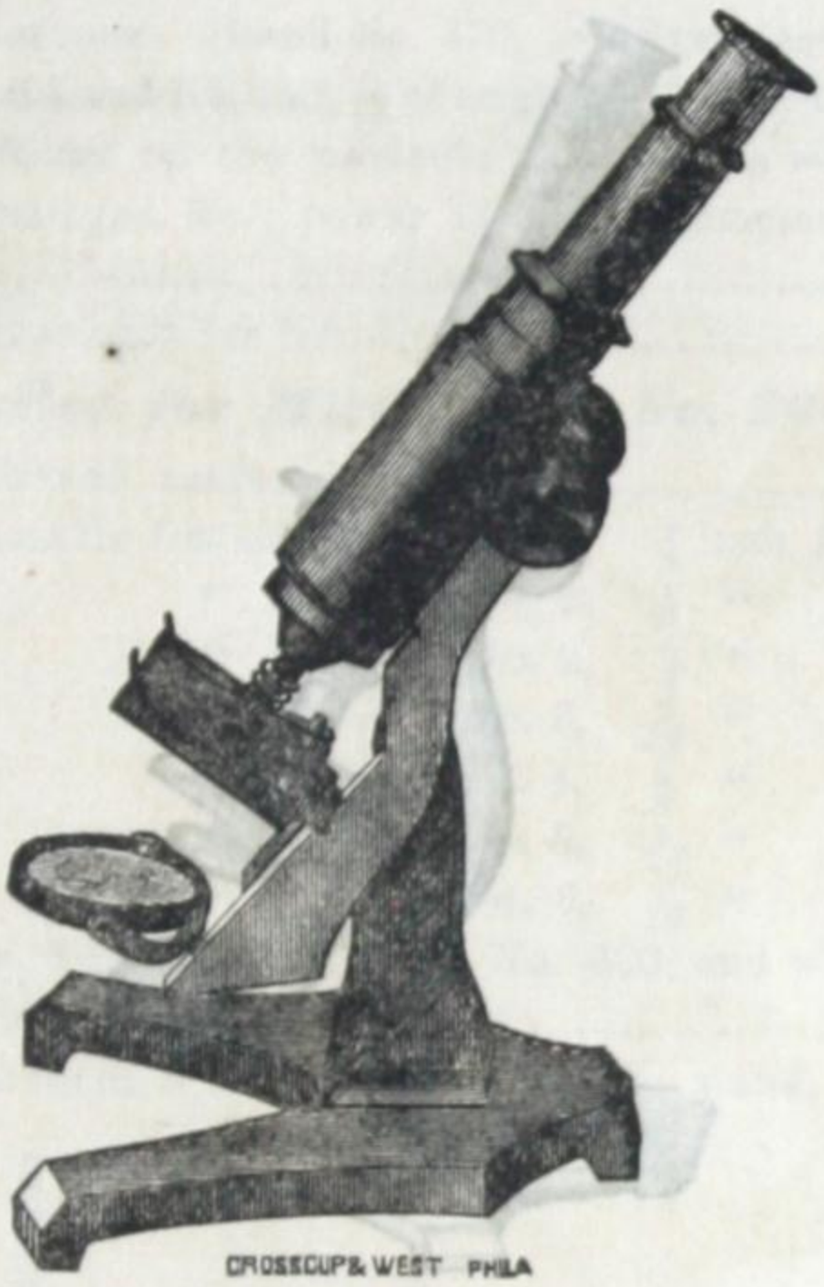
Packed in a Wooden Box, - - - - $10.00.

I can furnish the following Objects of French make at 15 cents each, or $1.50 per dozen, all of which can be well seen with this Instrument:

Eye of Fly.	Trachæ of Silk Worm.	Blood of Man.
Foot of Fly.	A Common Flea.	Blood of Rabbit.
Tongue of Fly.	Tongue of Bee.	Blood of Frog.
Wing of Fly.	Foot of Bee.	Blood of Chicken.
Skin of Spider.	Wing of Bee.	Spermatozoa of Sheep.
Foot of Spider.	Sting of Bee.	Spermatozoa of Man.
Guano.	Spicules of Sponge.	Hair of Man.
Skin of Caterpillar.	Anchors of Synapta.	Hair of Bat.
Proboscis of Butterfly.	Sections of Wood.	Hair of Rabbit.

Also, the following Photographs at 50 cents each, or $5.00 per dozen:

LORD'S PRAYER, TEN COMMANDMENTS, DECLARATION OF INDEPENDENCE, LINCOLN, GREELEY, LITTLE GRANDMOTHER, LITTLE WASHERWOMAN, LITTLE NELL, IDA, ROSE MASSEY, ROSELLI.

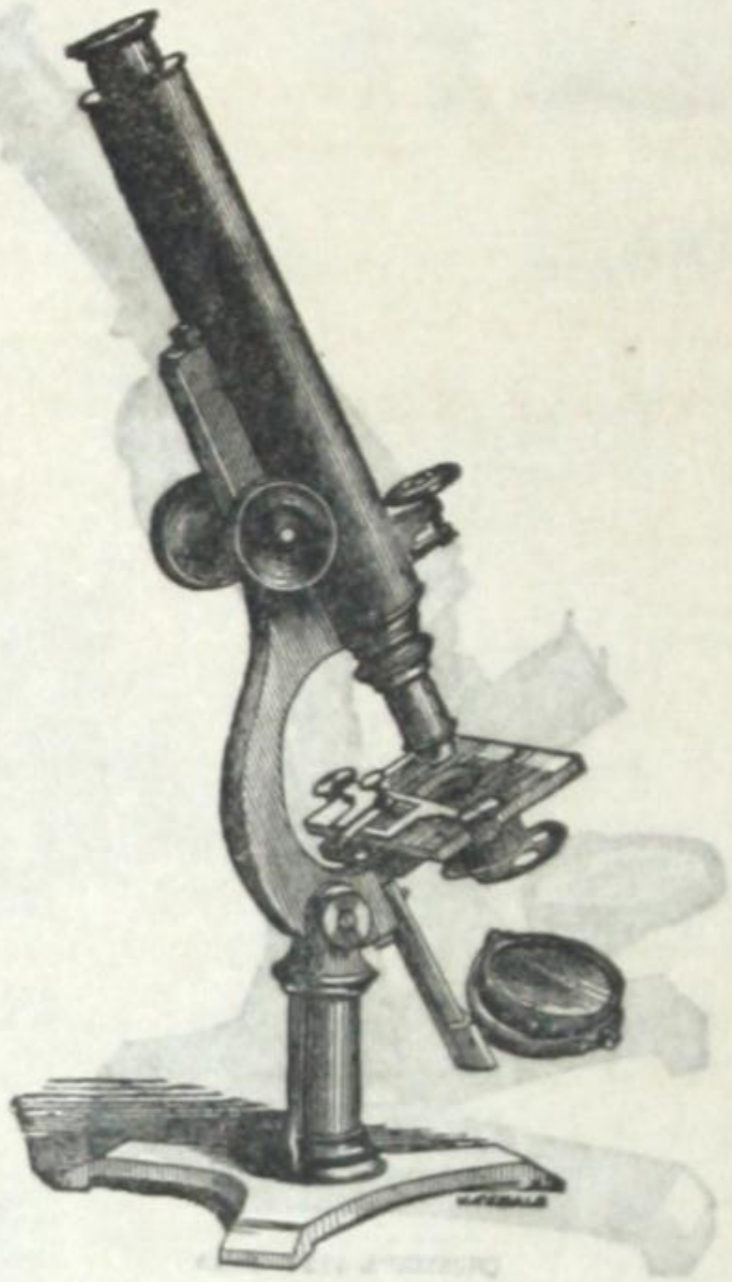


364.

No 364. A STUDENT MICROSCOPE. Has a set of three Achromatic Object Glasses, magnifying 33, 66 and 100 diameters—brass body, with rack adjustment for focus. Iron stand, 10 inches high, with joint; wood box.....$18 00

365.

No. 365. A STUDENT MICROSCOPE. 13 inches high, brass body on iron stand, with joint to incline. Fine adjustment for focus, movable stage, has a set of three Achromatic Lenses, giving power of 100, 200 and 300 diameters; walnut box.....$30 00



No. 370. Stand only; one Eye Piece, but no Object Glasses; iron bronzed stand, 14 inches high, similar to engraving; brass body, with quick and slow motion; on joint to incline at any angle; movable glass stage; will suit either the French or English Lenses.....$30 00

No. 371. STUDENT MICROSCOPE. Stand No. 370, Achromatic Object Glasses, No. 404—one eye-piece giving power of 75, 150 and 250 diameter. With Polished wood Case..... $33 00

No. 372. STUDENT MICROSCOPE. Stand No. 370, Achromatic Object Glasses, No. 401 and 404. One eye-piece giving power of 33, 50, 75, 112, 175 and 250 diameters as follows:

		Power.	Diameter.
No. 3 Object Glass.....Tube closed.....field...		$\frac{19}{1000}$	175,
" " ..... " extended, " ...		$\frac{15}{1000}$	250,
" 1 " ..... " closed..... " ...		$\frac{54}{1000}$	75,
" " ..... " extended, " ...		$\frac{39}{1000}$	112,
" " with one lens removed, Tube closed.....	" ...	$\frac{87}{1000}$	33,
" " with one lens removed, Tube extended.....	" ...	$\frac{65}{1000}$	50,

With Polished wood case..... 36 00

No. 373. STUDENT MICROSCOPE. Stand No. 370, one Eye-piece and Object Glasses No. 401 and No. 442, ($\frac{1}{5}$ of angle of 90), capable of showing the markings on the navicula angulata as well as Blood discs, Spermatozoa, &c.; power 33 to 250 diameter. Polished wood case..... $45 00

No. 374. POLARIZING APPARATUS for No. 370..... 25 00

Apparatus suited for Microscopes, No. 360 to 373.

No. 400. EYE-PIECES—French make..... 3 00

No. 401. FRENCH ACHROMATIC OBJECT GLASS, No. 0, $\frac{3}{4}$ inch focus..... 5 00

No. 402. " " " " No. 1, $\frac{1}{2}$ " " 5 00

No. 403. " " " " No. 2, $\frac{1}{4}$ " " 5 50

No. 404. " " " " No. 3, $\frac{3}{16}$ " " 6 00

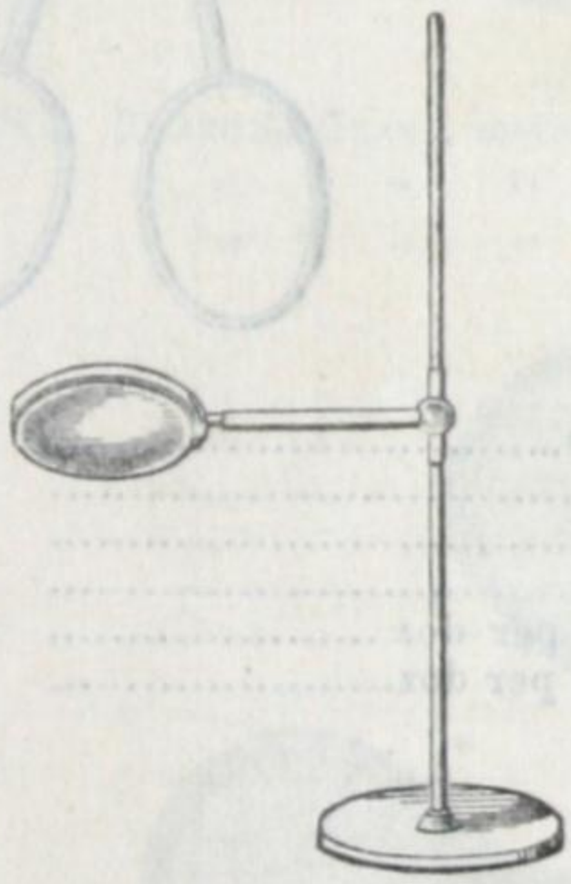
No. 405. " " " " No. 4, $\frac{1}{8}$ " " 7 00

No. 406. " " " " No. 5, $\frac{1}{10}$ " " 8 00

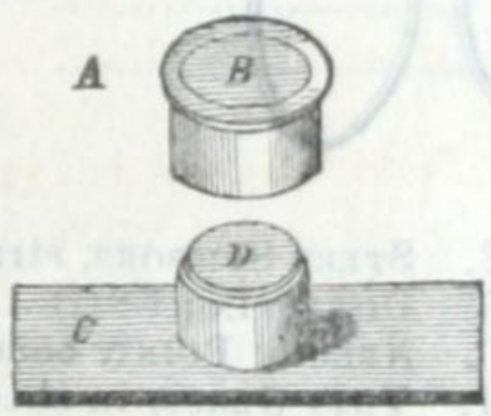
No. 407. " " " " No. 6, $\frac{1}{16}$ " " 12 00

No. 408. TUBE OF BRASS, 8 inches long, to fit No. 400, and with screw at the other end to fit 404..... 3 50

408, 400 and 404 will make a Microscope except the stand.



410.



411.

No. 410. CONDENSING LENS, $1\frac{1}{2}$ inch diameter, on iron stand, for illuminating opaque objects. This is a double Convex Lens, and will answer also for a dissecting Microscope..... 2 50

No. 411. ANIMALCULE CAGE, to hold a drop of water or a live animal, small, 1 00

" " large, with thin glass..... 2 50

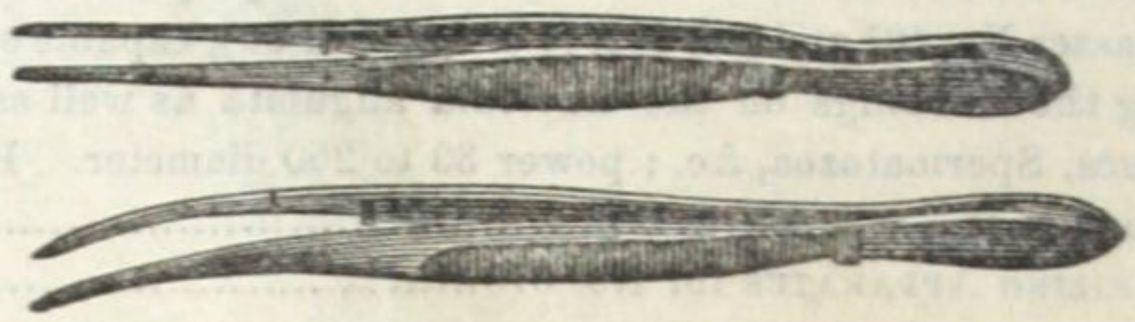
No. 412. GLASS ZOOPHYTE TROUGH, to hold a Lizard or Tad-Pole, to show circulation of the Blood..... 4 00

No. 413. GLASS SLIP, 3 by 1 inch, with concave center to hold a drop of water..... 25

No. 414. STAGE MICROMETER, $\frac{1}{100}$ and $\frac{1}{1000}$..... 2 00

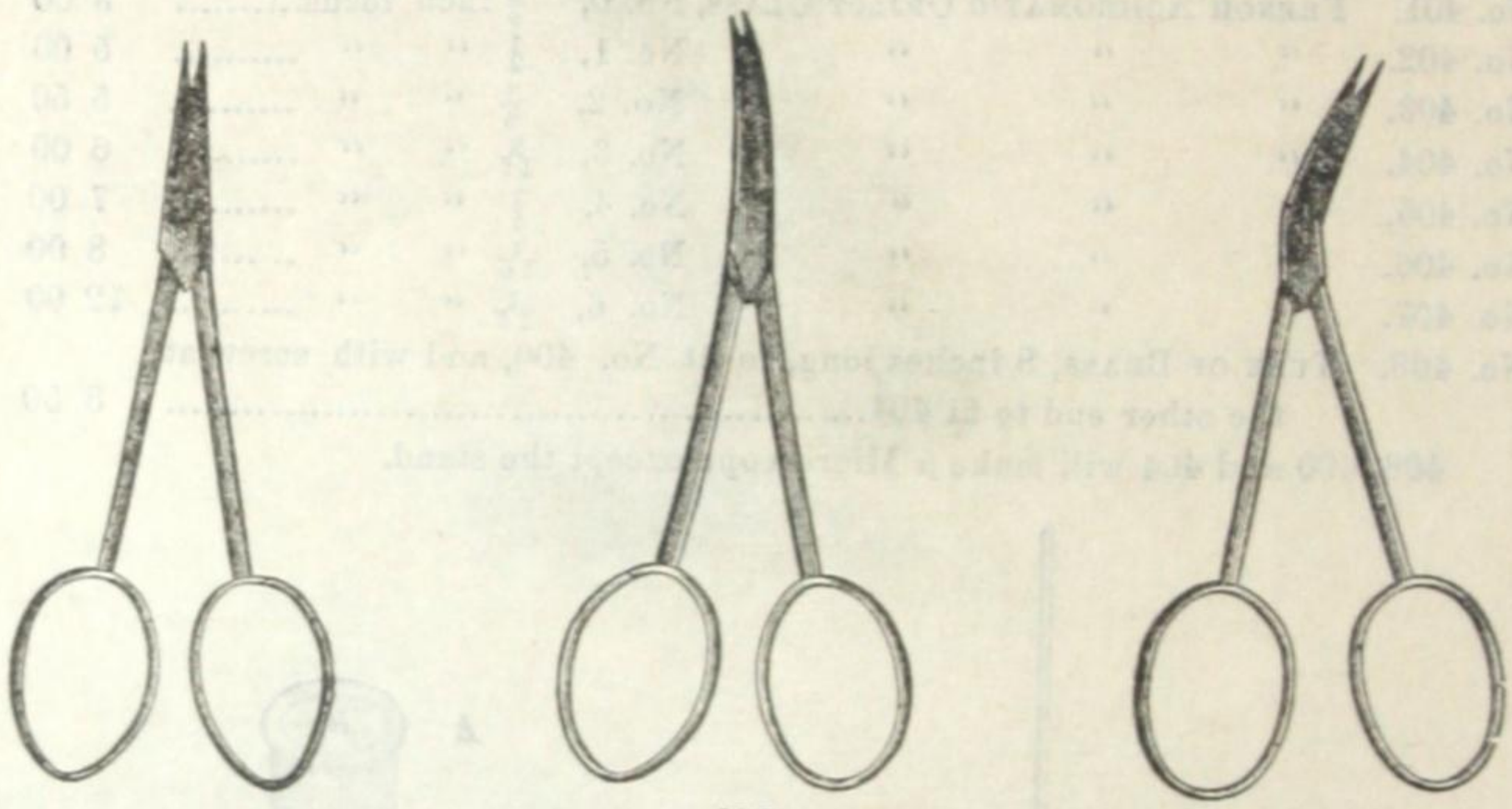
No. 415. MALTWOOD FINDER..... 4 00

No. 416. SELENITE PLATE, to be used with No. 374..... 1 50



417.

No. 417. STEEL FORCEPS, straight or curved..... 1 25



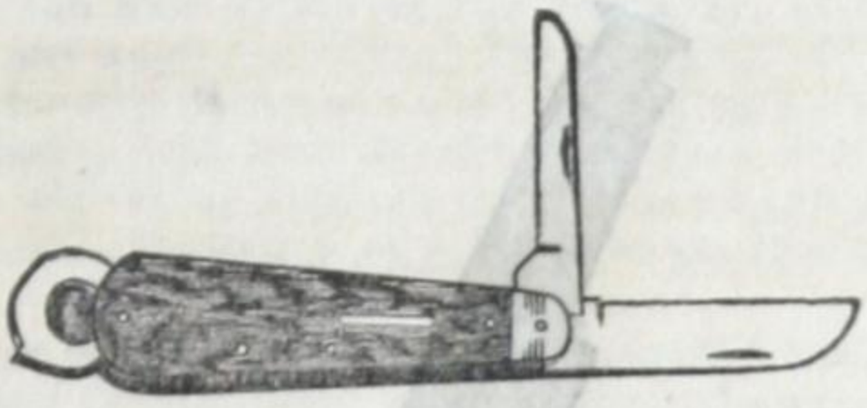
418.

No. 418. STEEL SCISSORS, straight or curved points..... 1 50
No. 419. DISSECTING KNIFE..... 75
No. 420. NEEDLE POINT, bone handle..... 15
No. 421. THIN GLASS, in sheets, per ounce..... 1 50
No. 422. THIN GLASS CIRCLES, ⅝ inch in diameter, per doz..... 24
No. 423. GLASS SLIPS, 3 by 1 inch, ground edges, per doz..... 48

424.

No. 424. TURN TABLE, used in making cells and in blacking thin glass circle..... 4 50
No. 425. ORDINARY GUM LABELS—blank—on which to write the name of the object, per box..... 30
No. 426. CANADA BALSAM, per 1 oz. Bottle..... 25
No. 427. ASPHALTUM, per 1 oz. Bottle..... 25

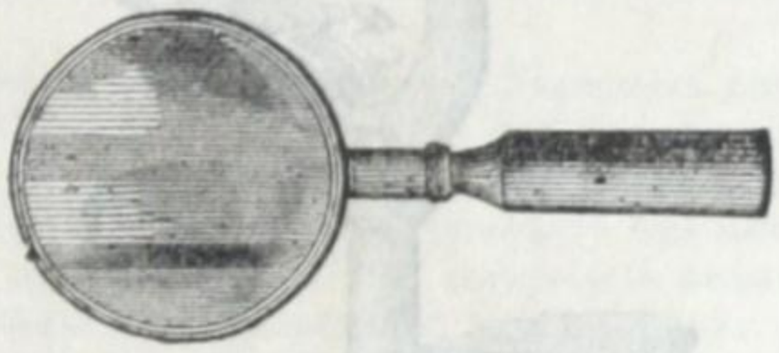
The mo-t of objects can be sufficiently well mounted with No. 422, 423, 424, 425, 426 and 427.



428.

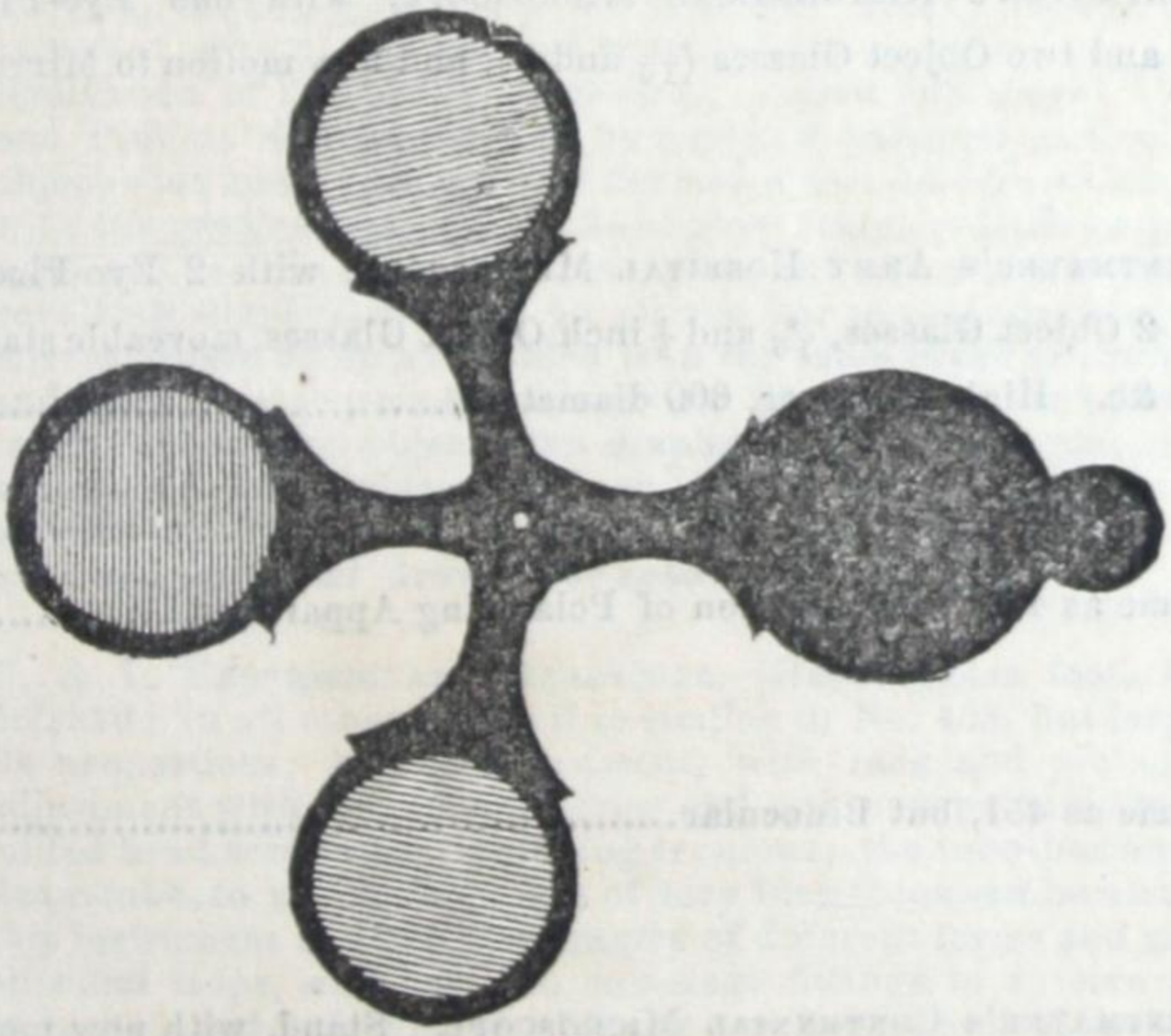
No. 428. BOTANICAL POCKET KNIFE, with two Blades and Magnifying Glass 1 50

No. 429. DISSECTING MICROSCOPE (see No. 410).



430.

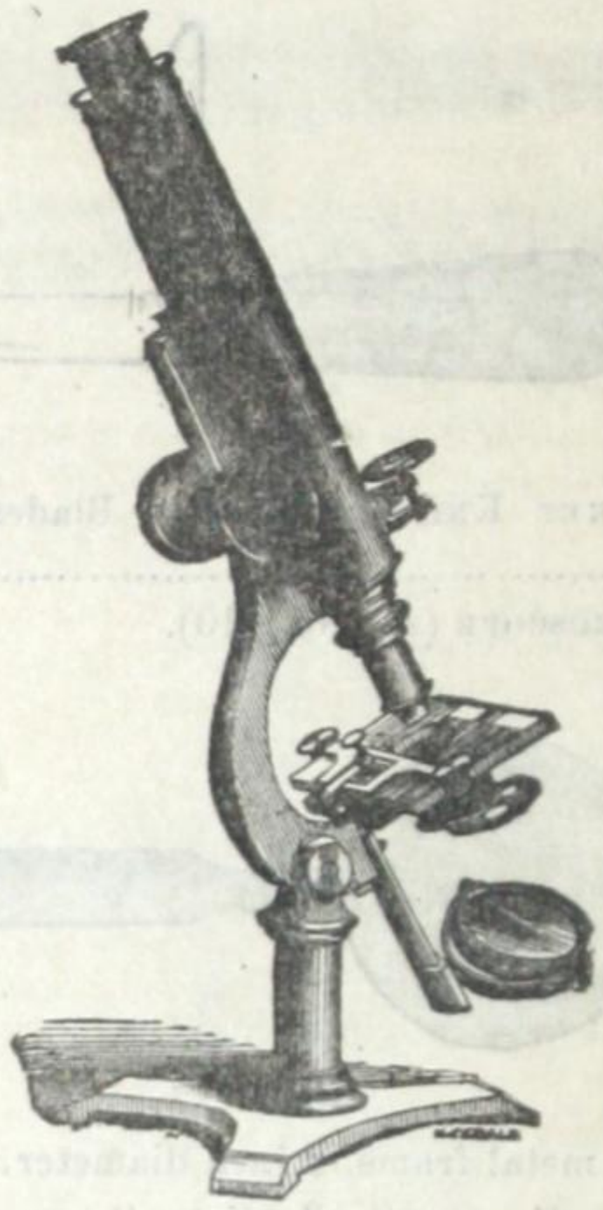
No. 430. READING GLASS, metal frame, 2 inch diameter 1 00
" " " " 3 " " 2 00
" " " " 4 " " 3 00



431.

No. 431. POCKET MAGNIFYING GLASS, 3 lens, each of different power; a higher power produced by using all three. Size of engraving, $1.25, larger size 1 75

No. 432. STANHOPE AND CODDINGTON LENSES ..... $1 50 to 5 00



451.

No. 450. ZENTMAYER'S HISTOLOGICAL MICROSCOPE, with one Eye-Piece and two Object Glasses ($\frac{8}{10}$ and $\frac{1}{5}$), and new motion to Mirror..$ 50 00

No. 451. ZENTMAYER'S ARMY HOSPITAL MICROSCOPE, with 2 Eye-Pieces, 2 Object Glasses, $\frac{8}{10}$ and $\frac{1}{5}$ inch Object Glasses, moveable stage, &c. Highest power, 600 diameters..... 135 00

No. 452. Same as 451, with addition of Polarizing Apparatus..... 160 00

No. 453. Same as 451, but Binocular..... 185 00

No. 454. ZENTMAYER'S CENTENNIAL MICROSCOPE. Stand, with new movement to Mirror. Stand only, with 3 Eye-Pieces but no Object Glasses..... 250 00

These are all very complete instruments.

No. 455—B. & L. FAMILY MICROSCOPE. Japanned cast iron foot and pillars, supporting the axis which carries the body, so that it may be inclined to any angle; revolving diaphragm below the stage; rack and pinion for adjustment of focus; the sliding part nickel-plated; concave mirror, adjustable for oblique light; one eye-piece, one achromatic objective, dividing so as to give two powers, 50 and 100 diameters. In walnut case with handle, lock and key.....$ 20 00

No. 456—B. & L. EDUCATIONAL MICROSCOPE. Japanned cast iron foot, with finely finished brass pillars, which support the axis, thus allowing the body to be inclined to any angle; coarse adjustment by rack and pinion; the sliding part of the tube being nickel-plated; fine adjustment by micrometer screw acting on secondary stage; the sliding part of the tube is nickel-plated; revolving diaphragm below the stage; concave mirror arranged for oblique light; one eye-piece (B); 2 inch and ½ inch objectives, magnifying 35 and 140 diameters. In walnut case, with handle, lock and key..... 30 00

No. 457—B. & L. STUDENT'S MICROSCOPE. Japanned cast iron foot, with finely finished brass pillars, which support the axis, thus allowing the body to be inclined to any angle; brass arm; coarse adjustment by sliding tube; fine adjustment by our new patent frictionless motion, acknowledged by competent authorities to be the simplest and best arrangement for this purpose; plain and concave mirrors, arranged so that their distance from the object may be varied; also adjustable for oblique light; revolving diaphragm under the stage; A and C eye-pieces; ¾ inch and ⅕ inch objectives; magnifying from 50 to 350 diameters. In walnut case, with handle, lock and key, and drawer for accessories..... 50 00

No. 458—B. & L. LARGE STUDENT'S MICROSCOPE. Heavy Japanned cast-iron foot, with highly finished brass pillars, carrying the axis for inclination of the body; brass arm; coarse adjustment by Rack and Pinion; fine adjustment by our new patented motion. The object-slide rests upon a newly devised object-holder, which moves with the greatest ease upon a fixed glass stage, and allows a movement of 1 inch in each direction; plain and concave mirrors, with revolving diaphragm hung on mirror bar so that diaphragm and mirror rotate on an axis which is in the same plane as the object, and at the same time the mirror can be moved on the mirror-bar to and from the object; the diaphragm may be replaced by a sub-stage; 3 eye-pieces: 2 inch, ¾ inch and ⅕ inch objectives, magnifying 20 to 350 diameters. In walnut case, with handle, lock and key, and drawer for accessories..... 85 00

No. 459—B. & L. PROFESSIONAL MICROSCOPE. Heavy brass foot, highly finished; in all other points it is similar to No. 458, but larger in its proportions; coarse adjustment, with rack and pinion; fine adjustment with micrometer screw and our new patented motion; milled head screws for tightening trunions; the tube has an inner draw-tube, to which objectives of very long focus can be attached; this instrument has two diaphragms of different forms and sizes of slits and stops, and has also sub-stage fittings to receive polarizer, etc., and is furnished with our new hemispherical immersion condenser of 1½ inch aperture, which gives no color, and has no spherical aberration; *three of our new periscopic eyepieces, giving a very large and flat field;* 2 inch, ¾ inch, ⅕ inch, and ⅛ inch (the latter immersion) objectives..... 100 00

No. 461.	ZENTMAYER'S OBJECT GLASSES, 3, 4 and 5 inch combined	15 00
	$1\frac{1}{2}$ inch, angle of aperture, 23	17 00
	$\frac{8}{10}$ " " " " 32	18 00
	$\frac{1}{5}$ " " " " 85	20 00
	$\frac{1}{5}$ " " " " 120, with adjustment for thickness of cover	40 00
No. 462.	W. WALES' LENSES, 3 inch angle of aperture, 12	15 00
	" " $1\frac{1}{2}$ " " " " 23	17 00
	" " $\frac{2}{5}$ " " " " 30	20 00
	" " $\frac{1}{5}$ " " " " 90	22 00
	" " $\frac{1}{5}$ " " " " 135, with adjustment for thickness	40 00
	$\frac{1}{10}$ inch—Immersion—angle 160	50 00
No. 463.	CONDENSING LENSES, on stand $5, $6 and	10 00
No. 464.	EYE-PIECES $5 and	6 00
No. 465.	POLARIZING APPARATUS, for No. 450	22 00
	" " " " 451	25 00
	" " " " 455	35 00
No. 466.	BICKNELL'S ACHROMATIC CONDENSER	25 00
No. 467.	ACHROMATIC CONDENSER, with centering adjustment, Achromatic combination, $\frac{1}{2}$ and $\frac{1}{5}$ inch	38 00
No. 468.	ACHROMATIC OBLIQUE PRISM	15 00
No. 469.	WENHAM'S PARABOLA	14 00
No. 470.	SPOT LENS	5 00
No. 471.	SELENITES, each	1 50
No. 472.	PARABOLIC SILVER-SIDE REFLECTOR	9 00
No. 473.	DARK WELL and set of 3 holders	5 50
No. 474.	STAGE FORCEPS	4 00
No. 475.	DOUBLE NOSE PIECE, straight	12 00
	" " " angular	15 00
No. 476.	STAGE MINERAL HOLDER	10 00
No. 477.	CAMERA LUCIDA	8 00
No. 478.	STAGE MICROMETER, 100 and 1000 to the inch	2 00
	" 100, 1000 and 2000 to the inch	2 50
No. 479.	WENHAM'S COMPRESSORIUM	3 50
No. 480.	MALTWOOD FINDER	4 00
No. 481.	ANIMALCULE CAGE, large	4 00
	" " small	3 50
No. 482.	BLUE GLASS CAP	1 50
No. 483.	ERECTOR	7 00
No. 484.	CONCAVE AMPLIFYING GLASS	8 00
No. 485.	FROG-PLATE, complete	5 00

No. 486.	LIEBERKUHNS, to 3, 2 and 1½ inch objectives, each					6 00
	"	to $\frac{8}{10}$	"	"	"	4 50
	"	to $\frac{4}{10}$ and ¼	"	"	"	4 00
No. 487.	SECTION CUTTER					12 00
No. 488.	CANADA BALSAM,	2 ounce Bottle				50
No. 489.	GOLD SIZE,	1 "	"			25
No. 490.	ASPHALTUM,	2 "	"			25
No. 491.	MARINE GLUE,	2 "	"			60
No. 492.	WHITE ZINC CEMENT,	1 "	"			50
No. 493.	DAMAR,	1 "	"			50
No. 494.	GLYCERINE JELLY,	2 "	"			50
No. 495.	BELL'S CEMENT,	1 "	"			75

MICROSCOPIC OBJECTS.

Sections of Teeth, human	50
" of human bones	50
Globules of Human blood	50
" of blood of Chicken	50
" " " Frog	50
" " " Rabbit	50
" " " Fish	50
Spermatozoa, Human	50
" of Rat	50
" of Sheep	50
" of Horse	50
Human Hair	50
Hair of Bat	50
" Rat	50
" Rabbit	50
" Mouse	50
Section of Coal	50

POLARIZING OBJECTS.

Salicine	50
Citric Acid	50
Scales of Eel	50
Tous les Mois Starch	50
Oxalurate of Ammonia	50
Raw Silk	50
Raw Cotton	50
Section of Agate	50
Section of Granite	50
Sulphate of Copper	50
Palate of Snail	50
Camphoric Acid	50
Oxalic Acid	50
Urea	50
Chlorate of Potash	50
Sulphur	50
Borax	50
Hair of Eleagnus	50
Tartaric Acid	50
Prussiate of Potash	50

INFUSORIA.

Barbadoes Earth	50
Guano	50
Arachnodiscus	50
Triceratium	50
Haliopelta	50
Deep Sea Soundings	50
Isthmia Enervis	50
Diatomes, from the shoal at Cherbourg	50
Gramatophera Serpentina	50

VARIOUS.

Spicules of Sponge	50
Anchors of Synapta	50

PARTS OF INSECTS.

Mouth of Fly	50
Eye of "	50
Foot of "	50
Wing of "	50
Antennæ of Fly	50
Tongue of Bee	50
Foot of "	50
Wing of "	50
Sting of "	50
Proboscis of Butterfly	50

Trachea of Silkworm	50
A Flea	50
Foot of Spider	50
Skin of "	50
Skin of Caterpillar	50
Young Silkworm	50
Skin of the Larva of a Beetle	50
Whole Insects, beautifully put up	1 00

PHOTOGRAPHS.

Lord's Prayer	50
Ten Commandments	50
Declaration of Independence	50
Abraham Lincoln	50
Horace Greeley	50
Little Grandmother	50
Little Washerwoman	50
Little Nell	50
Roselli	50
Rose Massey	50
Ida	50

NAVICULA.

Attenuata	50
Angulata	50
Formosa	50

SECTIONS OF WOOD.

Walnut	50
Oak	50
Vine	50
Birch	50
Mahogany	50
Ebony	50
A Weed	50
Poplar	50

VEGETABLE.

Petal of Geranium	50
Marine Algia	50
Seeds of Fern	50

OPAQUE.

Wing of Butterfly	
Diamond Beetle	
Finely colored or curious wings of Beetle	

TO PRESERVE OBJECTS FOR MICROSCOPIC EXAMINATION.

A few words about preparing objects, may be of use to young persons not previously informed on the subject:

Place the object you wish to preserve on a glass slip, and on the object put a drop of Canada Balsam, then warm the glass slightly so as to make the Balsam more fluid, and touch with a hot needle any air bubble that may rise to the surface, then put on top a thin glass circle and put a slight weight on it so as to press the object slightly, and set it away for a few days until the Balsam hardens. The object thus preserved will keep for years.

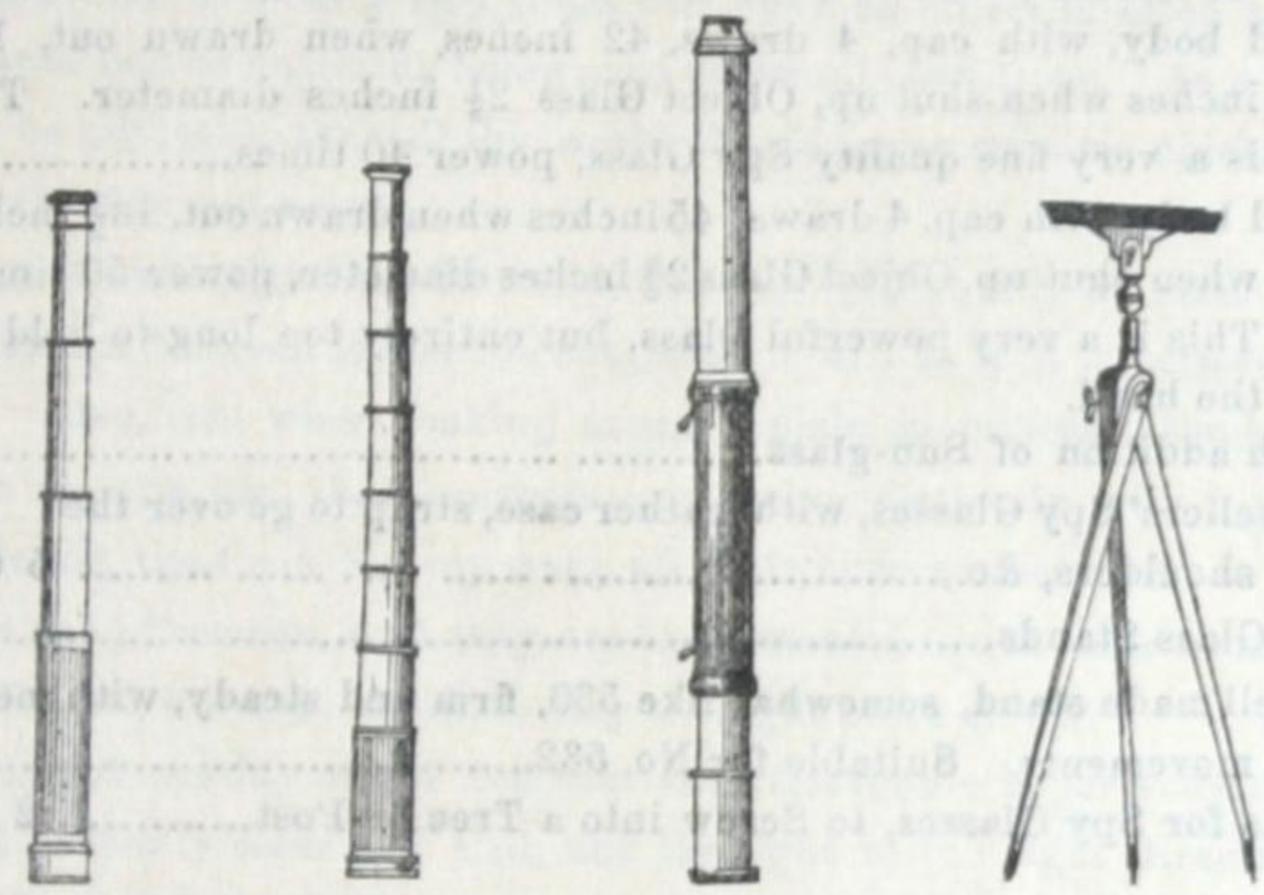
The object must be dry, (free from all blood or moisture.) Insects should be soaked for a few hours in turpentine, it makes them more pliant. Must not be put into the turpentine unless perfectly dry.

The best mode of preserving whole insects is to soak the insect in Liquor Potassa (to be had cheap of any apothecary), for a few days, according to the size of the insect; then place it for a few hours in alcohol, then for a few hours in turpentine, and while it is in the turpentine arrange it on a glass slip and drain off the turpentine, then put upon the object a drop of Canada Balsam and on it the thin glass cover and a weight on it to press it down, and set it aside to harden. The utmost care should be taken to have the Liquor Potassa, Alcohol and Turpentine perfectly free from dirt.

A spider, beetle or bee, is a good object to experiment on; a fly or mosquito is very difficult.

For more thorough information about mounting, I would refer to Martin's Book, No. 7102, on last page of this Catalogue.

Achromatic Spy Glasses and Telescopes.



515 517 522 530

515. Wood body with cap, three draws, 15 inches long when drawn out, 6 inches when shut up, Object Glass 1 in. diam. power 15 times. $3 00

516. Wood body with cap, three draws, 24 inches when drawn out, Object Glass $1\frac{3}{16}$ inches diameter, power 25 times..... 4 00

517. Wood body with cap, six draws, 16 inches when drawn out, $4\frac{1}{4}$ inches shut up, Object Glass $\frac{7}{8}$ inch diameter; a very portable pocket Spy Glass, power 15 times..... $5 00

518. Wood body, with cap, three draws, 32 inches when drawn out, Object Glass $1\frac{3}{8}$ inches diameter, power 30 times..... 5 00

519. Wood body with cap, three draws, 30 inches drawn out, 10 inches shut up, Object Glass $1\frac{5}{8}$ inches diameter, power 30 times..... 6 00

520. Ship Spy Glass, wood or metal body, with shade, one draw, 35 inches when drawn out, 20 inches shut up, Object Glass $1\frac{1}{2}$ inches diameter, power 20 times..... 7 00

521. Same as No 520, but with two draws; more portable, power 20 times. 7 00

522. Fine quality Ship Spy Glass, good screws and brass work, brass body, covered with cord, has shade to keep off the sun and rain; one draw, 36 inches drawn out, 20 inches shut up, Object Glass $1\frac{5}{8}$ inches diameter, power 25 times..... 12 00

523. Same as 522, but with two draws; more portable, power 25 times. 12 00

524. Wood body with cap, four draws, 37 inches when drawn out, 11 inches when shut up, Object Glass $1\frac{7}{8}$ inches diameter; a very superior Terrestrial Glass, and will also show the Moons of Jupiter; power 35 times..... 12 00

With addition of Sun-glass..... 14 00

525. Wood body with cap, three draws and an extension Eye-Piece, giving various powers of from 20 to 40 diameters, according as this Eye-Piece is drawn out; the advantage of a low power is that you have a greater field in view, Object Glass 1⅝ inches diameter, and though not offered as an Astronomical Glass, it will, under very favorable circumstances, show the Rings of Saturn; and it has a Sun Glass for looking at the Sun..... 15 00

527. Wood body, with cap, 4 draws, 42 inches when drawn out, 11½ inches when shut up, Object Glass 2⅛ inches diameter. This is a very fine quality Spy Glass, power 40 times..... 20 00

528. Wood body with cap, 4 draws, 45 inches when drawn out, 13½ inches when shut up, Object Glass 2⅜ inches diameter, power 50 times. This is a very powerful Glass, but entirely too long to hold in the hand. 22 50

With addition of Sun-glass..... 25 00

529. Travellers' Spy Glasses, with leather case, strap to go over the shoulders, &c.,..... 5 00 to 20 00

530. Spy Glass Stands.....

531. A well made stand, somewhat like 530, firm and steady, with metal movements. Suitable for No. 532..... 33 00

531½. Rests for Spy Glasses, to Screw into a Tree or Post.....2 00 to 5 00

Astronomical Telescopes.

532. Astronomical Telescope. Mahogany Body, 44 inches long. Achromatic 3 inch Object Glass. 1 Terrestrial Eye Piece of a power of 50, 1 Celestial Eye Piece of a power of 100, with Sun Glass; Rack Movement for focus..... $60 00

532 and 531 will be..... 90 00

This is intended to meet the want of a cheap Astronomical Telescope, and persons will do much better to buy it than attempt to get up one by buying the Lenses only.

ABOUT SPY GLASSES.

The question how far a Spy Glass will show an object is often asked, but no one distance can be named as being good under all conditions. As a preliminary, it would be advisable that all the world should agree on some object, say letters of a certain size and color.

Persons should also bear in mind, that the object will be much better seen when they are between it and the sun, than it will be if it is between them and the sun. Also, that when looking across a plain in mid-day, the heat causes a vibration in the air, that prevents one seeing distinctly with a glass of any power, hence, the Coast Survey make all their observations early in the morning or late in the afternoon, and they are thus enabled to see their signal twenty or thirty miles off, but that signal is only a bright piece of tin.

There is not one day out of ten that the atmosphere is perfectly clear--but if the air is perfectly clear and still, and the light in the right direction, I should suppose that with No. 524 Spy Glass, a person on a hill-top could recognize the countenance of another person on a hill-top two miles off, but I have not had an opportunity to make the trial.

With No 524 I have distinctly seen the pupil of a man's eye across the Delaware at Vine street wharf—say one mile. It was in the morning, and the atmosphere very clear.

I have seen, with 518, at a distance of ten miles, a man walking on the roof of Girard College, but then the sky formed the background; under ordinary conditions he would not be visible at one-fourth that distance.

There is an error in the public opinion of Opera Glasses.

Opera Glasses have but little power, seldom more than six times, but they have a large field of view, and do not require to be held so steady as a Spy Glass, hence they are used by sea captains in preference to a Spy Glass.

As a general rule, the power of an Opera Glass depends on its size; a small glass cannot be made as powerful, without contracting the field of view.

Spy Glass No. 515 is much more powerful than an Opera Glass of ten times the price.

The high price of Opera Glasses is more in the frame than in the glasses. An Opera Glass at $8.00 or $10.00 in plain frame, or at $16.00 to $25.00 for sea use, is as good as almost any.

W. Y. M'ALLISTER.

Opera Glasses are designated and priced according to the diameter of the Object Glasses in French lines, as follows:—

11 lines equal to 1 inch.				19 lines equal to $1\frac{11}{16}$ inch.			
13 "	"	"	$1\frac{3}{16}$ "	21 "	"	"	$1\frac{7}{8}$ "
15 "	"	"	$1\frac{5}{16}$ "	24 "	"	"	$2\frac{1}{8}$ "
17 "	"	"	$1\frac{1}{2}$ "	26 "	"	"	$2\frac{5}{16}$ "

534. Fine Achromatic Opera Glasses, Morocco body, fine finish, and a first-rate article.

15 lines	$ 5 50
17 "	6 50
19 "	7 50
21 "	8 50
24 "	10 00
26 "	11 00

535. Fine Achromatic Opera Glasses, Morocco bodies, gilt tube; same as No. 534.

15 lines	6 00
17 "	7 00
19 "	8 25
21 "	9 25
24 "	11 00
26 "	12 50

539. Fine Achromatic Opera Glasses, Morocco bodies, japanned tubes, having three powers, *Theatre*, *Field* and *Marine*, the marine power being the highest, and having a power as high as the large size Marine Opera Glasses. A very convenient and powerful Opera Glass, equally adapted for use at an opera or for tourists. It is only three inches long, and can be carried very conveniently in the pocket.

19 lines	17 50

540. BARDOU'S OPERA GLASSES, (the best maker in Paris,) in all styles of mountings.

Black Morocco and Black Tubes,	15 lines.....	8 00
" " " "	17 "	12 00
" " " "	19 "	14 00

Oval Opera Glasses.

542. Fine Achromatic Opera Glasses, Morocco bodies, japanned tubes, oval glasses. A very neat and handsome article.

15 lines.....	12 00
19 "	17 00

Duchesse Opera Glasses.

543. Fine Achromatic Opera Glasses, of small size, of various styles and prices, from..... $5 00 to 25 00

Pearl Opera Glasses.

544. Fine Achromatic Opera Glasses, white pearl bodies, handsomely finished, gilt cross-pieces and gilt tubes, flat tops. A very handsome Opera Glass.

11 lines.....	9 50
13 "	10 00
15 "	11 00
17 "	13 00
19 "	15 50
21 "	18 50

545. Fine Achromatic Opera Glasses, white pearl bodies, gilt cross-pieces and gilt tubes; fancy tops, giving the Opera Glass a more handsome appearance.

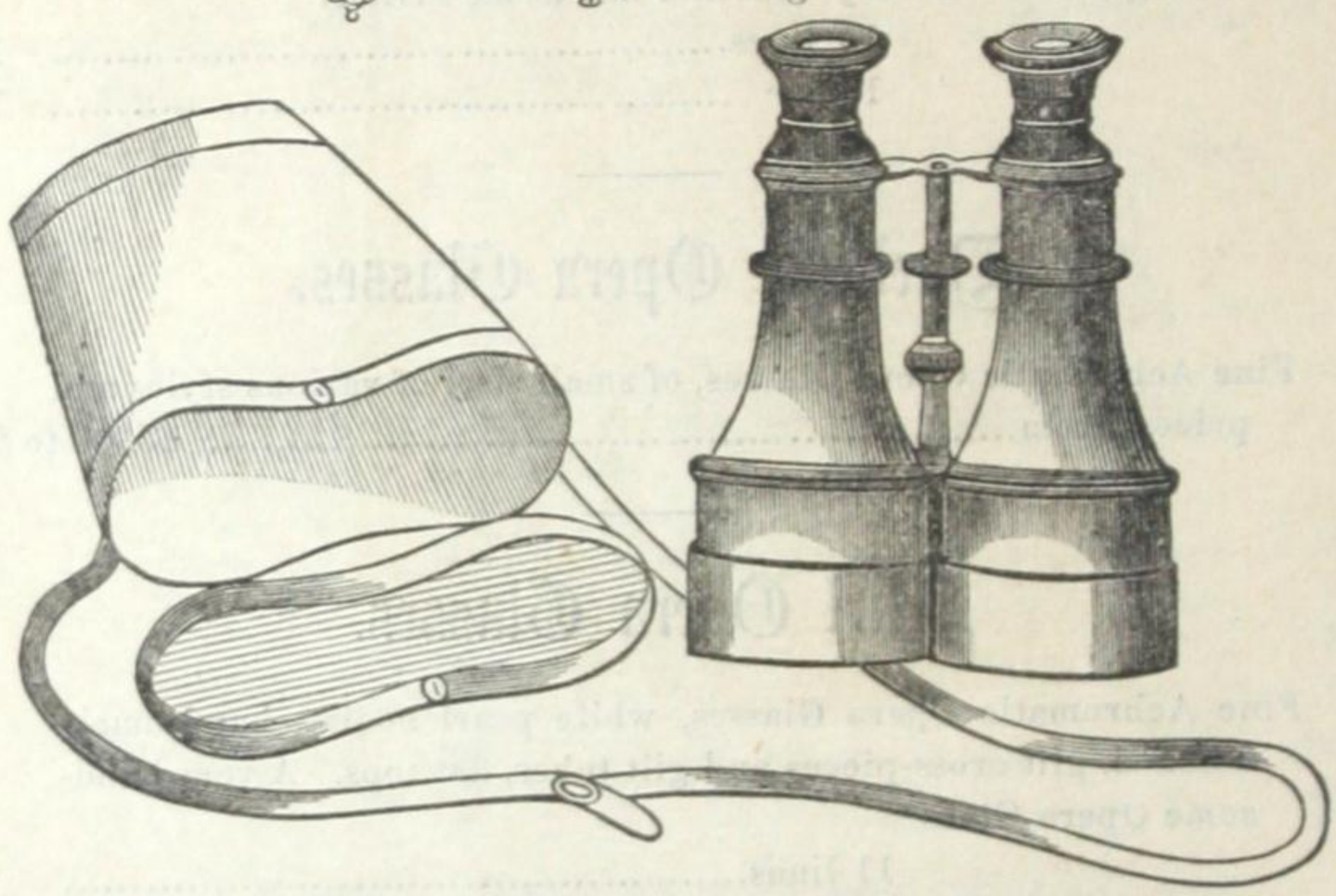
11 lines.....	13 50
13 "	14 00
15 "	15 00
17 "	17 00
19 "	19 00
21 "	24 00
24 "	28 00

Rock Crystal Opera Glasses.

546. Fine Achromatic Rock Crystal Opera Glasses, Morocco bodies, japanned tubes, curved bridges, straight bodies, propelling at both ends, and having a very high power, higher than any other opera glasses in this catalogue.

11 lines	20 00
14 "	22 00

Marine Opera Glasses.



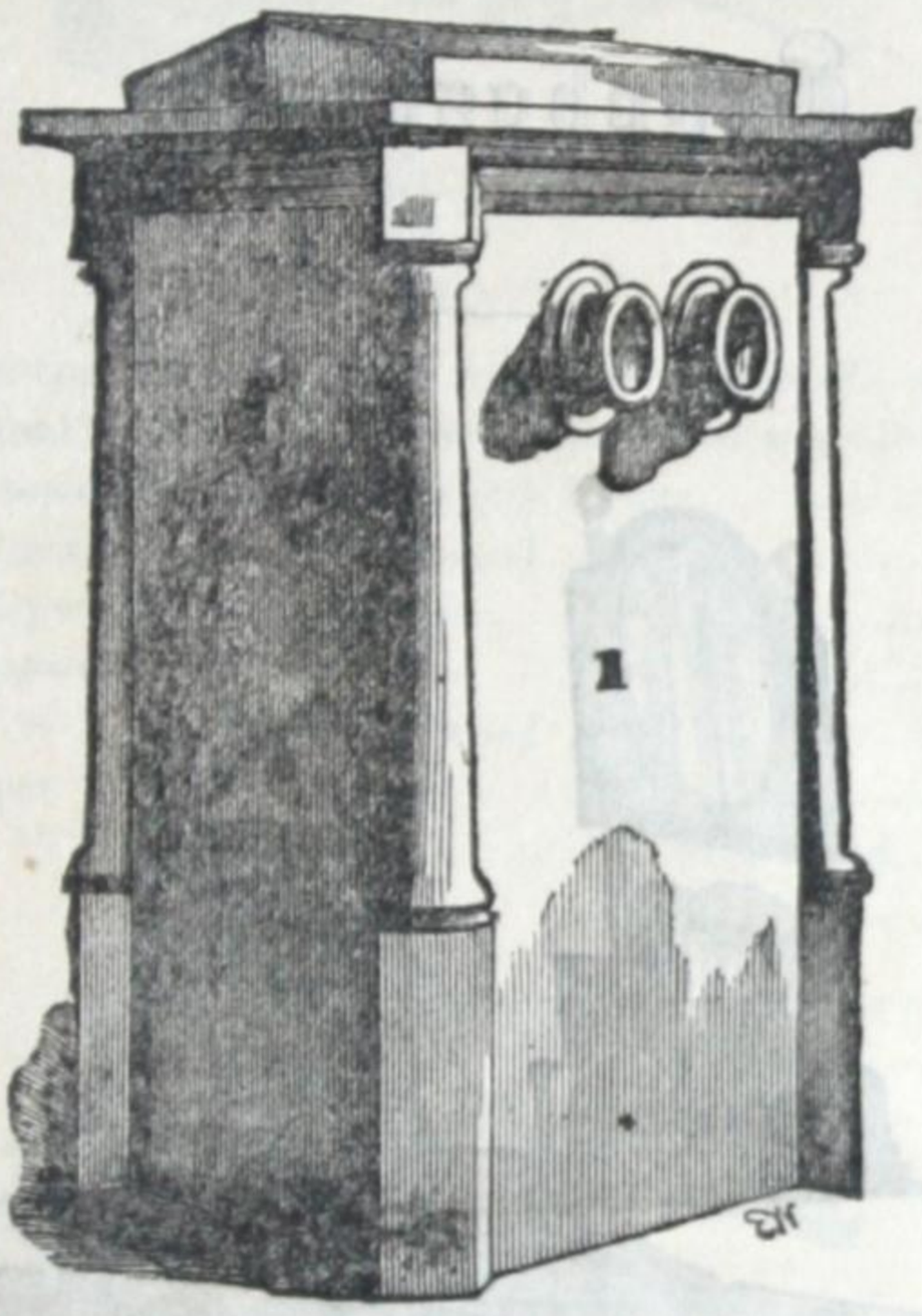
547. Fine Achromatic Marine Opera Glasses, Morocco bodies, japanned tubes; shade to extend over the Object Glass; hard-sewed leather case, with strap to go over the shoulder, metal tops and rims.

21 lines	14 00
24 "	15 00
26 "	16 00

548. Fine Achromatic Marine Opera Glasses, Morocco bodies, japanned tubes, shades to the Object Glasses; hard leather cases, with strap to go over the shoulder, and having 3 powers—Theatre, Field and Marine. 24 lines 32 50

549. Fine Achromatic Marine Opera Glass, Morocco bodies, japanned tubes, shades to the Object Glasses; patent leather cases, with strap to go over the shoulder; ivory index wheel for changing the power; 3 powers, Theatre, Field and Marine. A very fine glass. 24 lines 45 00

The Revolving Stereoscope.



562 and 565.

The Revolving Stereoscope consists in an endless chain, with links to which the pictures are attached at right angles, passing over a square axle, so that when this axle or handle is turned, each link when on the top of the axle, holds its picture perpendicular upwards, in focus of the lenses, and thus the pictures are brought successively in view.

Parlor Stereoscopes—18 inches high, and proper for the eye when set on a table—in rosewood.....

562. No. 1—With two pairs of eye pieces and two reflectors, a chain of 72 picture holders for 144 paper, or 72 transparent or glass pictures 50 00

Library Stereoscopes—in curled Black Walnut.....

565. No. 1—With two pairs of eye pieces, one of which is fitted in a hinged door, to open, and admit light for pictures on glass, with a chain of 72 picture frames for 144 paper or 72 glass pictures. With adjustment, &c..... 30 00

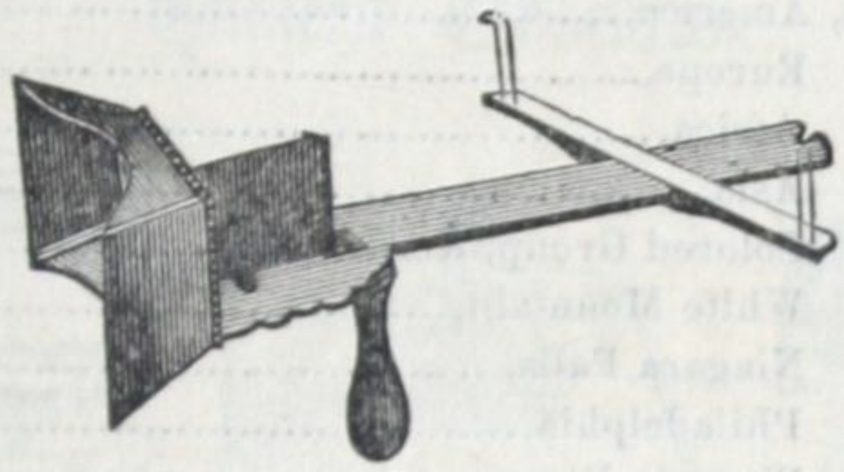
Graphoscopes.

No. 568.

This new Instrument being adapted to view either a single picture or a Stereoscopic Picture, having two sets of Lenses, has a range of several inches for focus, thus enabling old or young sights to see equally well; and being so arranged that it can be placed at any angle, has become exceedingly popular.

I offer them at the following prices, in finely finished, handsome, polished Walnut Frames:

2½ inch Lens, with Stereoscopic Lens, unpolished frame.....	$2 50
3 " " " " " varnished "	7 50
4 " " " " " finely polished frame.....	16 50
5½ " " " " " " " "	24 00
6½ " " " " " " " "	42 00
7½ " " " " " " " "	48 00



570.

Holme's Stereoscope—the best kind yet invented—gives more adjustment for focus and more light than any other pattern.

571.	Rounded	Rosewood	Shield,	Rosewood	Frame	.....	2 50
572.	"	Satinwood	"	Satinwood	"	.....	2 50
573.	"	Tulipwood	"	Walnut	"	.....	1 50
574.	"	Rosewood	"	"	"	.....	1 50
575.	"	"	"	Cedarwood	"	.....	1 50
576.	"	Paper	"	Walnut	"	.....	75
577.	"	"	"	"	"	with stand.....	1 00

The foregoing prices are for the instruments only without pictures.

Pictures for the Stereoscope.

Of America, Europe, Asia and Africa. The stock is too large and too constantly varying for us to give a list.

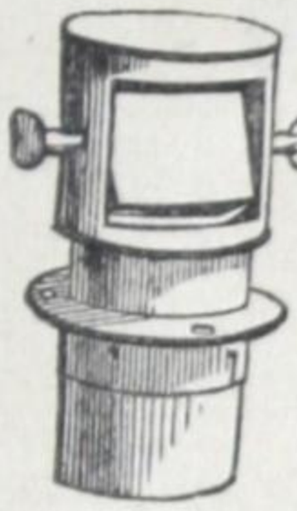
583. Paper Pictures, America,.....
" " Europe,.....
" " Africa,.....
" " Asia,.....
" " Colored Group, &c.,.....
" " White Mountain,.....
" " Niagara Falls, ...
" " Philadelphia,.....
" " Western Views,.....
" " of Statuary,.....

Also England, Ireland, Scotland, Paris—the Rhine—the Alps—Venice—Rome, &c., &c.

HOUR OR SAND GLASSES.

No.		Price.
600.	Rosewood Hour Glass.	$2 50
601.	" Half-hour Glass	1 75
602.	" Quarter-hour Glass	1 25
603.	White Wood Hour Glass	2 00
604.	" " Half-hour Glass	1 50
605.	Egg Boilers, or 3 Minute Glasses on metal stand to reverse,	50

Camera Obscuras.



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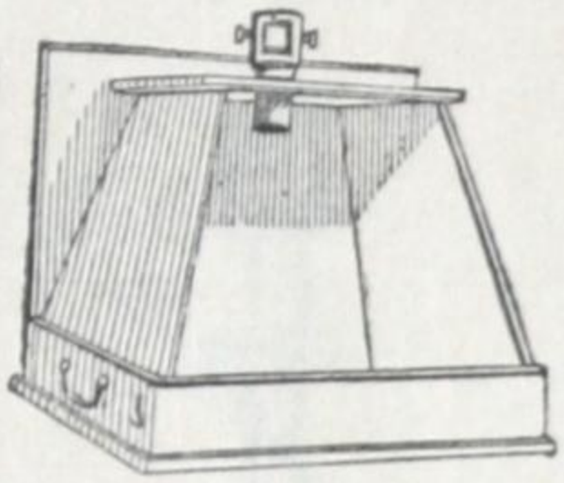


712

714

711. Camera Obscura Head, made of brass, with prismatic Lens. This is the best kind of Lens for a Camera Obscura, as it forms both Lens and Mirror.....each, $6 50

712. Camera Obscura Head, same as above, but mounted in a portable Walnut Box, with handle and Lens for viewing the picture in proper position..... 20 00

728.
729.
730.

735.
736.
737.

739.

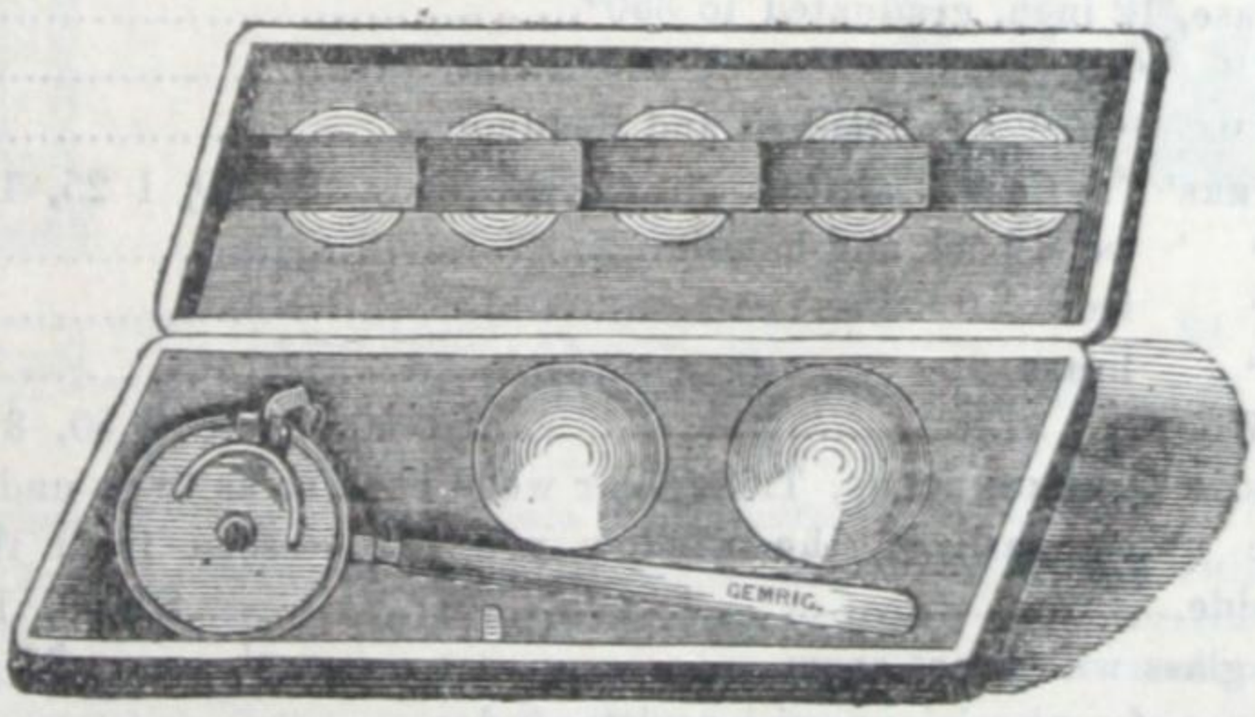
Polarizing Apparatus.

728. Nicol Prisms, $\frac{5}{8}$ inch long..... $ 3 75
729. " " $\frac{7}{8}$ " 4 50
730. " " $1\frac{5}{8}$ " 16 00

735. Selenites, blue, yellow, red and green..... 75
736. " flowers, birds, &c..... 2 00
737. Glass Squares, Circles, verre trompé..... 3 25

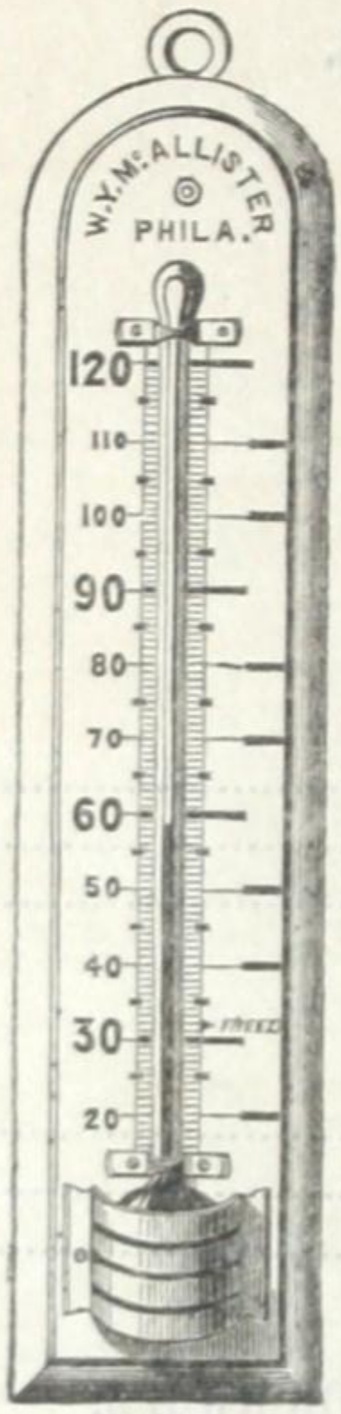
Opthalmoscopes and Laryngoscopes.

739. Liebrich's Opthalmoscopes in hard rubber frame, concave mirror, $1\frac{1}{4}$ inches diameter, convex condensing lens and attached diaphram, with three concave and one convex lens to adjust at pleasure..... 7 00



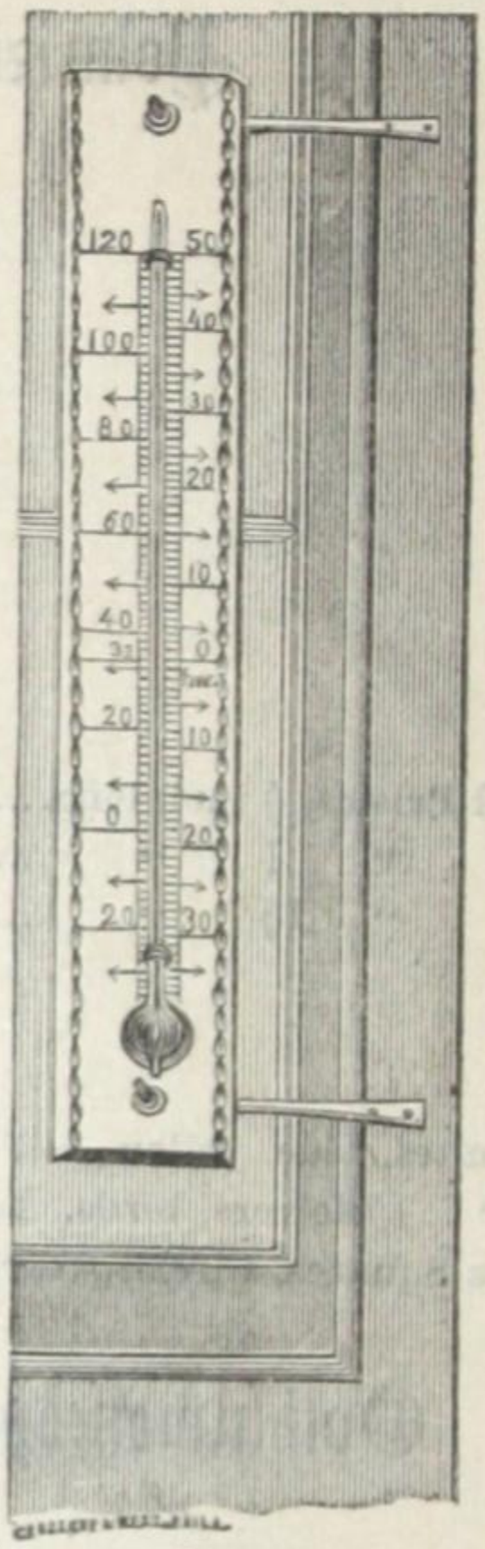
739.

Thermometers.



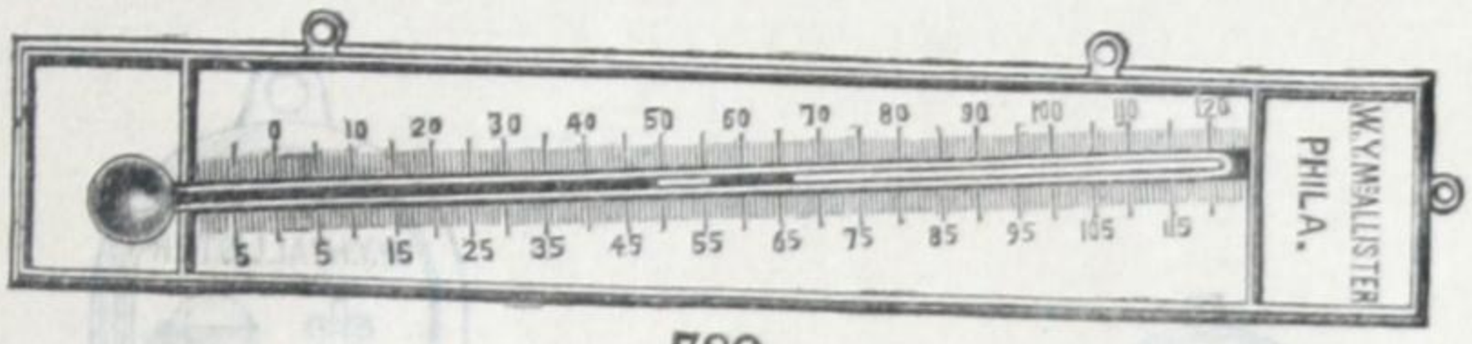
764.

750.



767.

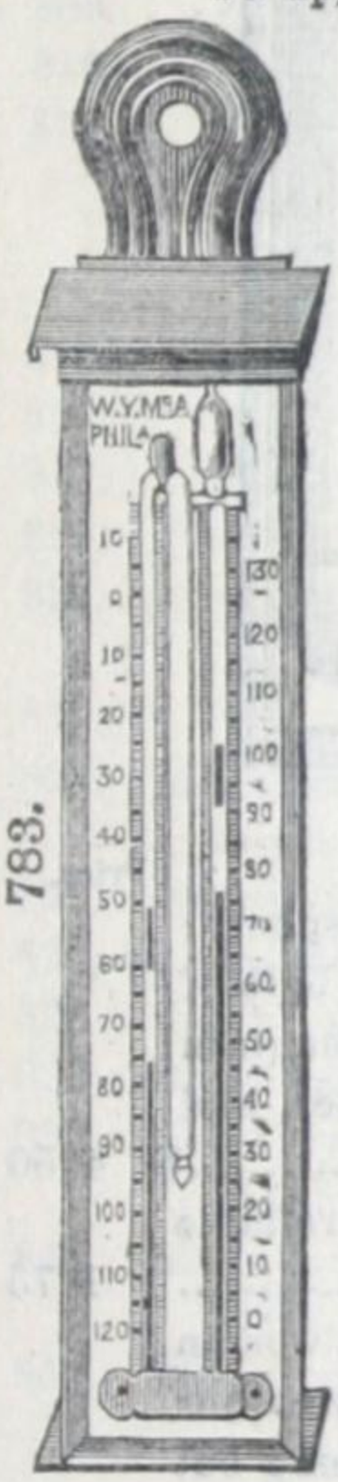
No.		Price
750.	Tin Case	35, 50, 75 cents, $1 00, 1 25, 1 50, 2 25, 2 50
751.	Tin Case, 14 inches long, large and distinct column of mercury, large figures, single degrees	2 50
755.	Tin Case, 12 inch, graduated to 350°	$ 3 00
756.	" " " " " " 600°	4 00
758.	" " " " Fahrenheit and Reaumur	1 75
760.	Brewers' Tin Case	$1 00, 1 25, 1 50, 2 25
761.	" wood back and handle	2 25
762.	" iron " "	2 50
763.	" brass " "	3 00
764.	Box Wood	$1 50, 2 00, 2 50, 3 00, 4 00
765.	Window Thermometers, Triangular wood back so as to go under the upper sash of the window yet to be seen from the inside	$1 00, 1 25, 2 25
767.	Plate glass with brass arms	$5 00 to 6 00
770.	Clinical, for physicians, with register index	3 00



No. 780. Price.

780. SELF-REGISTERING. Minimum to show the greatest degree of cold. To use it hold the bulb end up until the index runs to the end of the spirit of wine, then hang it up by the side loops..... 2 75

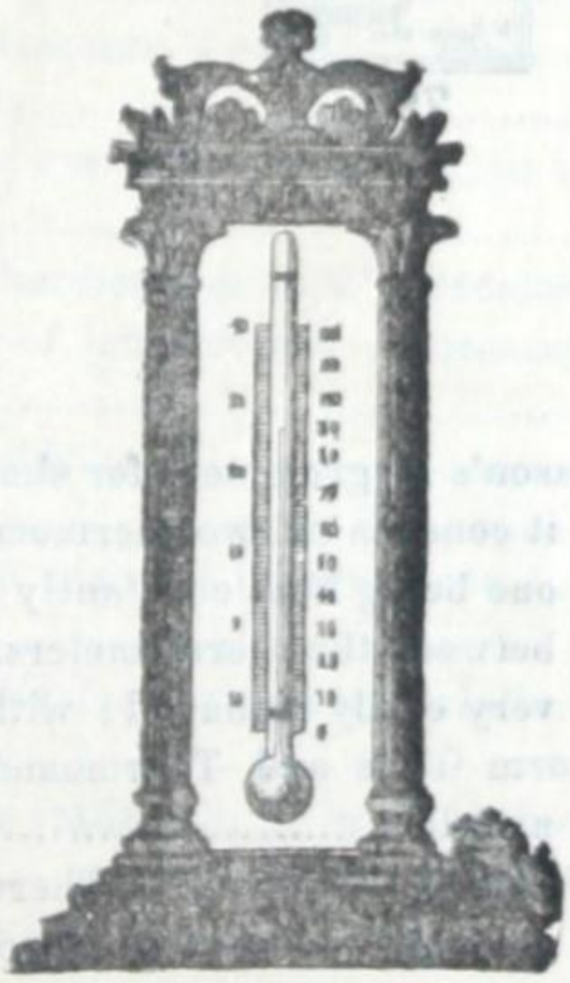
781. Maximum to show greatest heat. These are of mercury, with an index in front, they are very easily put out of order and cannot be sent by express—when transported the bulb end should always be up,..... 3 00



783.

783 Is a new kind of self-registering, Thermometer, and registers both heat and cold, and generally gives satisfaction, these also cannot be sent by express.
With Boxwood scale.....$4 50 and 6 50
With Porcelain or White Glass scale....$8 00 and 10 00

785. Large Thermometer, painted wood, 2 feet long, large red spirit of wine column, large figures...$ 7 00

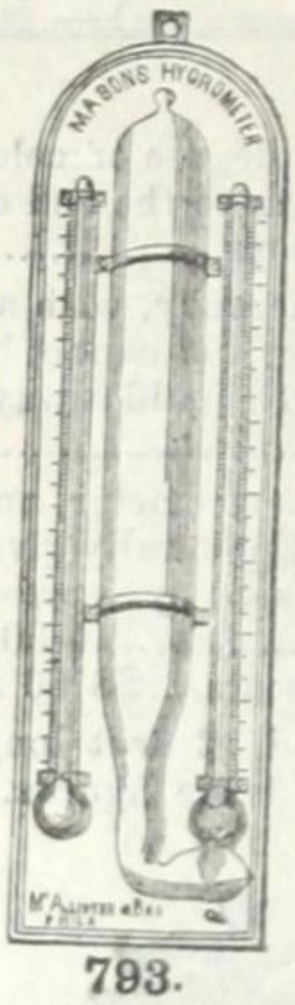


786.

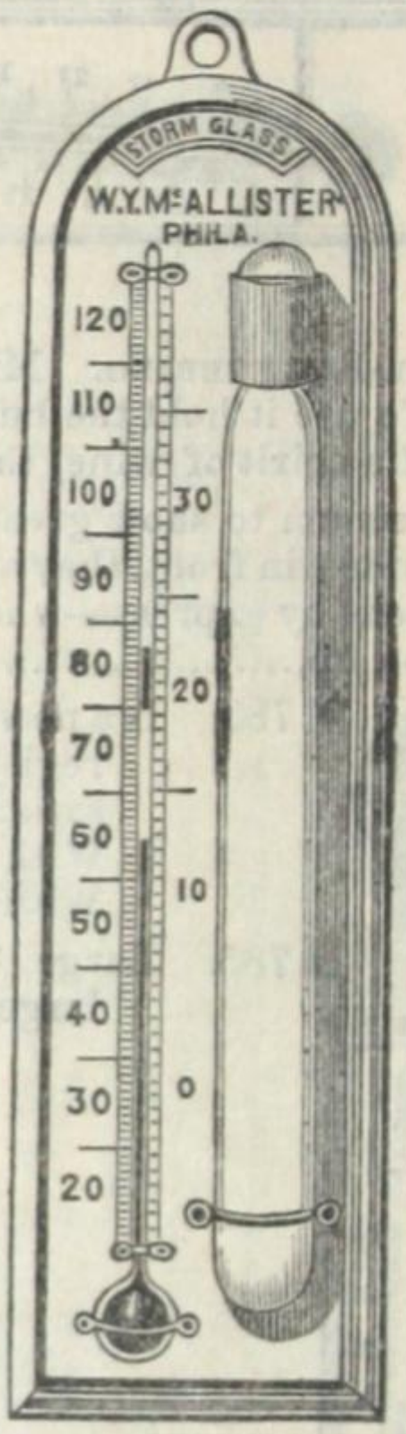
786. Fancy stand, various patterns.....$1 00 to 10 00
787. " wood back, German Silver Mountings, $1 50 to 4 00
788. Copper case,.....$3 50 to 6 00

790. All glass cylinders, paper scale for immersion in liquids.....75c. to 2 00

792. SMITHSONIAN PATTERN. This is a Metal scale 12 inches long, without case, this scale is fastened by a brass frame so as to separate it about two inches from the house or post. This is the most carefully made Thermometer we have for sale..... 5 00



793.



795.

No.		Price.
793.	Mason's Hygrometer; for showing the humidity of the atmosphere: it consists of two thermometers placed side by side, the bulb of one being kept constantly wet by water from the glass fountain between the thermometers. The only reliable hygrometer, and very easily managed; with directions and tables.....	$ 4 50
795.	Storm Glass and Thermometer; an interesting but not reliable article.....	1 75
796.	WEATHER HOUSE, with Thermometer. This is a man and woman on a string—the woman comes out of the house in good weather but remains in the house in wet weather—it is an amusing but not thoroughly reliable weather indicator.....	1 50

No Thermometers or Hydrometers sent by express unless *paid for in advance*, and no allowance under any circumstances for breakage, the plea that the article was not properly packed, or broken when packed, will not be listened to. These rticles require more careful handling than they get. The purchaser must take the risk, and to avoid any quarrels we must require payment in advance.

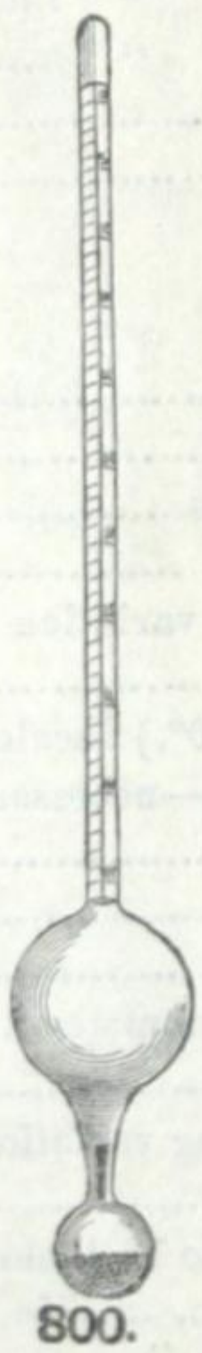
Hydrometers.

No.		Price.
800,	Glass Hydrometer for Syrup, made with Thermometer at 60°.....	75
801.	" " " Alkali, " " "	75
802.	" " " Beer, " " "	75
803.	" " " Acid, " " "	75
840.	" " " Bark, " " "	75
805.	" " " Vinegar, " " "	75
806.	" " " Milk, " " "	75
810.	" " Twaddell, No. 1, 2 & 3, each.....	75
811.	" " " No. 4, 5 & 6 "	1 00
815.	" " for Salt.....	75
816.	" " Salometers for sea water.....	75
817.	" " " " sea steamers, 3 scales.....	1 00
819.	" " Coal Oil.....	75
820.	" " " " with scale of correction for variation of temperature.....	3 00
825.	" " Alcohol, (made with thermometer at 60°,) 2 scales,	1 00
826.	M'Culloch Book of Tables, for variation of temperature—necessary to get the exact result.....	50
827.	Copper Tank with thermometer in the side.....	6 00
825, 826 and 827 together, price.....		7 00
828.	Copper Tank with table of correction in place of thermometer.....	6 00
825 and 828 together.....		7 00
830.	Glass Hydrometer for Alcohol, with scale for correcting variation of temperature.....	3 00
844.	Glass Jars, for holding the liquid when testing it, 10 to 18 inches high.....	75c. to $1 50
850.	Thermometer on brass scale to use with 817.....	1 75

No Hydrometers sent by Express unless paid for in advance.

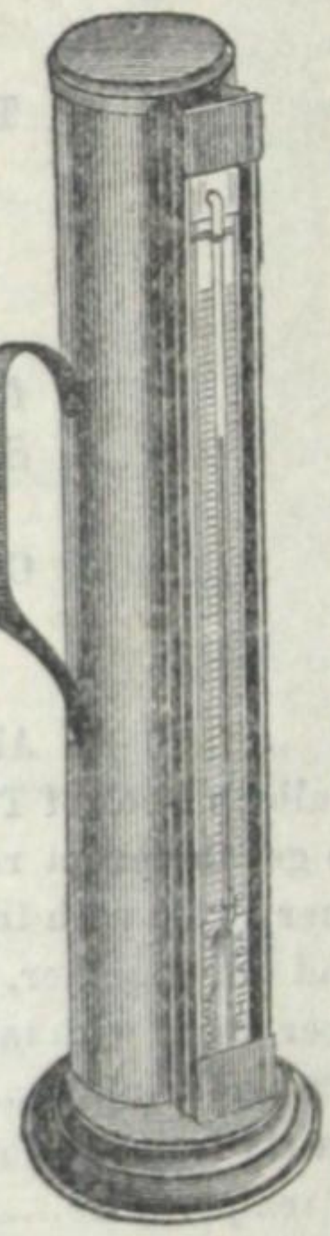
No allowance for breakage.

There is too much risk in sending either Hydrometers or Thermometers by Express for us to take the responsibility.



800.

830. 820.



827. 828.

Aneroid Barometers.

Fig. 1.

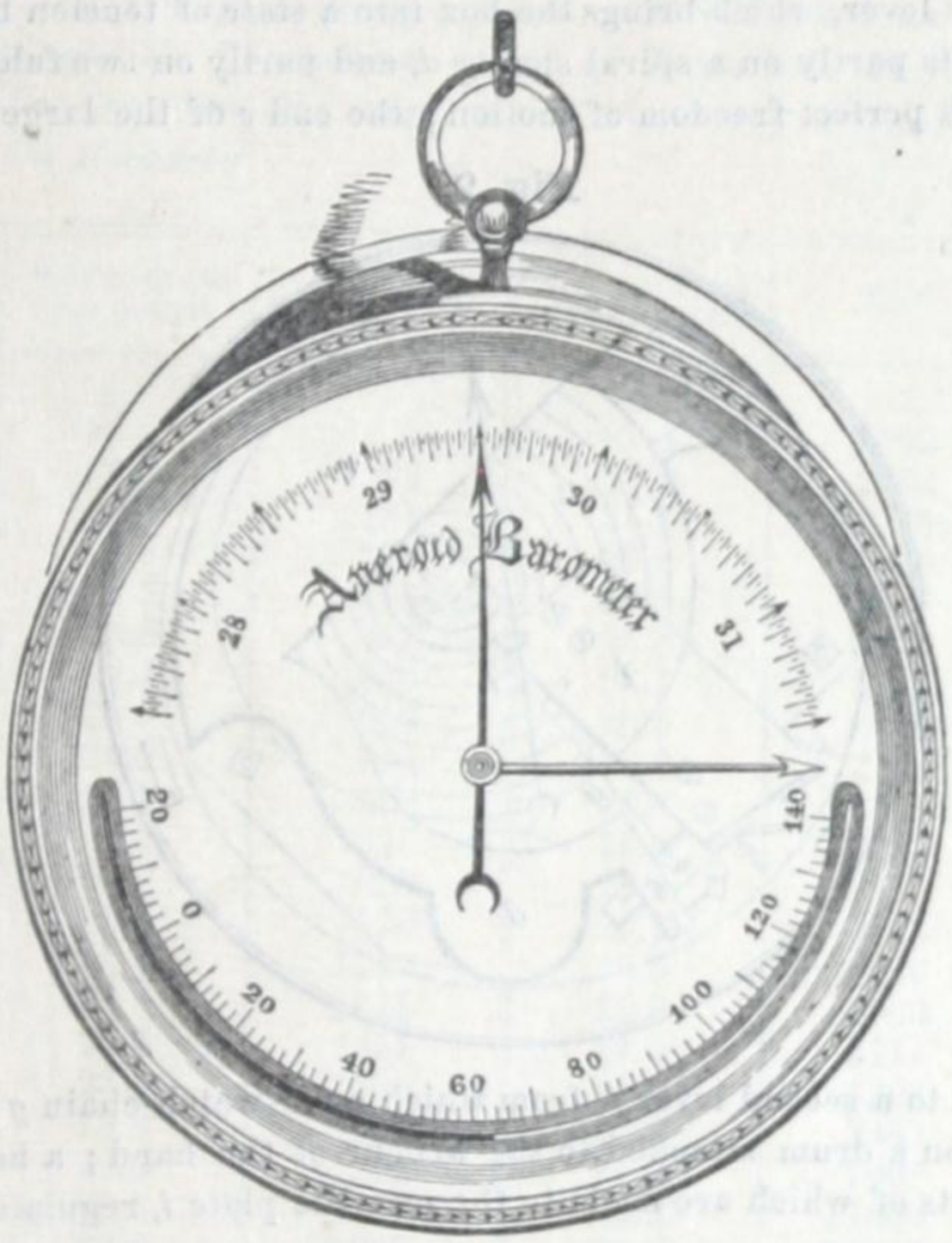


Fig. 1 represents the external appearance of the instrument. It is four inches and three-quarters in diameter across the face, and one inch and three-quarters in thickness. The pressure of the atmosphere is indicated by a hand pointing to a scale, which is graduated to correspond with the common barometer: thermometers are placed on the face, one of which is essential.

Fig. 2 represents the internal construction as seen when the face is removed, but with the hand still attached. *a* is a flat, circular box made of some white metal, exhausted of air through the short tube *b*, which is subsequently made

air-tight by soldering; the upper and lower surfaces of the box are corrugated in concentric circles, which gives it greater elasticity; and the box is fixed to the bottom of a metallic case, which encloses the mechanism of the whole instrument. In the centre of the *upper* surface of the elastic box, is a solid cylindrical socket *x*, about half an inch high, to the top of which the *principal lever*, *c*, *d*, *e*, is attached; this lever, which brings the box into a state of tension by separating the surfaces, rests partly on a spiral spring *d*, and partly on two fulcrums having knife-edges, with perfect freedom of motion; the end *e* of the large or principal

Fig. 2.

lever is attached to a second lever *f*, from which a fine watch-chain *g* extends to *h*, where it works on a drum attached to the arbour of the hand; a hair spring at *h*, the attachments of which are made to the metallic plate *i*, regulates the motion of the hand.

As the weight of the atmosphere is increased or diminished, so is the surface of the corrugated elastic box depressed or elevated, as is also at the same time the spiral spring *d*, upon which the principal lever rests; and this motion is communicated through the levers to the arbour of the hand at *h*. The tension of the box in its construction is equal to 44 lbs. At the back of the Aneroid is a screw to adjust the hand to the height of any mercurial barometer: for comparative observations the Aneroid must be placed in the position for which the adjustment is made.

The word ANEROID is derived from the Greek ALPHA, NEROS EIDOS, meaning a form without fluid. The Aneroid Barometer is the most simple, beautiful and accurate instrument yet invented to indicate atmospheric changes. It is more accurate than the Mercurial Barometer, more convenient, more portable, and not so likely to get out of order. They are almost entirely used by the U. S. Coast Survey, and are peculiarly adapted to Travellers and Nautical use. They are also a very useful and ornamental instrument for a Parlor, Hall or Library.

To ascertain with accuracy the state of the weather, it is also necessary to use a Hygrometer, such as No. 800.

The Barometer is a very useful instrument for ascertaining elevations. To enable persons unacquainted with the mode of measuring, I give below a table for that purpose. I recommend the Aneroid Barometer as far preferable to any other kind, they are so portable, and can be sent anywhere by Express, with perfect safety.

The height of the Atmosphere being assumed at 27.500 feet, with the Barometer at 30.00 inches, and the Thermometer at 55° of Fahrenheit, the following Table of Elevations has been computed, answering to the corresponding depressions of the Mercury in the Barometer.

Height of the Barometer.	Feet.	Height of the Barometer.	Feet.
in.		in.	
30.0	0	27.3	2592
29.9	92	27.2	2692
29.8	184	27.1	2793
29.7	276	27.0	2895
29.6	368	26.9	2997
29.5	462	26.8	3099
29.4	556	26.7	3201
29.3	650	26.6	3304
29.2	744	26.5	3406
29.1	838	26.4	3511
29.0	933	26.3	3615
28.9	1028	26.2	3719
28.8	1123	26.1	3824
28.7	1219	26.0	3926
28.6	1315	25.0	5000
28.5	1411	24.0	6111
28.4	1508	23.0	7263
28.3	1605	22.0	8462
28.2	1702	21.0	7907
28.1	1799	20.0	11000
28.0	1897	19.0	12345
27.9	1996	18.0	13750
27.8	2095	17.0	15214
27.6	2194	16.0	16740
27.5	2392	15.0	18335
27.4	2491	10.0	27500

835. Aneroid Barometer, 5 inches diameter, paper dial..... 12 00

836 Aneroid Barometer, 5 inches diameter, open face, showing the machinery, with thermometer..... 16 00

837. 8 inches, carved oak frame, suitable for an office..... 35 00

ANEROIDS FOR ALTITUDES, AS WELL AS FOR THE WEATHER. BEST LONDON MAKE.

838. 3 inches, graduated to 6000 feet..... 30 00

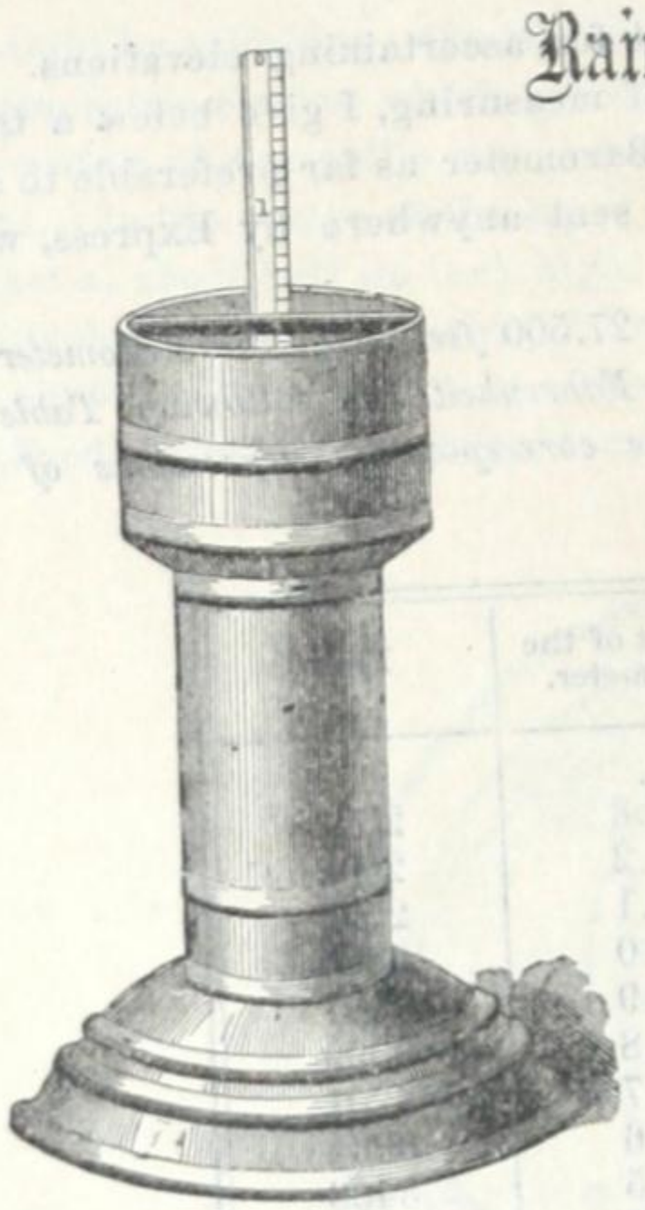
838½. 3 " " 20,000 " 40 00

839. 5 " " 6000 " 35 00

839½. 5 " " 20,000 " 45 00

840. 2½ " silver case, like watch, graduated to 20,000 feet..... 50 00

Rain Gauges.

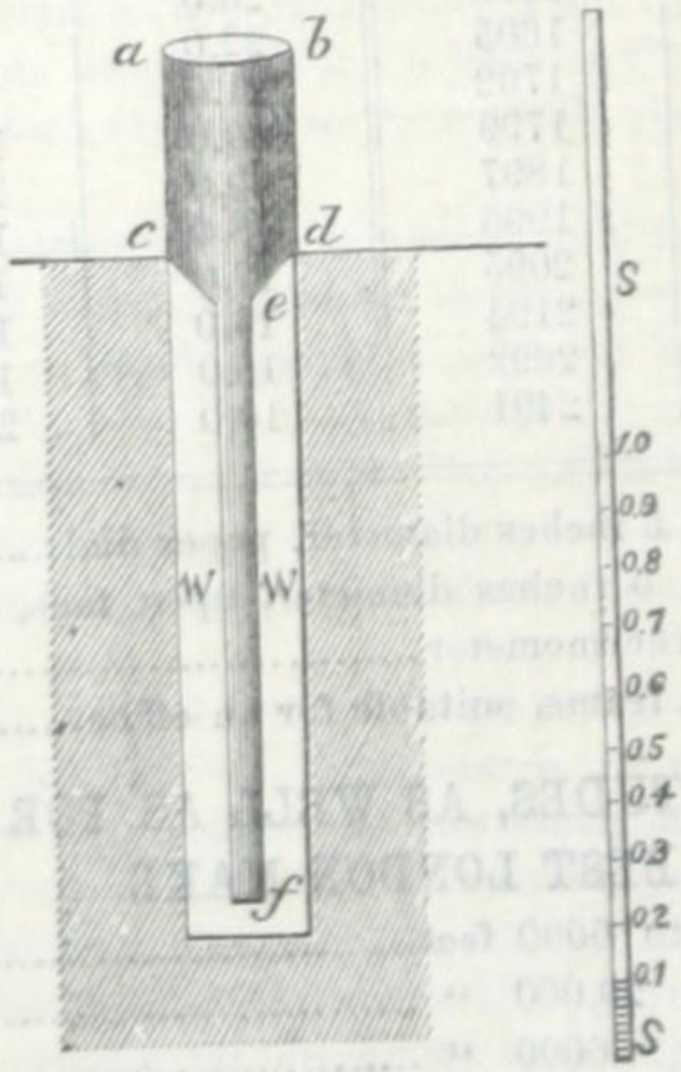


841

842

841. Rain Gauge, japanned tin, with graduated float, registers to the 20th of an inch..... $3 00

842. Rain Gauge, japanned, with glass graduated tube for measuring, graduated to 10ths..... 4 50



843

The Smithsonian Rain Gauge.

843. The Smithsonian Rain Gauge, made entirely of Brass. This Gauge has been adopted by the Smithsonian Institution and U. S. Patent Office, and is the most simple in its construction of any now in use. It is furnished with a graduated scale which reads to tenths and hundredths of an inch; also a wooden cylinder to insert permanently in the ground for the protection and ready adjustment of the instrument. A printed description and directions for use, accompany each..... $5 00

BAROMETERS.

Barometers, whether mercurial or Aneroid, are of most use for taking altitudes, or at sea, where any disturbance of the elements is important, whether rain or wind. The marks upon them of Rain, Change, Fair, &c., are of no importance. The important point in a Barometer is its height now compared with what it was a few hours previous.

Suppose the Barometer at this moment indicates 30 inches, now, if a few hours previous it had been at $29\frac{9}{10}$ inches we should predict Fair weather; but if it had been at $30\frac{1}{10}$ inches we should predict bad weather; the point is not merely where it is, but also where it has been.

Therefore to get any useful information by a Barometer it must be noted every few hours: say at breakfast, dinner, tea, and bed-time, and at same time it would be as well to record the direction of the wind and state of the weather.

Persons who make this matter a hobby study the Barometer every few hours, and taken in, sometimes, with the direction of the wind, state of the clouds, they are able to form a better opinion as to whether the hay must be taken in this afternoon or whether it can be left out till morning, than they could without the Barometer.

With respect to the Barometer indicating Rain, especially, there is a popular error; as a general rule the lowering of the Barometer is followed by rain, but it is by no means always so.

Mercurial Barometers cannot be sent by Express with any certainty that they will not be damaged, and it is in this respect that the Aneroid is more desirable; but even the Aneroid requires as careful handling as a watch, and should be carried in the hand or in a carpet bag; the rough jarring a trunk or box receives is very apt to move the hand out of place.

Whoever can get Old Probabilities' reports will be better informed than by any observations of his own. People in the cities get Old Prob. twice a day and have but little use for a Barometer, for Old Probabilities has the result of many observations North, South, East and West.

Mathematical Instruments

AT

WHOLESALE AND RETAIL.

January 1, 1878.

SWISS DRAWING INSTRUMENTS, No. 6000 to 6059, will be retailed at ***twenty*** per cent. off these Catalogue prices; and FRENCH DRAWING INSTRUMENTS, from No. 6224 to 6267, will be retailed at ***fifteen*** per cent. off these Catalogue prices.

WILLIAM Y. McALLISTER,

No. 728 CHESTNUT STREET,

PHILADELPHIA.

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Beam Compass Furniture,.....4,18
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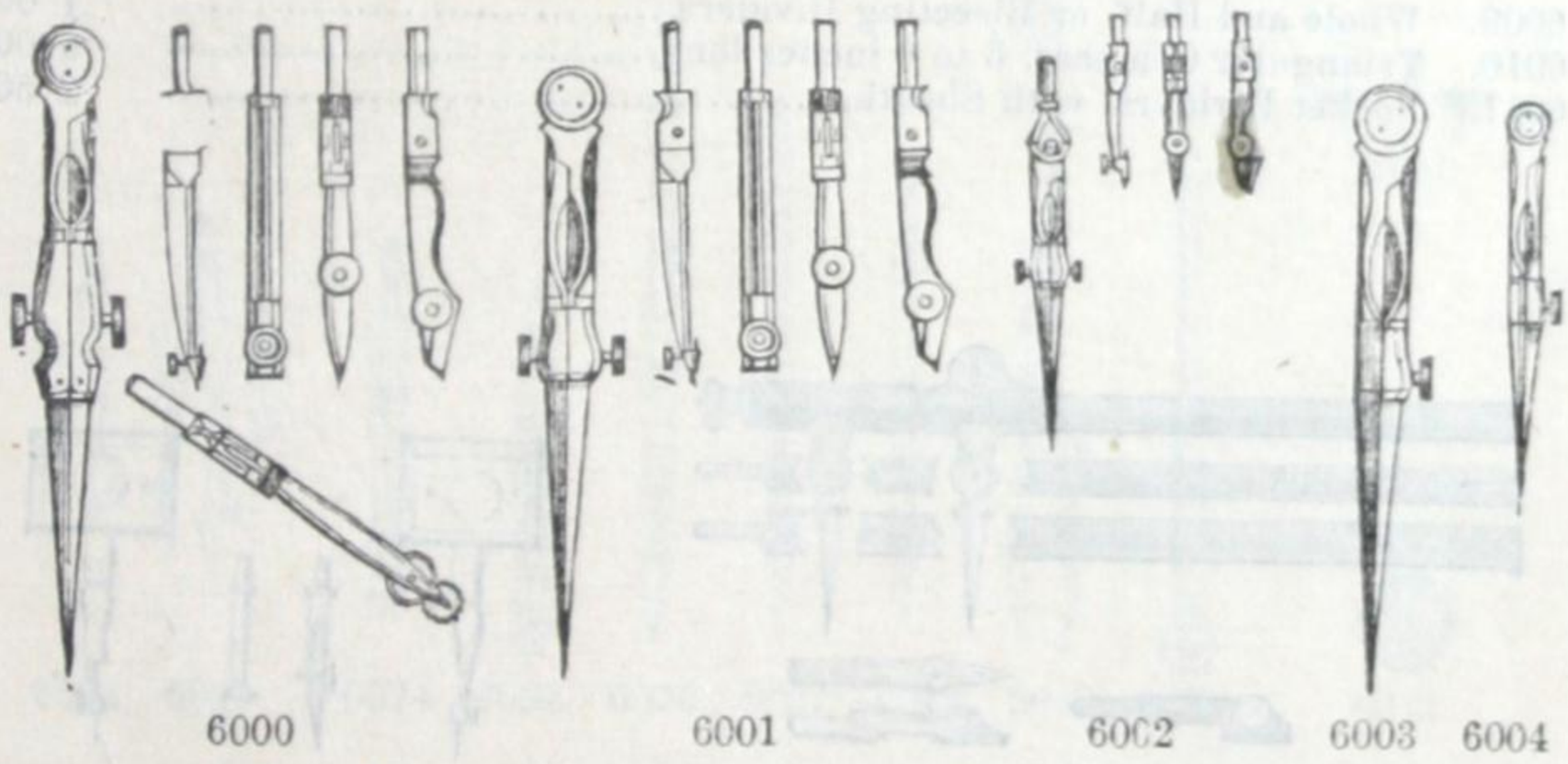
Wire Gauges.....30

Swiss Drawing Instruments.

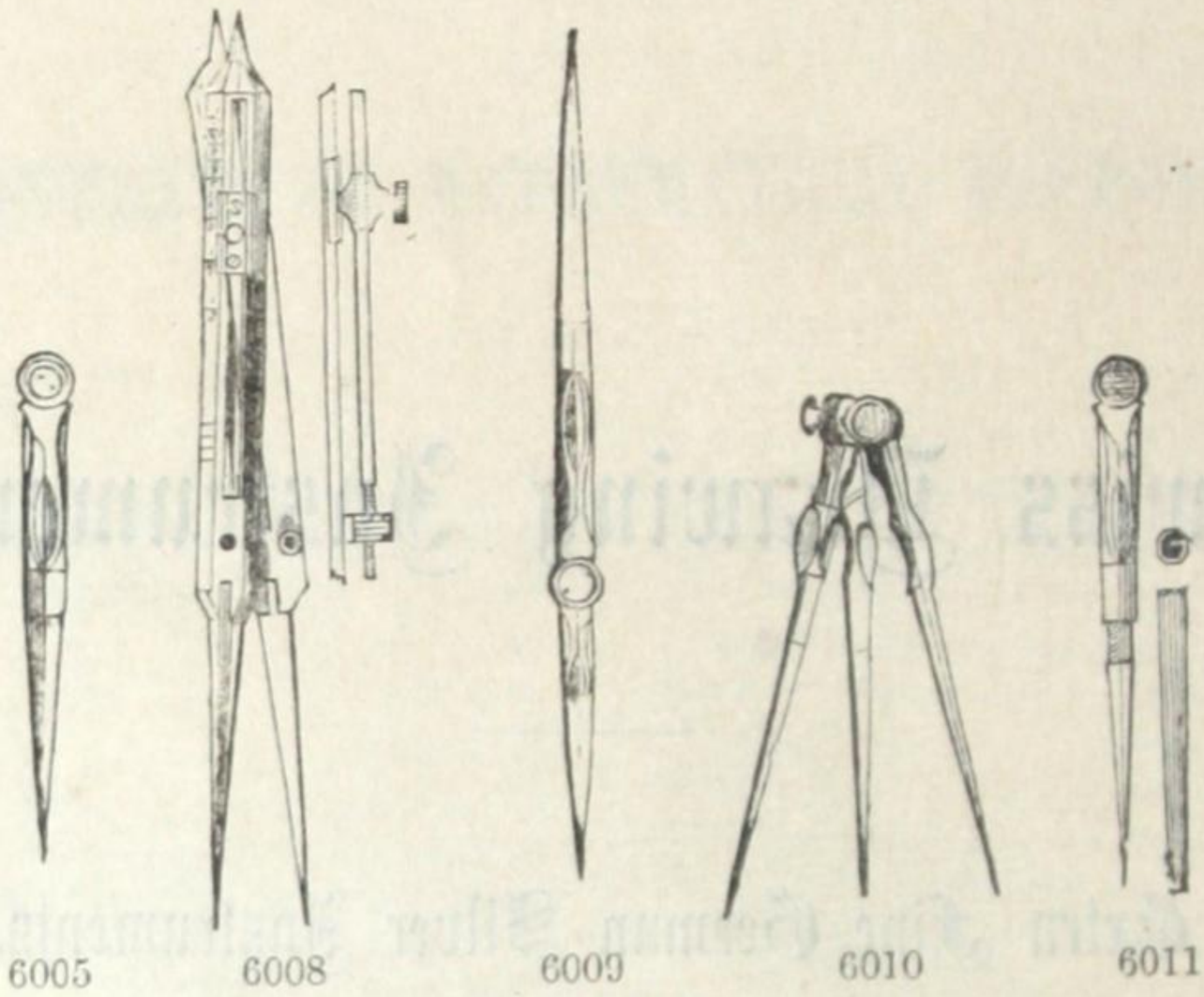
Extra Fine German Silver Instruments.

Having purchased from Mr. Amsler, who has retired from business, his interest in, and stock of, those celebrated Instruments, for which he was the principal agent, I am able to offer them on the most favorable terms.



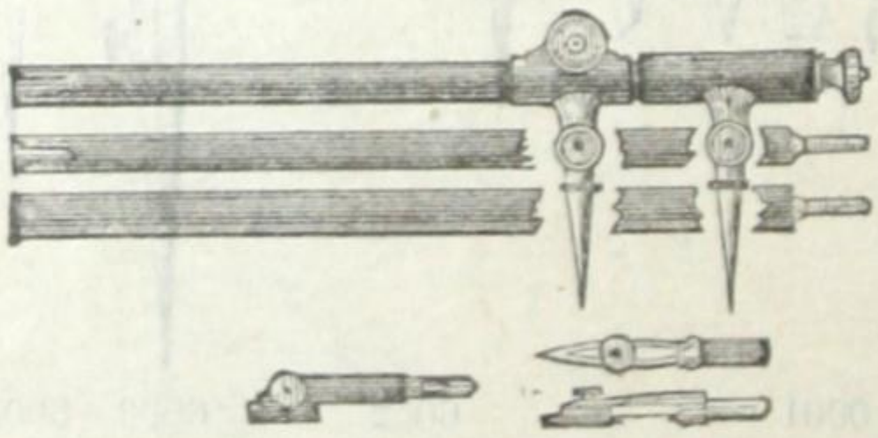
6000 6001 6002 6003 6004

No.		Price.
6000.	Dividers, 6½ inches long, with joints, in each leg, with pen, pencil-holder, needle-point, lengthening bar, and dotting pen,	$10 50
6001.	Dividers, 6 inches long, with pen, pencil-holder, needle-point, and lengthening bar,	7 75
6002.	Dividers, 4 inches long, with pen, pencil-holder, and needle-point,	5 75
6003.	Hair-spring Dividers, 5½ inches,	3 00
6004.	" " 4½ "	2 50

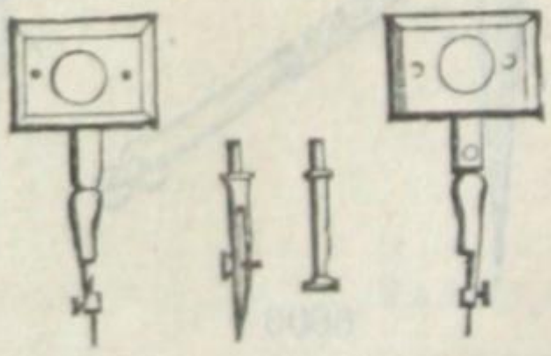


6005 6008 6009 6010 6011

No.		Price.
6005.	Plain Dividers, 5½ inches,	$2 25
6006.	" " 4½ "	1 80
6007.	Proportional Dividers, with Rack, finely graduated, for lines and circles, 9 inches long,	12 00
6008.	Proportional Dividers, with Micrometer adjustment, finely graduated for lines and circles, 9 inches long,	14 00
6009.	Whole and Half, or Bisecting Dividers,	4 00
6010.	Triangular Compass, 5 to 6 inches long,	5 00
6011.	Pocket Dividers, with Sheath,	2 50

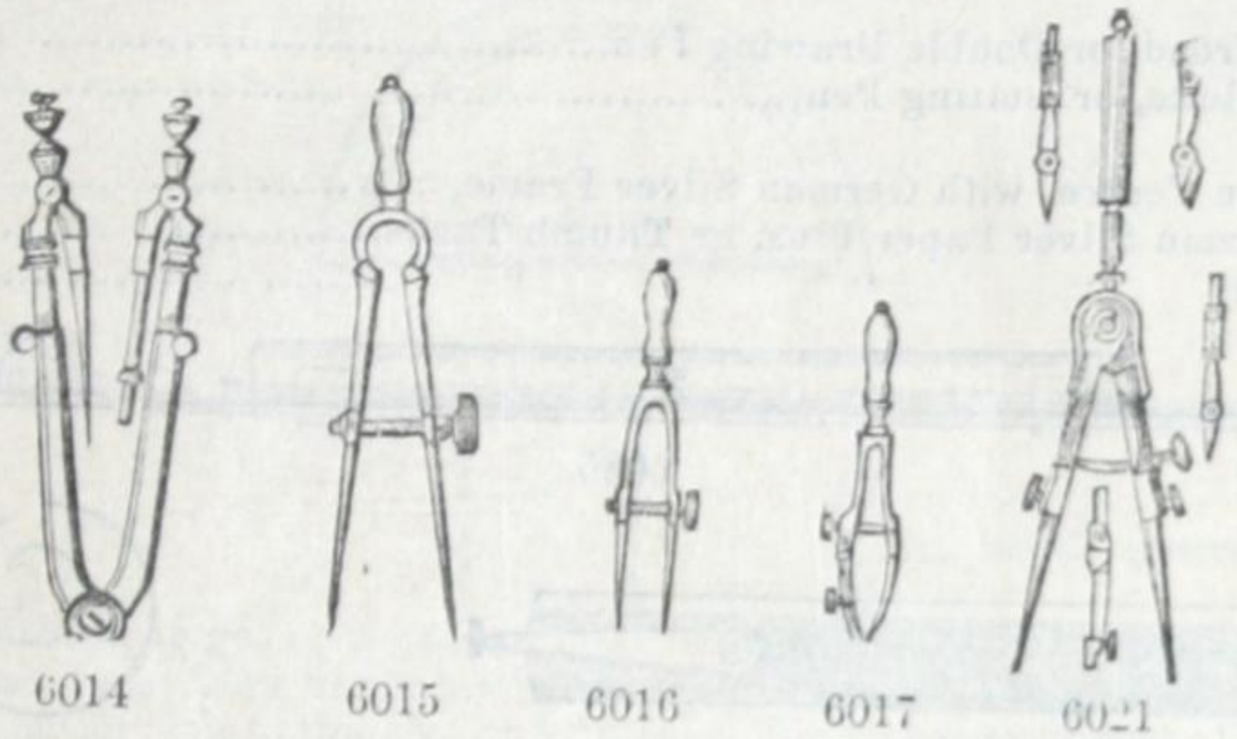


6012



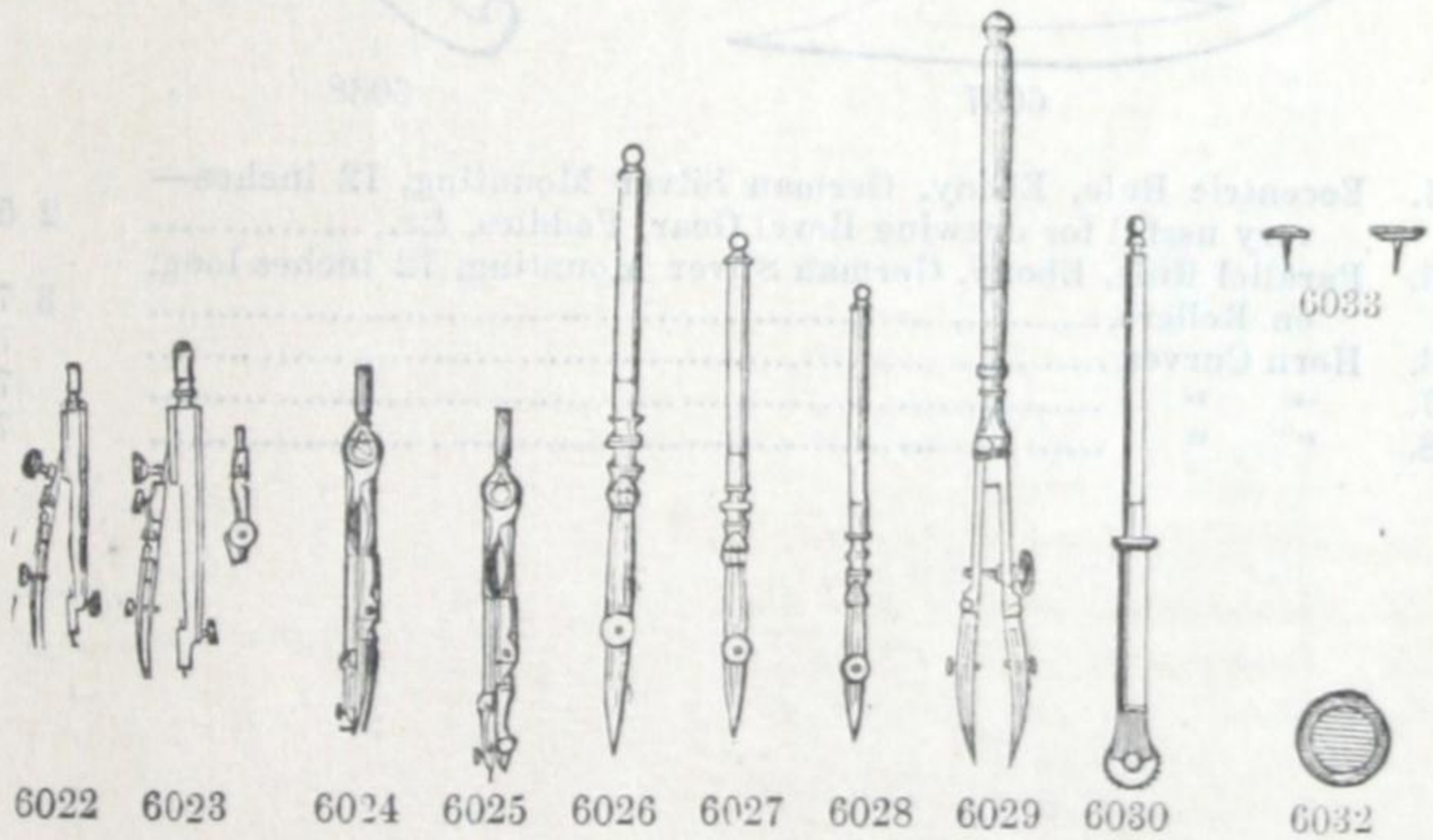
6013

6012.	Beam Compass, 24 inches long, in 3 German Silver bars, with pen, pencil, needle-point, and two straight points, Micrometer adjustment,	14 50
6013.	Furniture for Beam Compass, with pen, pencil, needle-point, two straight points, Micrometer adjustment,	8 00



6014 6015 6016 6017 6021

No.		Price
6014.	Universal, or Pillar Compasses, with handles—a very useful instrument,	$9 50
6015.	Large Steel-spring Stepping Divider,	3 00
6016.	Small " " " "	1 60
6017.	" " Bow Pen,	2 25
6018.	" " " " with needle-point,	3 00
6019.	" " " Pencil,	2 25
6020.	" " " " with needle-point,	3 00
6021.	Spring Bow Pen, 4 inches long, Ivory Handle, pencil, needle-point, 2 pen points—in fact, a complete set of instruments,	8 00



6033

6022 6023 6024 6025 6026 6027 6028 6029 6030 6032

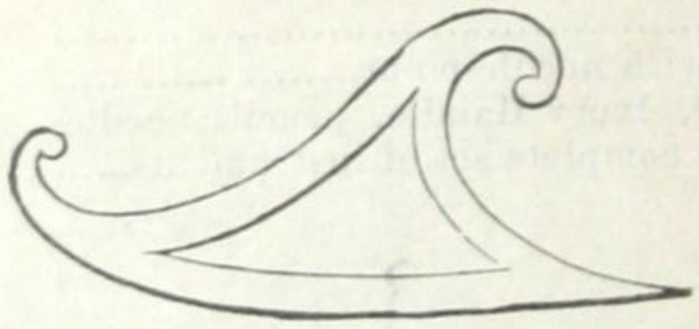
6022.	Spring Bow Pen, German Silver, with needle-point,	2 60
6023.	" " " " " and pencil-point,	3 50
6024.	Bow Compass, German Silver, with needle-point, and pen, joints in each leg,	3 50
6025.	Bow Compass, German Silver, with needle-point, and pencil-holder joints in each leg,	3 50
6026.	Drawing Pen, 6 inches long, with joints,	1 95
6027.	" 5¼ " "	1 70
6028.	" 4½ " "	1 55

No.		Price.
6029.	Railroad, or Double Drawing Pen,	$3 60
6030.	Roulette, or Dotting Pen,	2 50
6032.	Horn Centre, with German Silver Frame,	50
6033.	German Silver Paper Pins, or Thumb Tacks,	75
6033½.	Steel " " "	75

6035

6034

6036



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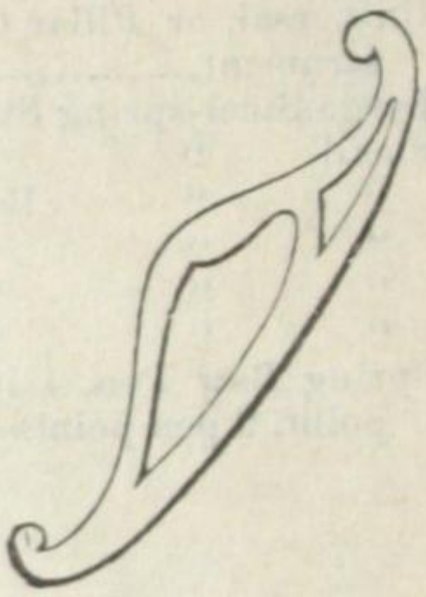
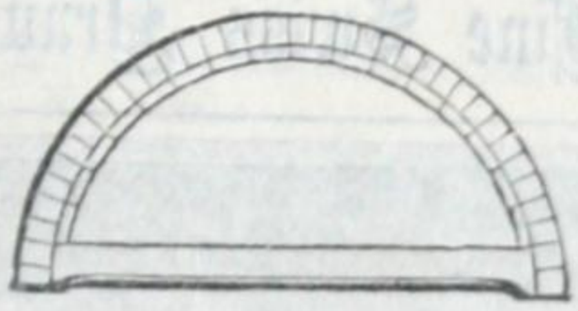


6038

6034.	Eccentric Rule, Ebony, German Silver Mounting, 12 inches—very useful for drawing Bevel Gear, Paddles, &c.,	2 50
6035.	Parallel Rule, Ebony, German Silver Mounting, 12 inches long, on Rollers,	3 75
6036.	Horn Curves,	75
6037.	" "	75
6038.	" "	75

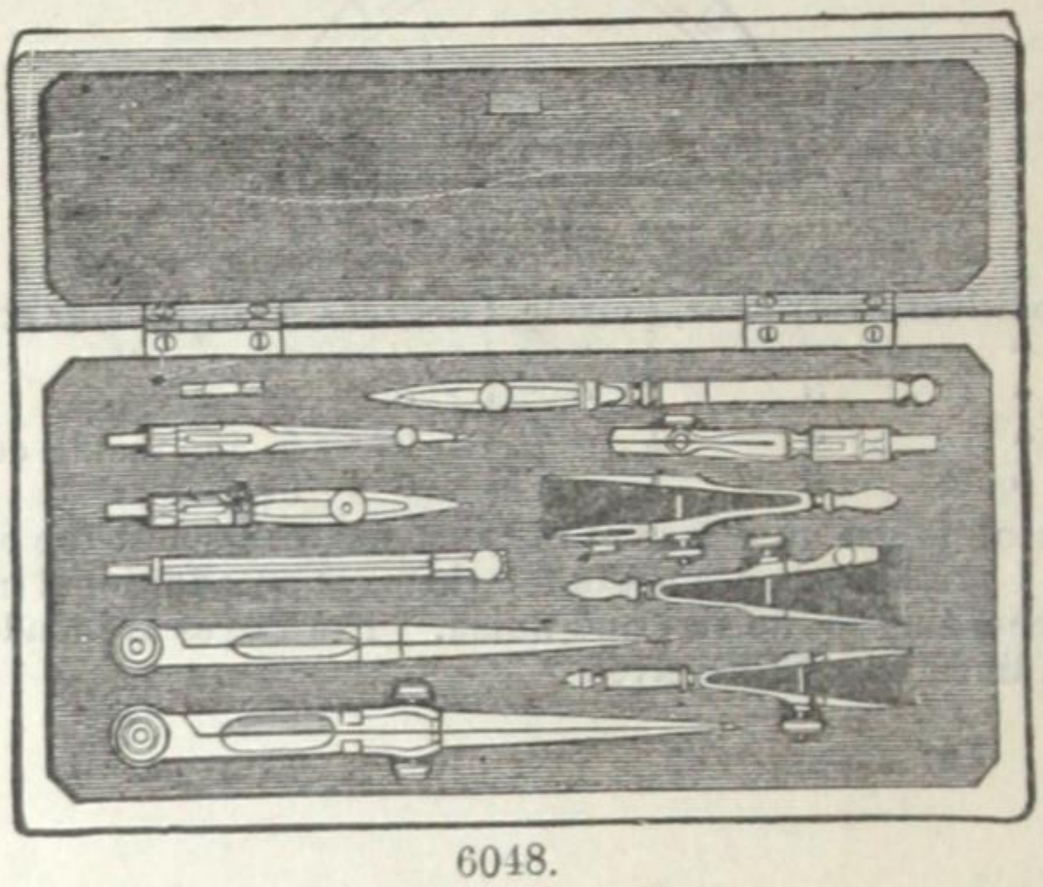


6039

6039.	German Silver Protractor,	$\frac{1}{2}$	circle,	1	degrees,	$4\frac{1}{4}$	in. outside centre,	1	80
6040.	"	"	$\frac{1}{2}$	"	$\frac{1}{2}$	"	$4\frac{3}{4}$ "	2	40
6041.	"	"	$\frac{1}{2}$	"	$\frac{1}{4}$	"	$5\frac{1}{2}$ "	3	70
6042.	"	"	$\frac{1}{2}$	"	$\frac{1}{4}$	"	5 in. inside centre,	2	75
6043.	"	"	$\frac{1}{2}$	"	$\frac{1}{4}$	"	$5\frac{3}{4}$ "	4	30

Persons wishing to get up a case of instruments, can select the pieces from the above list, and I can have boxes made for them, at an additional cost of from $5 to $20, each, according to the size and finish. The Boxes are made of Walnut or Rosewo)d, and lined with Silk-velvet.

Cases of Extra Fine Swiss Drawing Instruments.



6048.

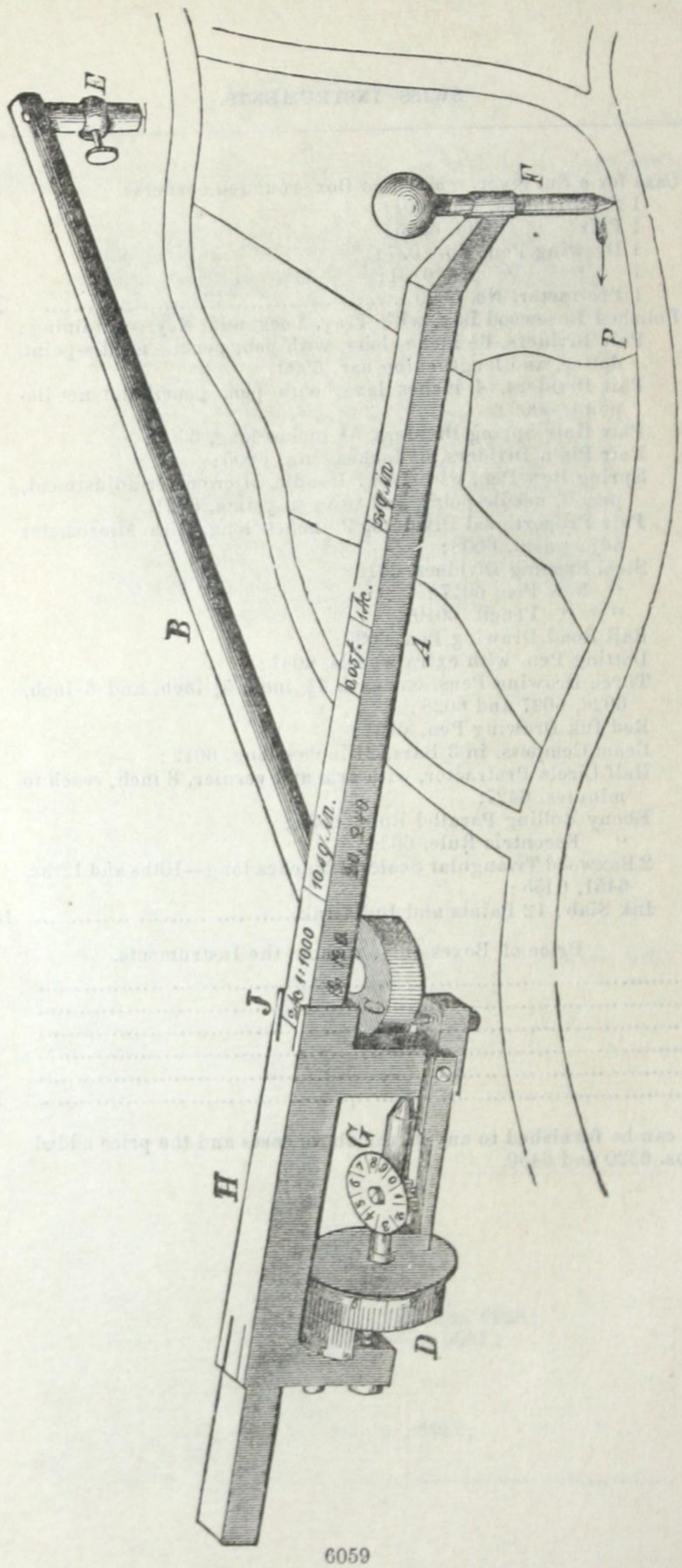
No.		Price.
6047.	Morocco Box, Rounded Corners, containing:— Set of Instruments, No. 6001; Plain Dividers, No. 6005; Drawing Pen, No. 6027	$14 00
6048.	Walnut Box, with Tray and Lock; Set of Instruments, No. 6001; Plain Dividers, No. 6005; Drawing Pen, No. 6027; Spacing Dividers, No. 6016. Steel Bow Pen, No. 6017; Steel Bow Pencil, No. 6019	$21 50
6049.	Same as 6048, with the addition of 6 inch Triangular Scale, 6453	23 00
6051.	Engineers' Case. Walnut Box, Lock and Tray:— Set of Instruments, No. 6001; Set of Instruments, No. 6002; Plain Dividers, No. 6005; Spacing Dividers, No. 6016; Steel Bow Pen, No. 6017; Steel Bow Pencil, No. 6019; Beam Compass, No. 6013; Drawing Pen, No. 6027	$36 50
6052.	Walnut Box, Tray and Lock:— Set of Instruments, No. 6001; Set of Instruments, No. 6002; Plain Dividers, No. 6005; Hair Spring Dividers, No. 6003; Three Drawing Pens, Nos. 6026, 6027 and 6028; Proportional Dividers, with Rack, No. 6007; Spacing Dividers, No. 6016; Steel Bow Pen, No. 6017; Steel Bow Pencil, No. 6019; Beam Compass, 3 bars, 24 inch, No. 6012; Road Pen, No. 6029; Dotting Pen, No. 6030	$70 00

No.		Price.
6053.	Case for a Surveyor. Morocco Box, rounded corners: 1 Set Dividers, No. 6001; 1 Pair " No. 6005; 1 Drawing Pen, No. 6027; 1 " " No. 6131; 1 Protractor, No. 6040	$17 00
6054.	Polished Rosewood Box, with Tray, Lock and Key, containing: Pair Dividers, 6½ inches long, with pen, pencil, needle-point, dotter, and lengthening bar, 6000; Pair Dividers, 4 inches long, with pen, pencil and needle-point, 6002; Pair Hair Spring Dividers, 5½ inches long, 6003; Pair Plain Dividers, 5½ inches long, 6005; Spring Bow Pen, with Ivory Handle, Micrometer adjustment, pencil, needle-point, and two pen points, 6021; Pair Proportional Dividers, 9 inches long, with Micrometer adjustment, 6008; Steel Spacing Dividers, 6016; " Bow Pen, 6017; " " Pencil, 6019; Rail Road Drawing Pen, 6029; Dotting Pen, with extra wheels, 6031; Three Drawing Pens, one each 4½ inch, 5¼ inch, and 6 inch, 6026, 6027 and 6028; Red Ink Drawing Pen, 6131; Beam Compass, in 3 Bars, 24 inches long, 6012; Half Circle Protractor, with arm and vernier, 8 inch, reach to minutes, 6427; Ebony Rolling Parallel Rule, 6035; " Eccentric Rule, 6034; 2 Boxwood Triangular Scales, 12 inches long—10ths and 12ths, 6451, 6455; Ink Slab; 12 Paints and India Ink	130 00

Price of Boxes only, without the Instruments.

6047.		2 50
6048.		3 75
6051.		5 00
6052.		8 00
6053.		2 50
6054.		17 00

Scales can be furnished to any of the above cases and the price added. See Nos. 6320 and 6450.



6059

AMSLER'S POLAR PLANIMETER.

Directions for Using Amsler's Polar Planimeter.

By means of AMSLER'S POLAR PLANIMETER, a person entirely ignorant of Geometry, may ascertain the area of any planimetrical figure, no matter how irregular its outlines may be, more correctly, and in much shorter time, than the most experienced Mathematician could calculate it.

The management of the Instrument can be easily learned in half an hour, and in size it is no larger than a two-feet folding rule.

The Planimeter indicates square feet, or square inches, and acres for surveying.

DIRECTIONS.—Preparatory to the use of the Instrument, ascertain its state:—The Index Roller D must play easily, without coming in contact with the nonius, (or vernier.) The screw centres, on which its axis revolves, must be adjusted so as to allow perfect freedom of rotation; the same is to be observed for the centre pin C.

The needle point E ought to project but very little from its socket. Great care must be taken not to bend any part of the instrument.

To ascertain the area of a figure in square inches, slide the square rod A into the tube H, so that the line marked 10 sq. in. (10 square inches,) stands fair with the bevelled part of the tube J. Then set the instrument on the paper, so that the index roller D, the tracing point F, and the needle point E, rest on the paper; press the latter point a little on the paper—not enough to pierce it through. This point is to remain stationary during the whole operation. Set the tracing point F on any point P of the outline, and mark that point, and read off the state of the counting wheel G, and the index roller D. Suppose the counting wheel indicates 3 (as in cut), the index roller 905 (90 degrees to be read on the index roller, and 5-10 on the nonius,) so that the O of the nonius stands on 90 5-1000 of the circumference of the index roller. Write down the number just read off thus, 3,905.

Now follow, with the tracing point F, the outline of the figure, or part of the figure to be measured, with great exactness, in the same direction as the hands of a watch would move, until you arrive at the starting point.

Straight lines may be followed along a rule; then read off again the state of the indicators. Suppose you find now 5,763, *i. e.* the counting wheel indicating 5, and the index roller and nonius 76 3-10 degrees. From these two readings, the area found is to be obtained, and here two points are to be considered.

A. If the needle point E is outside of the figure just traced round, the first number (3,905) is to be deducted from the second number (5,763).

5,763
3,905 and the remainder (1,858) is to be multiplied by ten, equal 18.58;
1,858 which is the area desired.

B. If the needle point E is inside of the outlines of the figure, add to the number last read off (5,763) the number marked on the side of the square rod next to where 10 sq. in. is marked on the upper side.

In this case, it is 20,240, the last number 5,763 read off
The number on side 20,240

26,003 Deduct from this amount the number first read off, 3,905

22,098 Multiply this remainder by ten, equal 220,98, and this is the amount of square inches, or area of the measured figure.

It is of no consequence whether the roller moves inside or outside of the outlines of the figure, provided it moves on a smooth surface even with the figure.

To obtain the area in square feet, slide the square rod into the tube up to the line marked 0,1 sq. ft. or 0,05 sq. ft. In this case the difference between the first and second readings of the indicators is to be multiplied by 0,1 or 0,05. If the

difference, for instance, is 4,653, the rod being up to the line marked 0,1 sq. ft., then is 4,653×0, 1=0,4653 equal to the area in decimal fractions of a square foot.

If the needle point is within the outlines of the figures as described in B, proceed the same way as at B, but multiply by 0,1 or 0,05.

If the figure to be measured is at a reduced scale, the result has to be multiplied by the square of the proportion of the reduction. If the proportion of the figure to the full size is as 1 : 10, the result is to be multiplied by $10^2 = 100$—for instance: the result of the first example is 1,858, which, multiplied by 100, (1,858×100)= 1858 sq. inches, would be the amount of the area.

If the amount of acres is to be ascertained, the proportion of the reduction being 1 : 1000, slide the square rod up to the line marked 2 ac. 1 : 1000, or 1 ac., and operate as indicated above; the result is to be multiplied by 1 or 2, instead of 10 or 5. If the rod is set up to the line marked 1 ac., no multiplication is necessary.

Should the plan of the piece of land be drawn on a smaller scale than 1-1000—for example, 1-5000th—then multiply the result with the square of the proportion of the reduction to the scale of 1-1000. Thus, for the scale of 1-5000, the result would have to be multiplied by 5×5=25, (1-5000ths being to 1-1000th as 5 : 1.) If the scale is 1-500th, multiply the result by $\frac{1}{2}^2 = \frac{1}{4}$, that is to say, divide the result by 4.

Remark.—If, on reading off the horizontal or counting wheel, G, the indicator points near the middle line between two figures, say between 3 or 4, then see how the index roller stands to the nonius. If the 0 on the nonius is on the lower side of the 0 of the roller, therefore near 100, then read 3; but if the 0 on the nonius is on the upper side, therefore near 0 on the roller, then read 4 for unity.

If the horizontal wheel turns on its axis during the tracing operation, so that it goes beyond 0, (in fact 10,) and even marks several revolutions, and then stops at any number—for instance, 7—you read 17 or 27, &c., adding as many times ten as the wheel has made full revolutions.

It is easy to notice the number of revolutions. If the wheel G marks 6, and the roller D is, for instance, on 0 degrees 7-10 degrees, or on 4 degrees 7-10 degrees, then the reading is of course 6,007, or 6,047. The number read off the nonius always taking the third place after the units.

The cut shows the actual size of the Instrument.

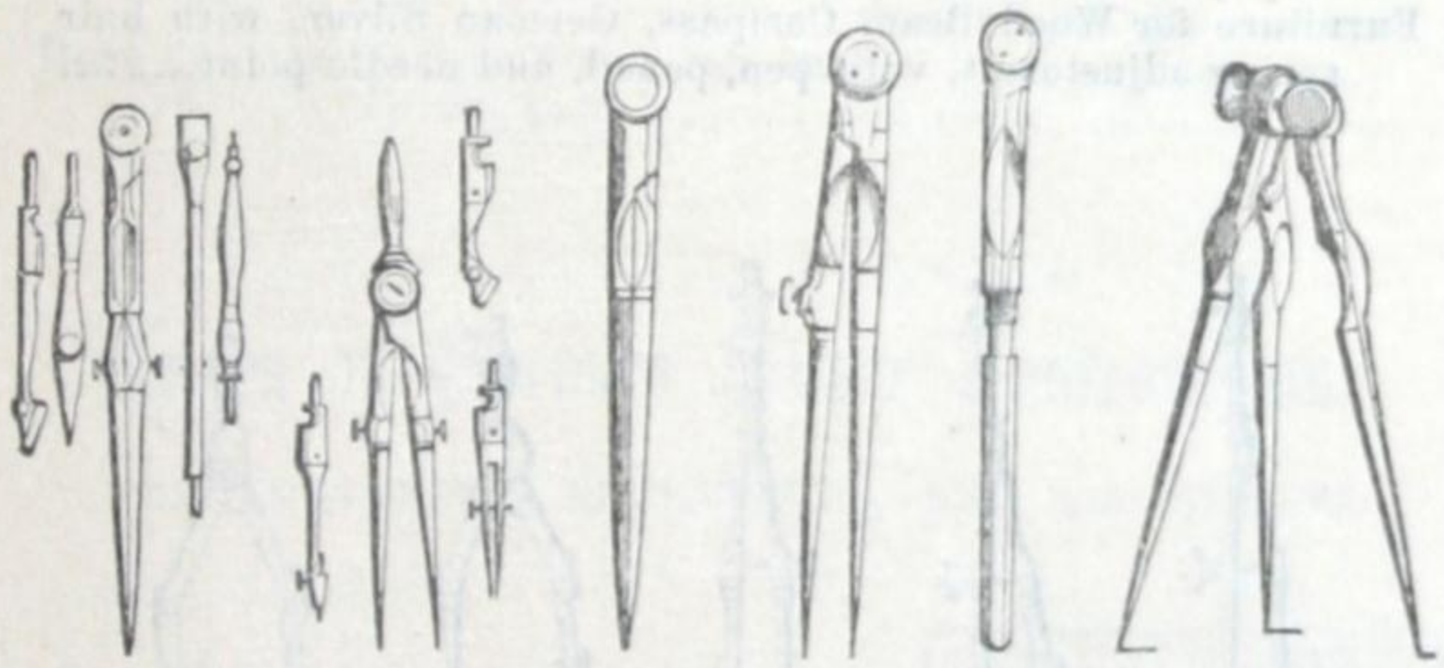
Price in Box,..... $35 00

Draftsmen, Engineers, Surveyors, Ship Builders, Architects, Machinists, will please devote *a few moments* only to the examination of this instrument, and they will at once be convinced of its great importance and value.

Mathematical Instruments.

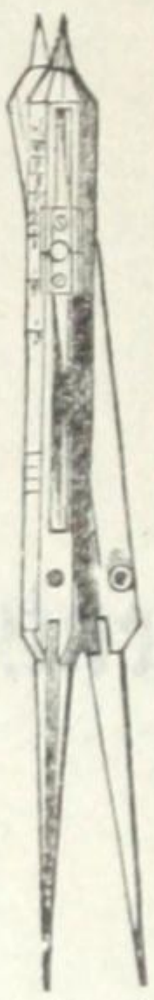
German Silver Instruments.

BUT NOT EQUAL TO THE SWISS.



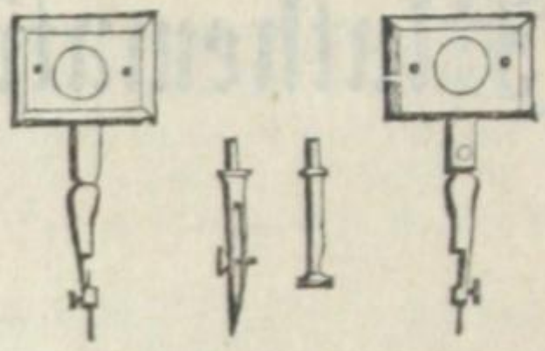
6100 6101 6104 6107 6109 6110

6100.	Dividers, German Silver, 6 inches long, with pen, pencil, needle-point, and lengthening bar	3 50
6101.	Dividers, German Silver, 3 inches long, with pen, pencil and needle-point	2 75
6104.	Dividers, German Silver, 5 inch long,	80
6107.	" " 5 " with hair spring	1 80
6109.	Pocket Dividers, German Silver, 5 inches long, with shields for pocket	2 00
6110.	Triangular Compass, German Silver, with 3 legs. 5 inches long	3 50



6111

6114



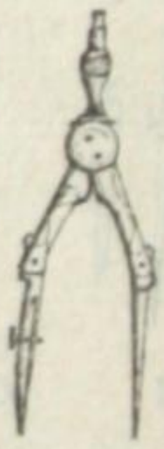
6115

No.		Price.
6111.	Proportional Dividers, German Silver, medium quality	$2 25
6112.	Proportional Dividers, German Silver, 9 inches long, with Rack, finely graduated for lines and circles	12 00
6113.	Whole and Half Dividers, German Silver	3 75
6114.	Universal Dividers, German Silver, for the Pocket, with handles, with points to shift	9 50
6115.	Furniture for Wood Beam Compass, German Silver, with hair spring adjustment, with pen, pencil, and needle-point	6 00

6118

6119

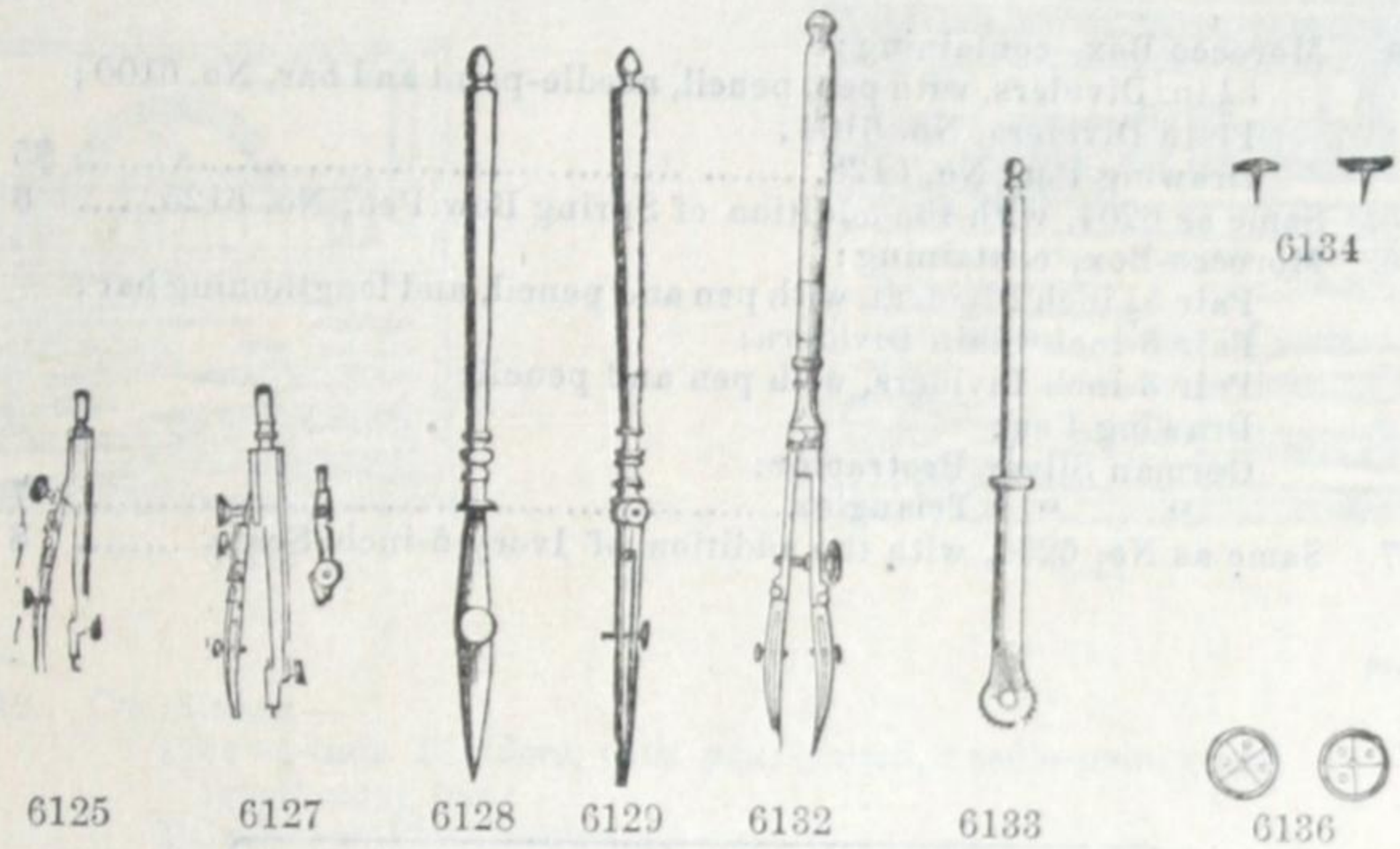
6120



6123

6124

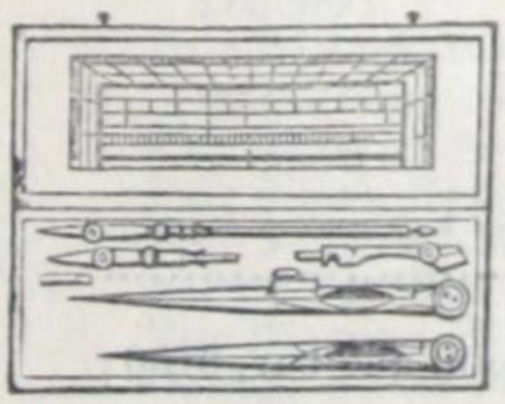
6118.	Steel Spacing Dividers	1 60
6119.	" Bow Pen	2 25
6120.	" " Pencil	2 25
6121.	" " Pen, with needle-point	3 00
6122.	" " Pencil, "	3 00
6123.	Dividers, German Silver, with pen, joint in each leg	3 50
6124.	Dividers, German Silver, with pencil, joint in each leg, and needle-point	3 50



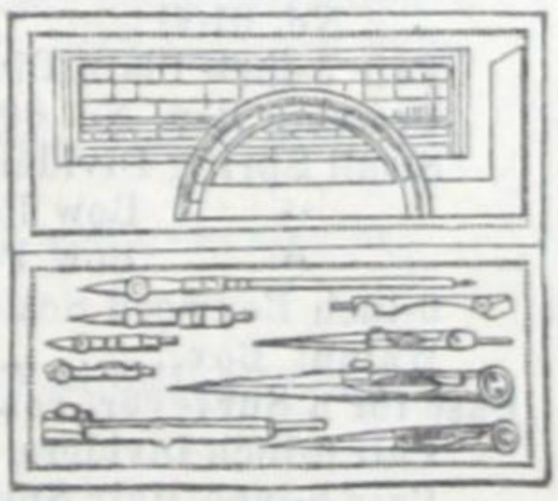
No.		Price.
6125.	Bow Pen, German Silver, with adjusting spring and needle-point,	$2 60
6127.	" " " " " and pencil leg	3 50
6128.	Drawing Pen, German Silver, hinge to pen	60
6129.	" " " and Protracting Pin,	75
6131.	Drawing Pen, all German Silver, for Red Ink	95
6132.	Railroad, or Double Drawing Pen, German Silver, fine finish	3 60
6133.	Roulette, German Silver, for dotting lines	95
6134.	German Silver Paper Tacks, flat heads—per doz	75
6135.	" " " larger—per doz	1 00
6136.	Horn Centres, German Silver rim, each	50
6137.	" No rim, each	25

Cases of German Silver Instruments.

FOR ENGINEERS, ARCHITECTS, AND MACHINISTS.



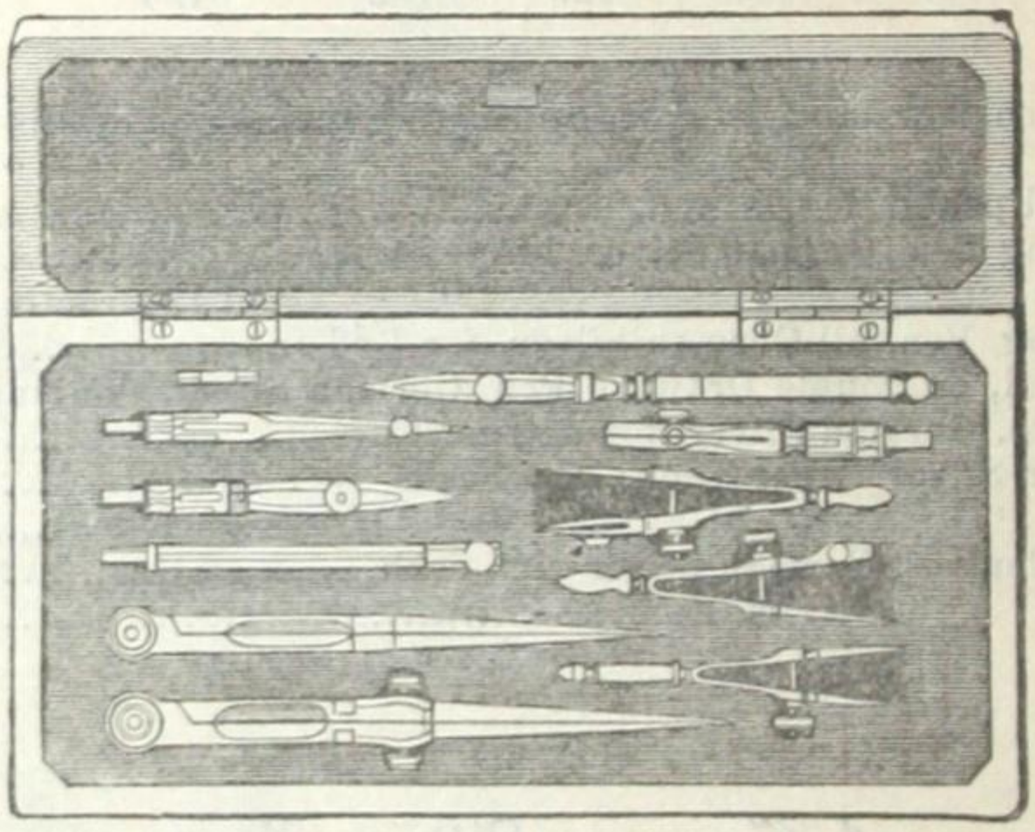
6203



6206

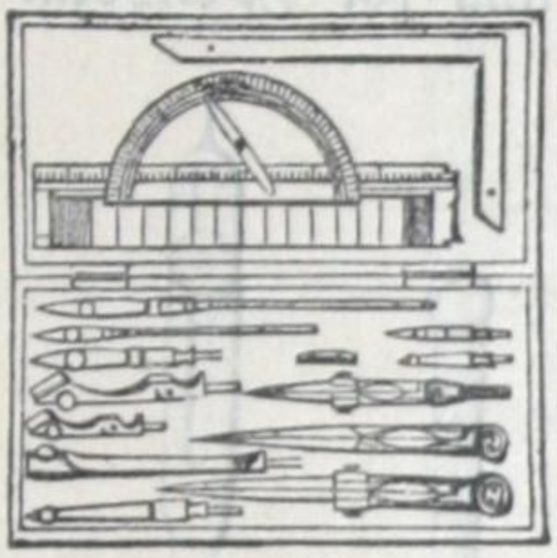
6200. Morocco Box, containing pair 3-inch Dividers, with pen, pencil, and needle-point 4 00

No.		Price.
6204.	Morocco Box, containing: 5½ in. Dividers, with pen, pencil, needle-point and bar, No. 6100; Plain Dividers, No. 6104; Drawing Pen, No. 6128,	$5 00
6205.	Same as 6204, with the addition of Spring Bow Pen, No. 6125	6 50
6206.	Morocco Box, containing: Pair 5½ inch Dividers, with pen and pencil, and lengthening bar; Pair 5-inch Plain Dividers; Pair 3-inch Dividers, with pen and pencil; Drawing Pen; German Silver Protractor; " " Triangle	7 50
6207.	Same as No. 6206, with the addition of Ivory 6-inch Scale.	8 25

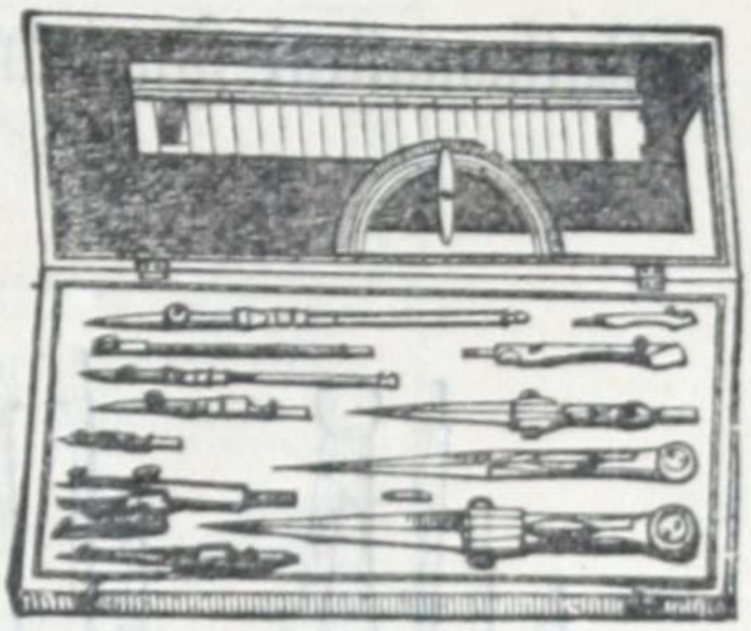


6208.

6208.	Case for a Machinist, containing:— Pair 6-inch Dividers, with pen, pencil, needle-point and bar, No. 6100; Pair 5-inch Plain Dividers, No. 6104; Drawing Pen, No. 6027; Small Spring Dividers, No. 6016; " Bow Pen, No. 6017 " Bow Pencil, No. 6019; 6-inch Boxwood Scale and Protractor, 6323; Walnut Box	13 50
6209	Case for a Surveyor, containing:— Pair 6-inch Dividers, pen, pencil, needle-point and bar, 6100; Pair 5-inch Hair Spring Dividers, 6107; Drawing Pen, No. 6027; " for Red Ink; 4¾-inch fine half-circle German Silver Protractor, No. 6040; Morocco Box, rounded corners	11 50



6210



6211

No. Price

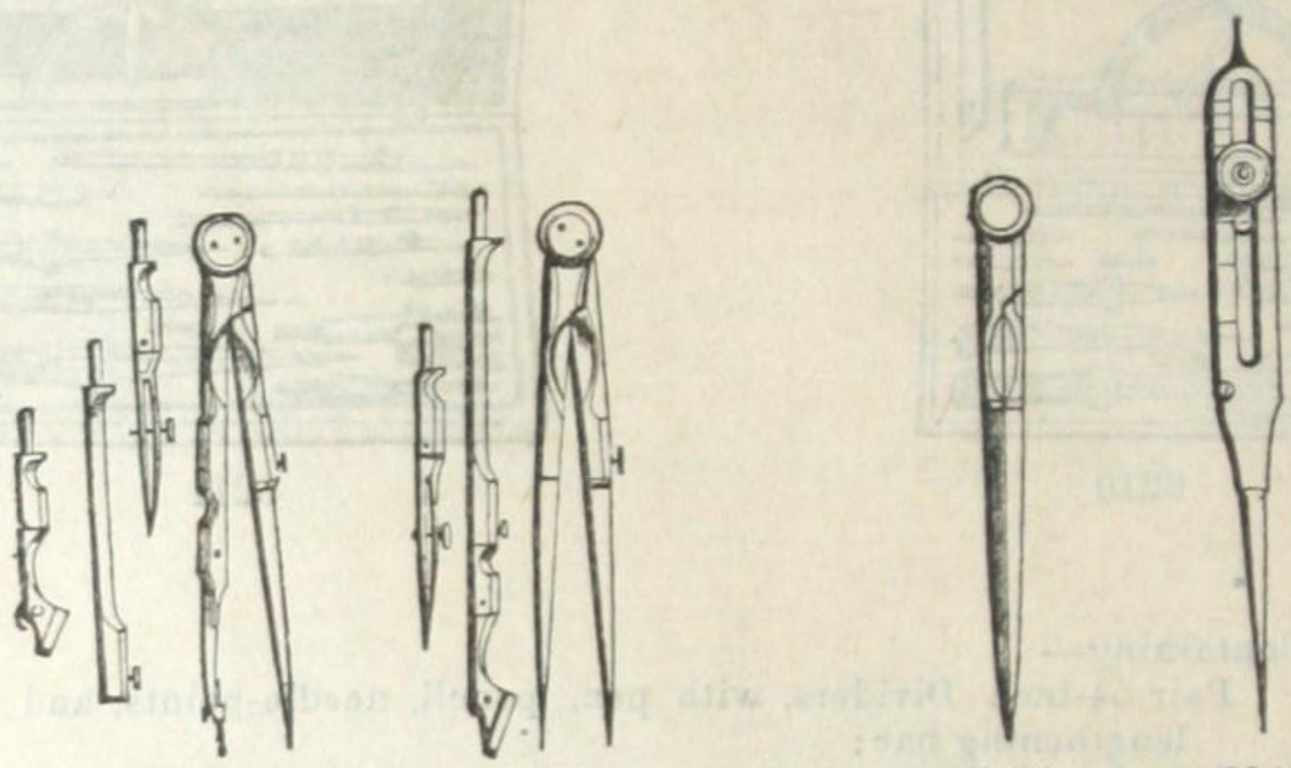
6210. Containing—
Pair 5½-inch Dividers, with pen, pencil, needle-points, and lengthening bar;
Pair 5-inch Plain Dividers;
Pair 3-inch Dividers, with pen, pencil, and needle-point;
Two Drawing Pens;
German Silver Protractor;
In a polished Walnut Box..... 10 50

6211. Polished Walnut Box, containing—
Pair 5½-inch Dividers, with pen, pencil, needle-point, and lengthening bar;
Pair 5-inch Plain Dividers;
Pair 3-inch Dividers, with pen, pencil, and needle-point;
Bow Pen, German Silver, with adjusting spring and needle-point;
Two Drawing Pens..... 11 25
German Silver Protractor;

6212. Morocco Box, containing—
Pair 5½-inch Dividers, with pen, pencil, needle-point, and lengthening bar.....
Pair 5-inch Hair Spring Dividers;
Pair 5-inch Plain Dividers;
Pair-3-inch Dividers, with pen, pencil, and needle-point;
Two Drawing Pens..... 10 00
Nos. 6204, 6205, 6209, 6211 and 6212 have no Scale with them; Scales can be added at the usual price, if desired, (See pages 21, 24 and 25),

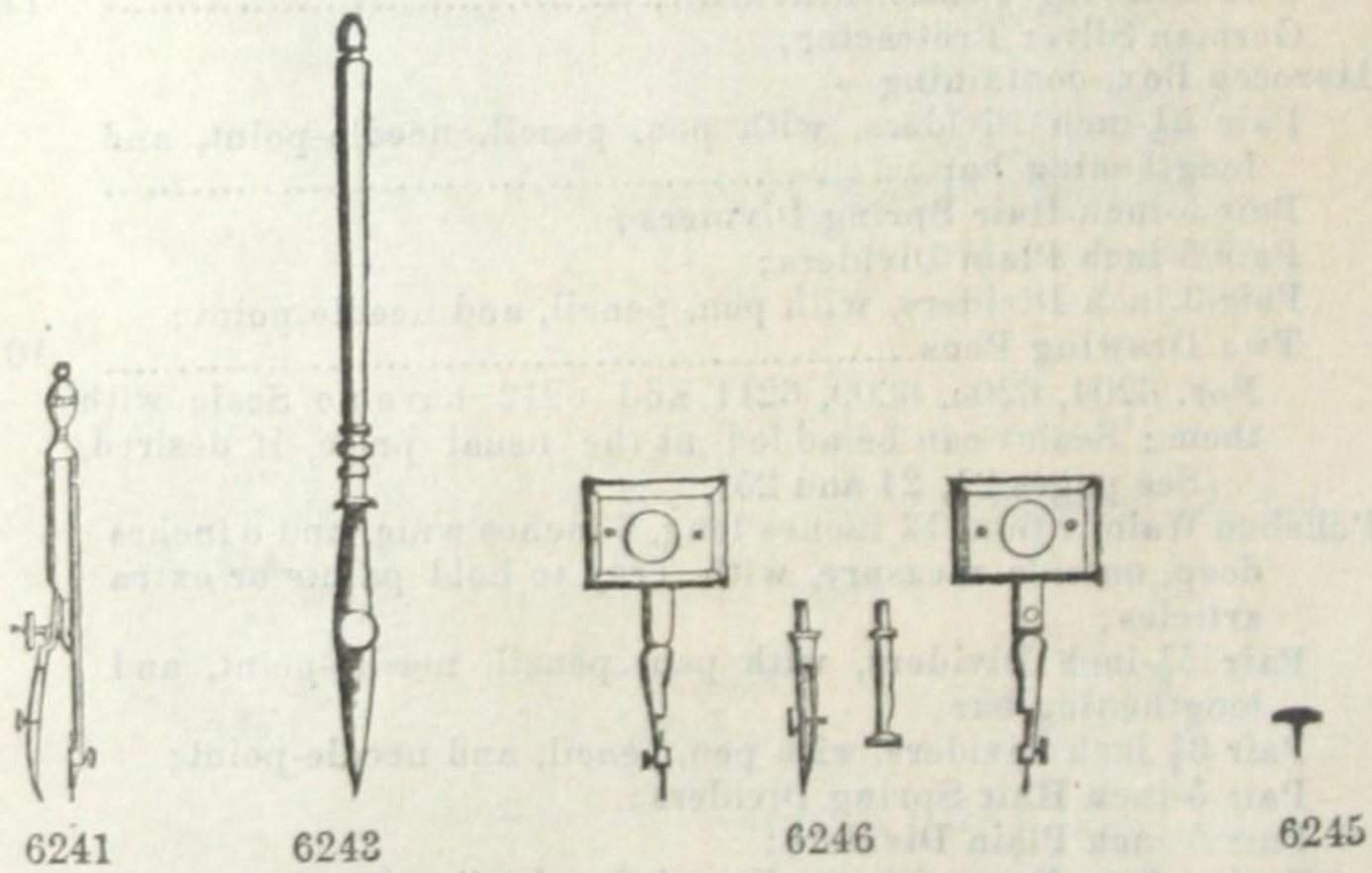
6213. Polished Walnut Box, 13 inches long, 6 inches wide, and 3 inches deep, outside measure, with Tray to hold paints or extra articles;
Pair 5½-inch Dividers, with pen, pencil, needle-point, and lengthening bar;
Pair 3½ inch Dividers, with pen, pencil, and needle-point;
Pair 5-inch Hair Spring Dividers;
Pair 5-inch Plain Dividers;
Spring Bow Pen, with needle-point and adjusting spring;
Two Drawing Pens;
German Silver Protractor;
Rubber Square;
Boxwood Triangular Scale, 12 inches long..... 21 00

Mathematical Instruments of Brass for Schools.



6224 6225 6232 6240

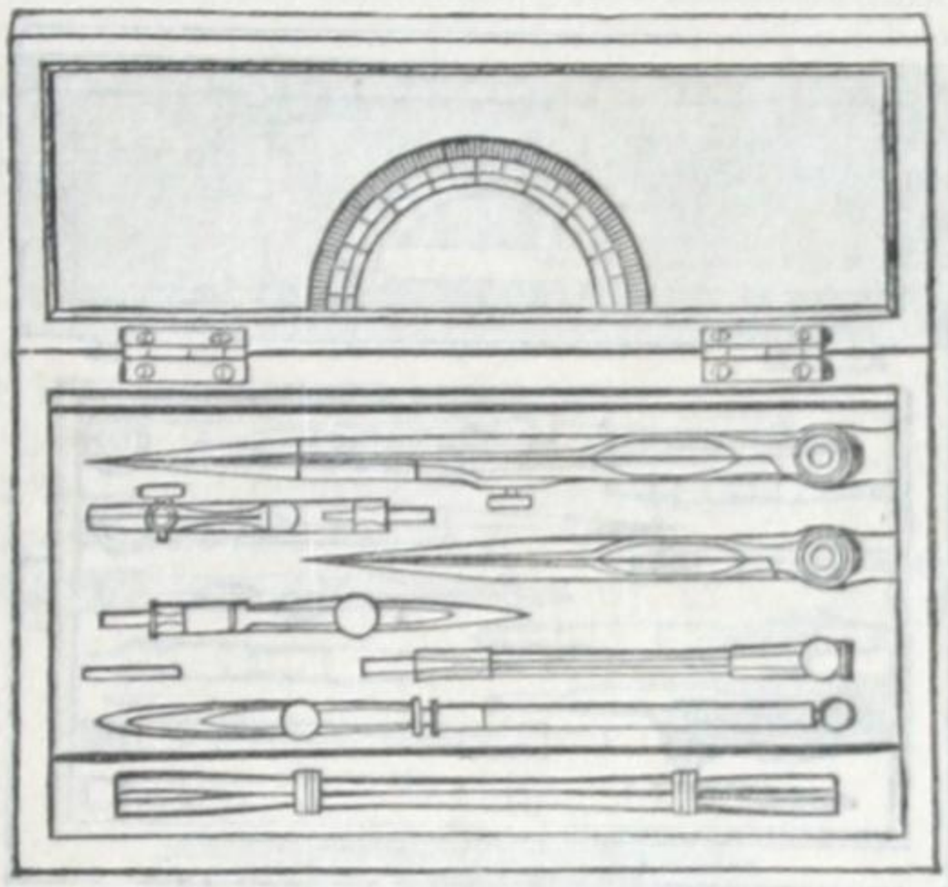
No.		Price.
6224.	Dividers, Brass, medium quality, 6 inches long, with pen, pencil, needle point, and lengthening bar	$ 1 00
6225.	Dividers, Brass, medium quality, 6 inches long, with pen, pencil, and lengthening bar	85
6232.	Dividers, Brass, medium quality, 5 inches long	40
6240.	Proportional Dividers, Brass, medium quality	2 00



6241 6242 6246 6245

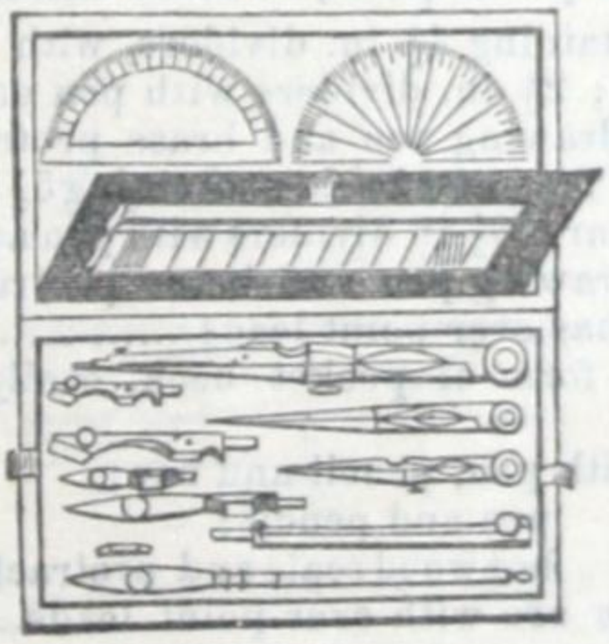
6241.	Bow Pens, Brass, with adjusting spring	1 00
6242.	Bow Pencils, Brass, with adjusting spring	1 00
6243.	Drawing Pens, Brass, mounted	85
6245.	Brass, Paper, Tacks, per doz	24

Cases of Brass Drawing Instruments, for Schools.



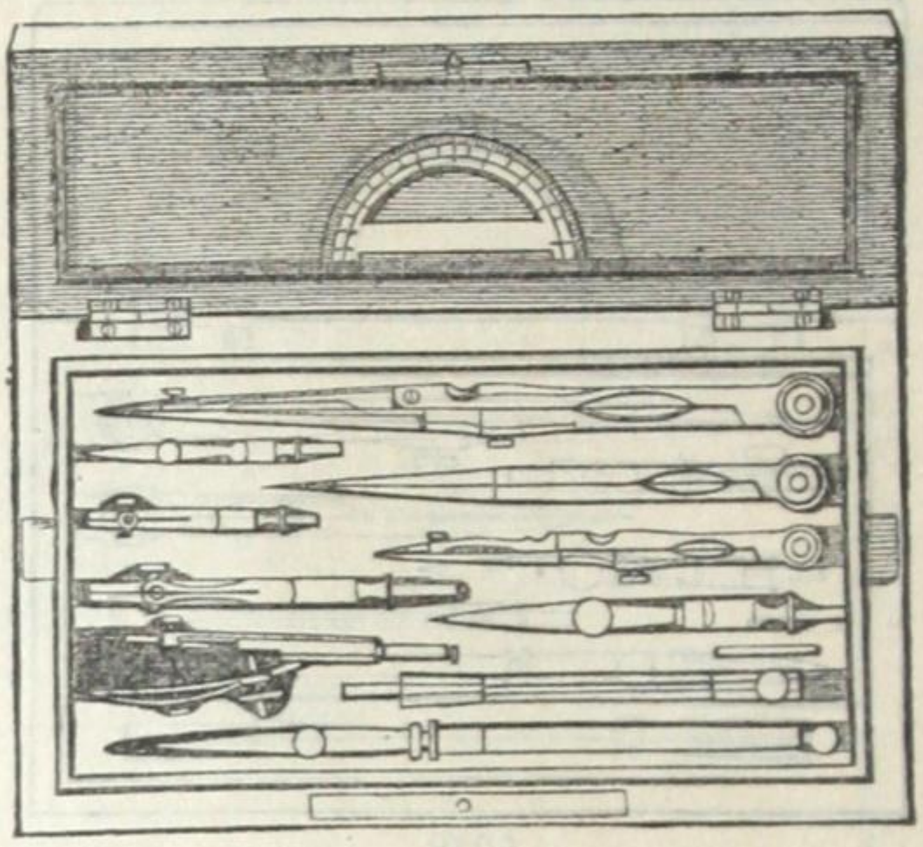
6249

No		Price.
6249	Rosewood Box, One set 4½ in. dividers, pen, pencil and bar. One pair plaindividers, 3½ in. One ebony handle drawing pen. One brass protractor	$ 1 20
6250.	Polished Mahogany Box, containing :— Pair 6-inch Dividers, with pen, pencil, and lengthening bar ; Pair 5-inch Plain Dividers ; Drawing Pen ; Horn Protractor	1 50
6251.	Same as No. 6250, with addition of 6-inch Boxwood Plotting Scale,	1 65
6252.	Same as No. 6251, with the addition of Ebony 6-inch Parallel Rule	1 90



6259

6259.	Polished Rosewood Box, with Tray and Lock and Key, containing Pair of 6-inch Needle Point Dividers, with Pen, Pencil and lengthening bar ; Pair 5-inch Plain Dividers ; Pair 3½-inch Dividers, with needle-point, pen and pencil ; Drawing Pen ; Brass Protractor ; Horn Protractor ; Boxwood Scale, 6 inches long	3 40
6260.	Same as No. 6259, with the addition of Ebony Parallel Rule, 6 inches long	3 65



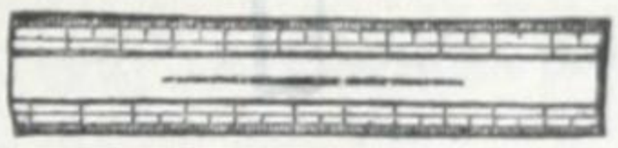
6261

No.		Price.
6261.	Polished Rosewood Box, with Tray, and Lock and Key, containing Pair 6-inch Needle Point Dividers, with pen, pencil and lengthening bar; Pair 5-inch Plain Dividers; Pair 3½ inch Needle Point Dividers, with pen and pencil; Spring Bow Pen, with adjusting screw and needle point; Drawing Pen; Brass Protractor; Horn Protractor; Ivory Plotting Scale, 6-inches long.....	$4 50
6262.	Same as No. 6261, with the addition of Ebony Parallel Rule,.....	4 75
6263.	Same as 6261, with the addition of a pa. of Proportional Dividers.....	6 50
	If with patent pencil point, 50 cents extra.	
6264.	Rosewood box containing 4½ in. dividers, with pen, pencil, and lengthening bar; 2½ in. dividers with pen and pencil; 3¾ in. plain dividers, drawing pen and brass protractor.....	2 00
6265.	Rosewood Box with Tray and Lock, containing 5½ in. dividers, with pen, pencil and bar; 3½ in dividers with pen and pencil; 4¼ in. plain dividers, drawing pen and brass protractor.....	2 50
6266.	Same as 6265, but has ever-point leads.....	3 00
6267.	Is a neat case in form of pocket book, easily carried in the pocket, contains 4½ in. dividers, with pen, pencil and bar; 2½ " " pen and pencil; 3½ " " boxwood scale and protractor; drawing pen. These instruments are with ever-point leads.....	2 75

6320

6322

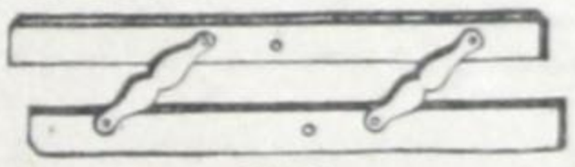
No.		Price.
6320.	Ivory 6-inch Plotting Scale, school quality	$ 75
6321.	Boxwood 6-inch Plotting Scale, school quality	15
6322.	Ivory 6-inch Scale and Protractor, school quality	1 50
6323.	Boxwood 6-inch Scale and Protractor, school quality	50
6330.	Ivory Scales and Protractors, fine quality, of various sizes and prices.	



6335

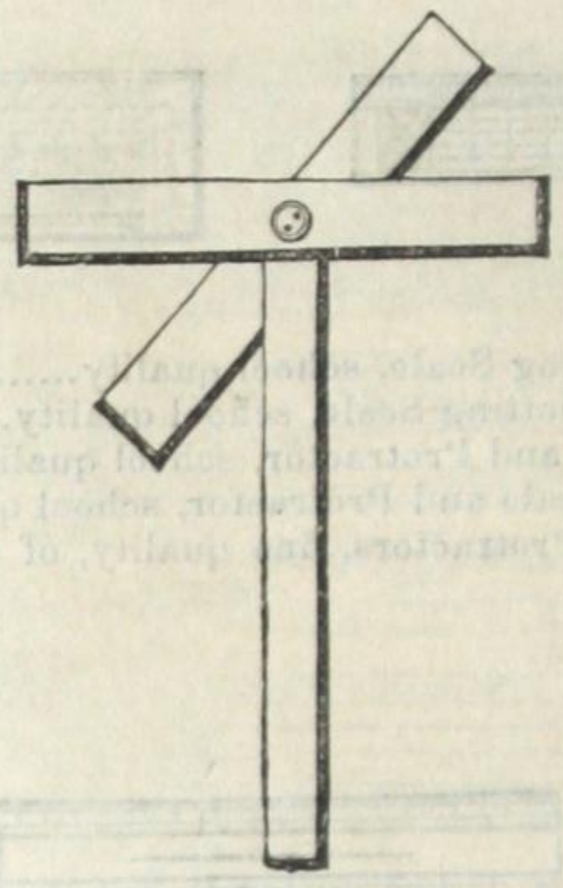
6335.	Ivory 12-inch Chain Scale, 20 and 50	3 00
6336.	" " " " 30 and 40	3 00
6337.	" " " " 60 and 100,	3 25
6340.	" " " " 16 graduations	3 75
6345.	Boxwood 12-inch Chain Scale, 20 and 50	1 25
6346.	" " " " 30 and 40	1 25
6347.	" " " " 10 and 16	1 25
6348.	" " " " 12 and 16	1 25
6352.	Boxw'd Chain Scale, 12 inches, graduated $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1, $\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 inch, each graduation subdivided into 12ths	1 50
6353.	Boxwood Chain Scale, 12 inches, graduated $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$ and 1, each graduation subdivided into 12ths	1 25
6355.	Boxwood 12-inch School of Design Scale, 8ths and 10ths	1 00

Parallel Rules.



6358.

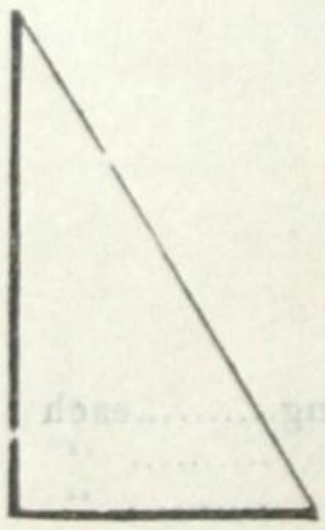
6358.	Parallel Rules, Ebony, brass mounted, 6 inches long ..... each	25
6359.	" " " " " 9 " ..... "	50
6360.	" " " " " 12 " ..... "	75
6361.	" " " " " 15 " ..... "	1 25
6363.	" " all brass, 12 " ..... "	4 00
6364.	" " " 15 " ..... "	5 00
6365.	" " " 18 " ..... "	6 00
6366.	" " " on Rollers, 9 " ..... "	6 00
6367.	" " " " 12 " ..... "	8 50
6368.	" " " " 15 " ..... "	10 00
6369.	" " Ebony, 12 inches long, on Rollers, Ivory graduated edge ..... "	6 50



T SQUARES.

No.		Price.
6375.	T Square, Fixed Head Blade, 18 inches long each	40
6376.	" " " " 24 " "	50
6377.	" " " " 30 " "	65
6378.	" " " " 36 " "	85
6379.	" Swivel " " 18 " "	1 00
6380.	" " " " 24 " "	1 20
6381.	" " " " 27 " "	1 35
6382.	" " " " 30 " "	1 35
6383.	" " " " 36 " "	1 60

Triangles, Squares and Curves.



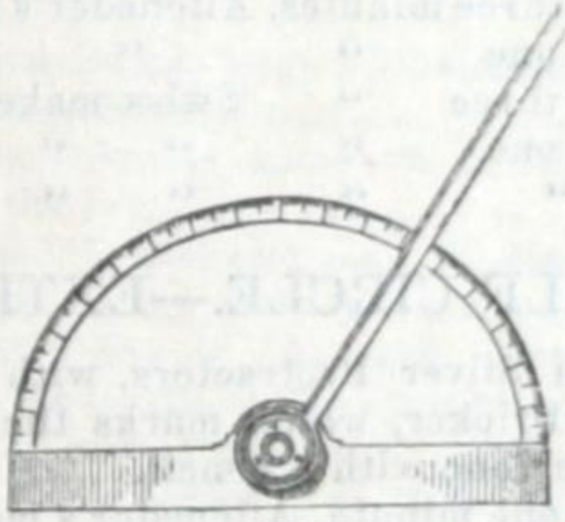
6395

6408

6395.	Whitewood Triangles, 30, 60 and 90 degrees, perpendicular, 5 to 9 inches long	20
6396.	Whitewood Triangles, 30, 60 and 90 degrees, perpendicular, 9 to 12 inches long	30
6397.	Whitewood Triangles, 45, 45 and 90 degrees	25
6398.	Triangle, framed of three kinds of wood, open centre, 30, 60 and 90 degrees, perpendicular 9 inches long	75

No.		Price.
6399.	Triangle, framed of three kinds of wood, open centre, 45, 45 and 90 perpendicular, 6 inches long	$ 75
6400.	Triangle, Gutta Percha, perpendicular, 6 inches long, 30, 60, and 90 degrees, 45, 45 and 90 degrees	50c. to 2 00
6402.	Gutta Percha, irregular curves	30c. to 2 00
6403.	German Silver Triangle, 30, 60 and 90 degrees perpendicular, 6 to 7 inches long	2 50
6404.	German Silver Triangle, 30, 60 and 90 degrees perpendicular, 8 to 10 inches long	3 50
6405.	German Silver Triangle, 45, 45 and 90 degrees perpendicular, 4 to 5 inches long	2 75
6406.	German Silver Triangle, 45, 45 and 90 degrees, perpendicular, 6 to 7 inches long	3 50
	Nos. 6403 to 6406 are made with Ivory buttons inserted in the German Silver, to prevent the triangle from soiling the paper.	
6408.	Whitewood Irregular Curves, various patterns ..... each	25
6409.	Horn " " " " ..... "	65
6410.	Drawing Board, 15 by 21 inches, moveable back	2 00
6411.	" " 30 by 40 " " "	5 00
6412.	" " 15 by 21 " plain	1 50
6413.	" " 15 by 21 " " on sloping supports like Writing Desk	2 00

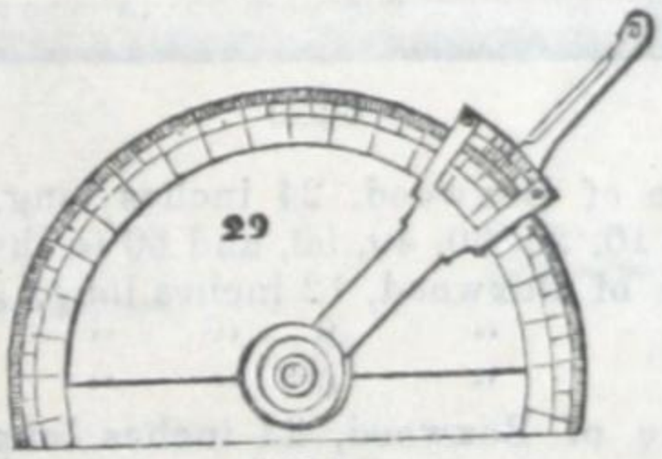
Finest German Silver Protractors.



6420

German Silver Half Circle Protractors, with Arm and Horn Centre.

6420.	5 inches, ½ degrees, Alteneder's make	6 50
6421.	6 " ½ " " "	7 50
6422.	7 " ½ " " "	9 00

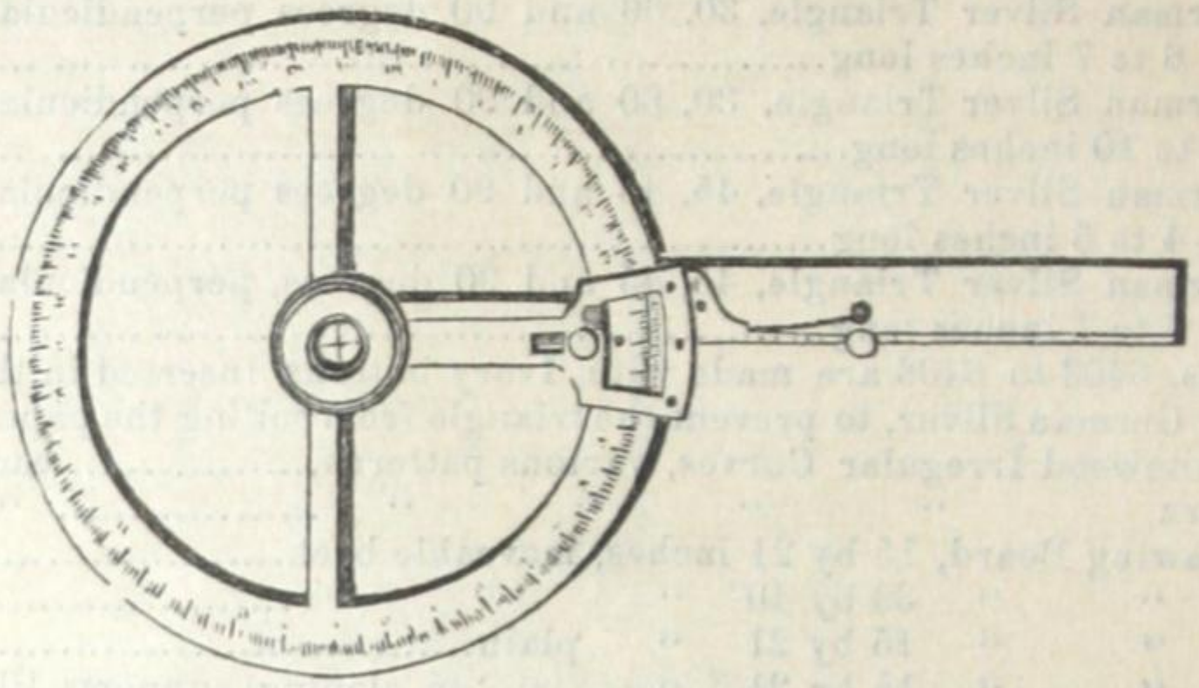


6423

German Silver Half Circle Protractors, with Arm, Vernier and Horn Centre.

6423.	5 inches, reading to three minutes, Alteneder's make	10 00
6424.	6 " " " " " "	12 00

No.		Price.
6425½.	8 inches, reading to minutes, Alteneder's make	$16 00
6425.	7 inches, reading to one minute, Alteneder's make	14 00
6426.	5½ " " to three " Swiss make	10 50
6427.	8 " " to one " " "	14 00
6428.	10 " " " " " "	17 00



6429.

WHOLE CIRCLE.

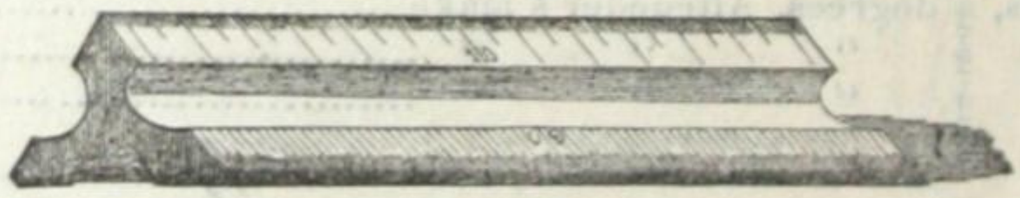
German Silver Whole Circle Protractors, with Arm, Vernier and Horn centre.

6429.	6 inches, reading to three minutes, Alteneder's make	15 00
6430.	8 " " to one " " "	18 00
6431.	5½ " " to three " Swiss make	13 50
6432.	8 " " to one " " "	15 50
6433.	10 " " " " " "	19 00

HALF CIRCLE.—EXTRA.

Half Circle German Silver Protractors, with Arm, Vernier and Horn centre and Pricker, which marks the degree more accurately than can be done with a pencil.

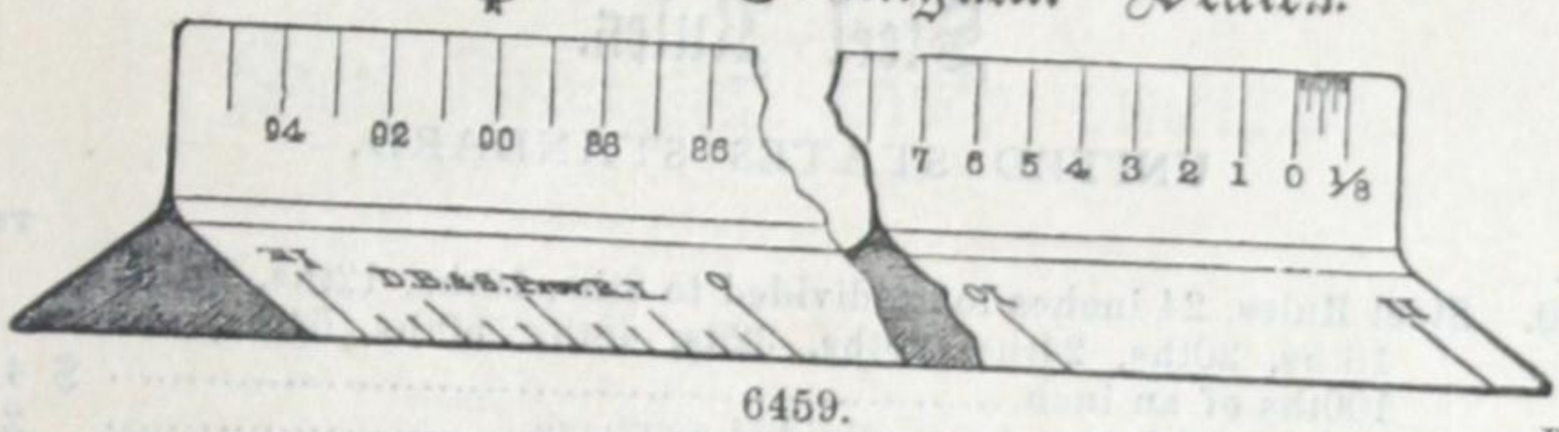
6434.	8 inches, reading to one minute, Alteneder's make	22 00
6435.	9 " " " " " "	25 00



6450

6450.	Triangular Scale of Boxwood, 24 inches long, for Engineers, graduated to 10, 20, 30, 40, 50, and 60 to the inch	5 00
6451.	Triangular Scale of Boxwood, 12 inches long, graduated same as 6450,	2 00
6452.	" " " 8 " " " " "	1 75
6453.	" " " 6 " " " " "	1 50
6454.	Triangular Scale of Boxwood, 24 inches long for Architects, graduated to $\frac{3}{32}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, 1½, 3 inches, and 16ths to the foot.	5 00
6455.	Triangular Scale of Boxwood, 12 inches long, graduated same as 6454,	2 00
6456.	" " " 8 " " " " "	1 75
6457.	" " " 6 " " " " "	1 50

Silver Plated Triangular Scales.



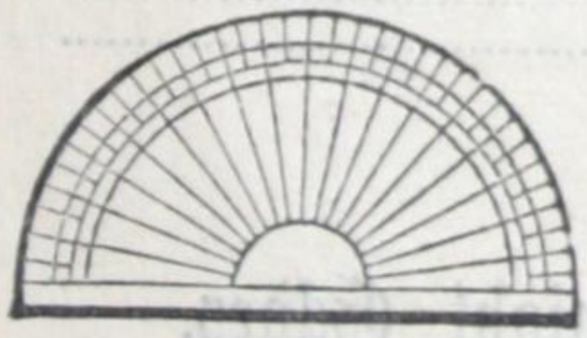
No. 6459.

No.		Price.
6459.	12 inch—having six scales for Architects and Mechanical Draughtsmen—giving $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1 inch.....	$ 6 00
6460.	12 inch for Railroad Engineers and Mechanical Draughtsmen—having 12 scales—8 of which can be used in decimals of feet and inches.....	6 00
	Two edges divided to scales of $\frac{1}{4}$, $\frac{1}{2}$, 1 and 2 inches to the foot. First spaces divided into 6ths, 12ths, 24ths and 48ths of an inch.....	
	Three edges divided to scales of $\frac{1}{6}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, and 1 inch to the foot. First spaces divided into 10ths, 20ths, 30ths, 40ths, 50ths, and 60ths of an inch.....	
	One edge, divided to scales of 6 and 12 inches to the foot. First spaces divided into 10ths, 100ths, and 1000ths of a foot.	

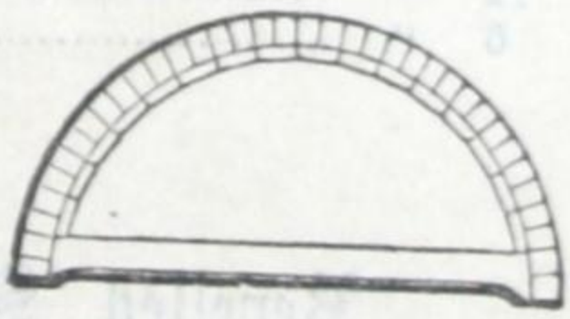
Paper Scales.

6480.	Paper Scales, nineteen inches long, $1\frac{3}{4}$ inches wide, for Architects and Engineers, in sets of six.....	
	Series A contains 6 Scales, one each, divided to $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, and 3 inches to the foot—per set.....	1 00
	Series B contains 6 Scales, one each, divided to $\frac{3}{32}$, $\frac{1}{8}$, $\frac{3}{16}$, $\frac{5}{16}$, $\frac{3}{8}$ and $\frac{7}{8}$ of an inch to the foot—per set.....	1 00
	Series C contains 6 Scales, one each, divided to 10, 20, 30, 40, 50 and 60 parts to the inch,—per set.....	1 00
	Separate scales of any of the above, each.....	20
	The advantages of these Scales are—they expand and contract nearly the same as drawing paper, do not soil the work, and distances can be set off from them without the use of dividers.	

Protractors of Horn, Brass, and German Silver.



6270



6275–6277

Horn Protractor, 4-inch Diameter, $\frac{1}{2}$ Circle.....		40
" " 5 " " $\frac{1}{2}$ " $\frac{1}{2}$ degrees		50
" " 6 " " $\frac{1}{2}$ " $\frac{1}{2}$ "		60
" " 7 " " $\frac{1}{2}$ " $\frac{1}{2}$ "		70
" " 8 " " $\frac{1}{2}$ " $\frac{1}{2}$ "		80
Brass " 4 " " $\frac{1}{2}$ " very common.....		20
German Silver Protractor, 4 inches diameter, medium quality...		75

Steel Rules.

UNITED STATES STANDARD.

No.		Price.
6490.	Steel Rules, 24 inches long, divided to 8ths, 10ths, 12ths, 14ths, 16ths, 20ths, 24ths, 28ths, 32ds, 48ths, 50ths, 64ths, and 100ths of an inch	$ 4 00
6491.	Steel Rule, 12 inches long, divided as above	2 00
6492.	" " 9 " " " "	1 50
6493.	" " 6 " " " "	1 00
6494.	" " 4 " " " "	75
6495.	" " 3 " " " "	50
6496.	Steel Shrink Rule, 24¼ inches long, divided to $\frac{1}{16}$ and $\frac{1}{8}$, for Moulders and Machinists	4 50
6498.	Boxwood Shrink Rule, 24¼ inches long, graduated like No. 6496.	3 00
6499.	Standard Steel Yard	3 00

STANDARD STEEL RULES. FRENCH MEASURE.

6500.	1 metre	10 00
6501.	½ metre	4 00
6502.	$\frac{1}{10}$ metre	85

They are divided on 3 edges to millimetres, and on one edge to fifths of millimetres.

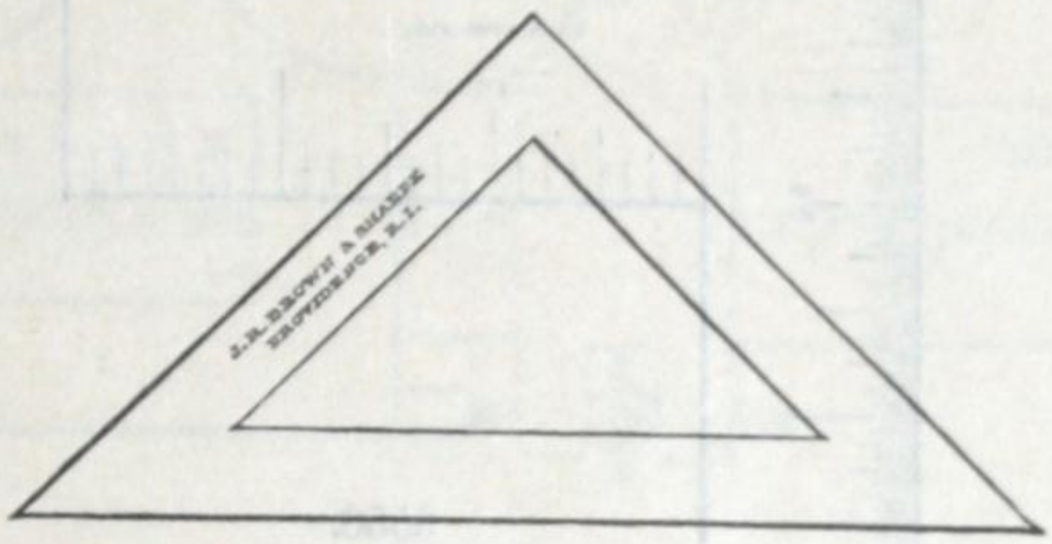
Standard Steel Straight Edges.

6510.	48 inches	9 00
6511.	36 "	6 00
6512.	24 "	3 00
6513.	18 "	2 25
6514.	12 "	1 50
6515.	6 "	75

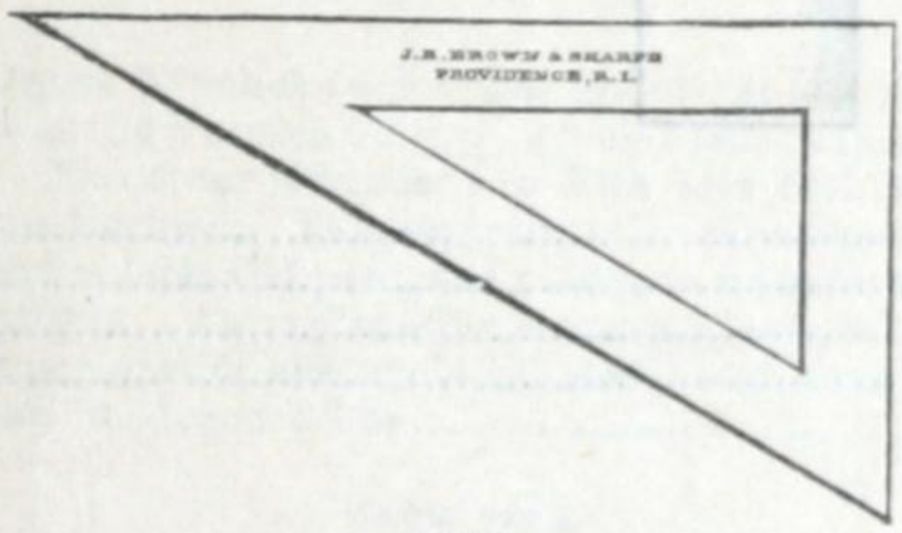
Bevelled Steel Straight Edges.

6520.	48 inches long, 3 inches wide, ¼ inch thick	12 00
6521.	36 " 3 " ¼ "	9 00
6522.	24 " 2 " $\frac{3}{8}$ "	4 00
6523.	18 " 1¾ " $\frac{3}{16}$ "	3 00

Steel Triangles. (OPEN CENTER.)



6535.

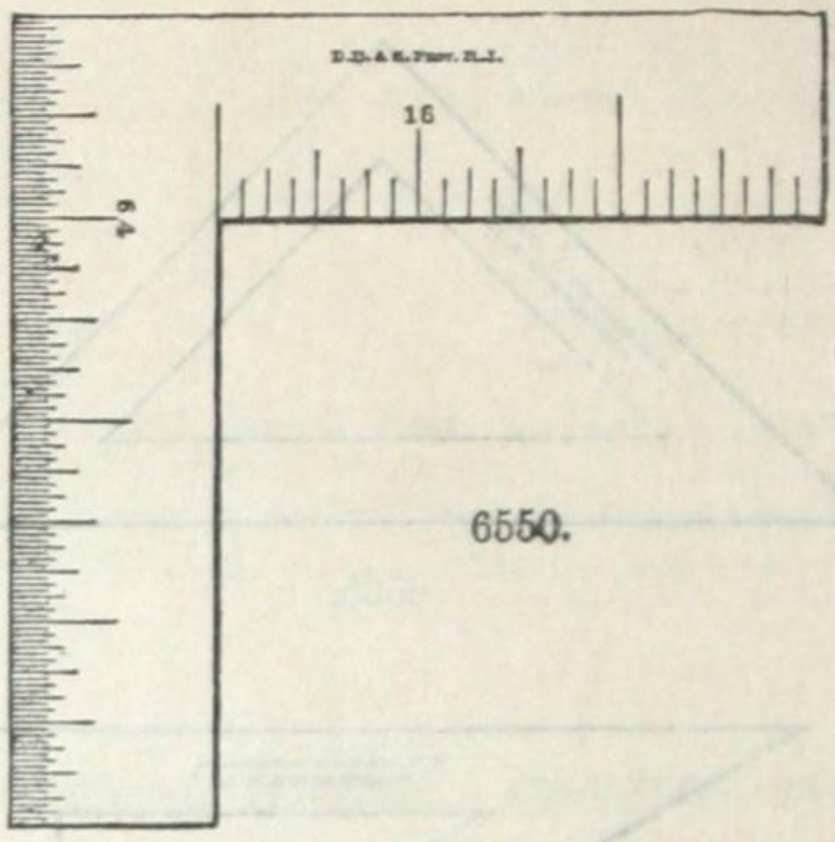


6537.

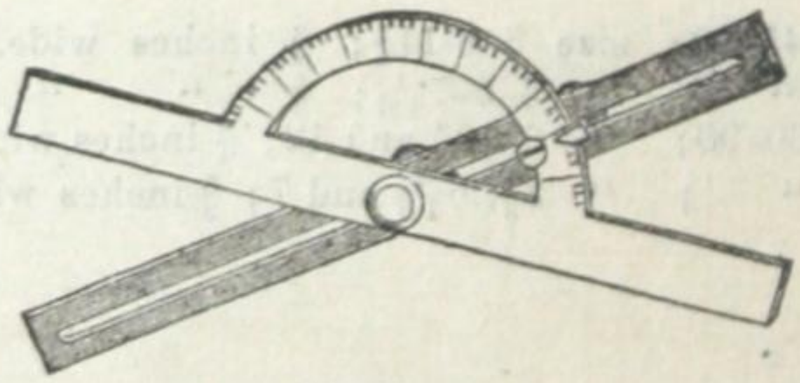
No.				Price.
6535.	Angle 45–45–90;	size 8–8–11¼; ¾ inches wide		$4 50
6536.	" "	" 5–5–7 1/16; ⅝ " "		3 50
6537.	" 30–60–90;	" 6–10⅜ and 12; ¾ inches wide		4 50
6538.	" " ;	" 3½, 6 1/16 and 7; ⅝ inches wide		3 50

Thin Steel Squares.

GRADUATED ON EACH ARM—FOR DRAUGHTSMEN AND MACHINISTS.



No.		Price.
6550.	2 inch	$1 50
6551.	3 "	2 00
6552.	4 "	2 50
6553.	6 "	3 50

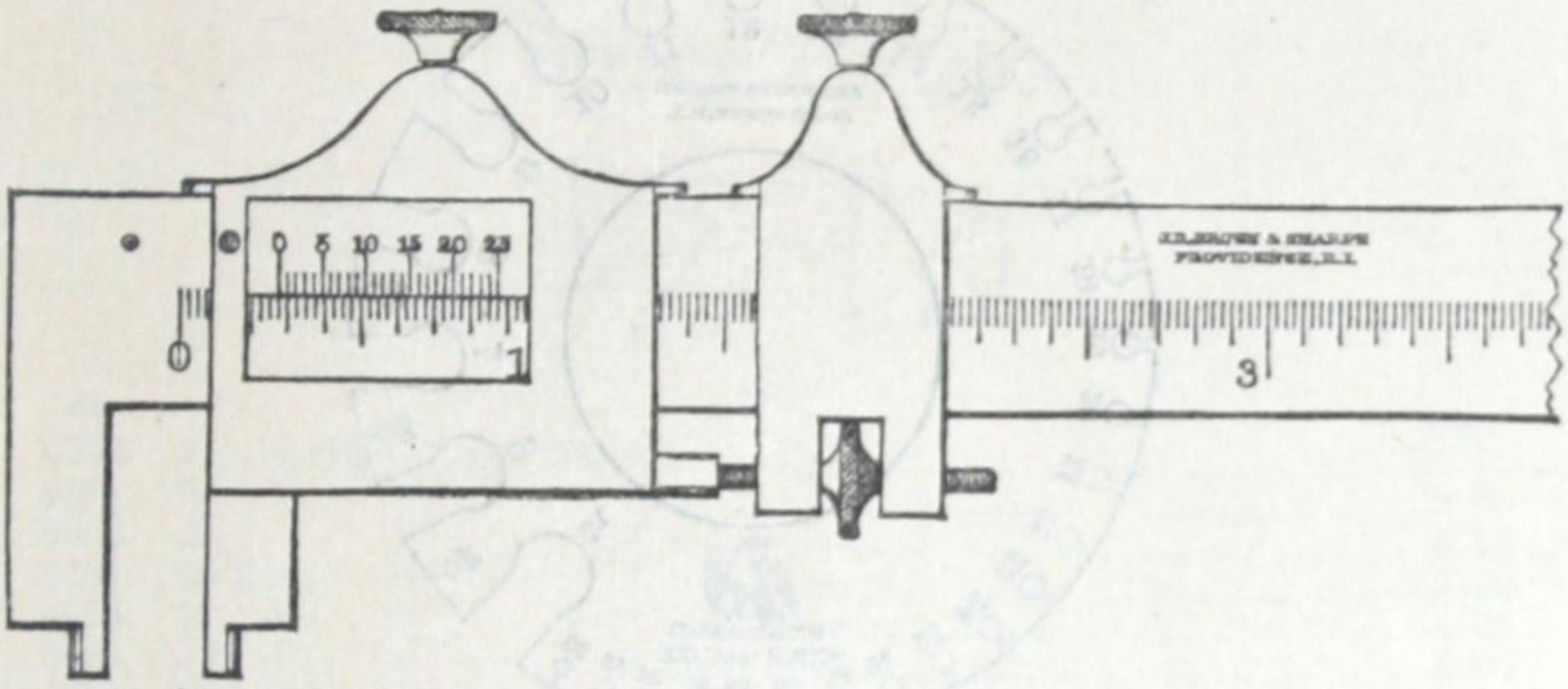


6610.

6610. Bevel Protractor, all steel, with Arm 10 inches long, divided to degrees, for machinists 6 50

Vernier Caliper.

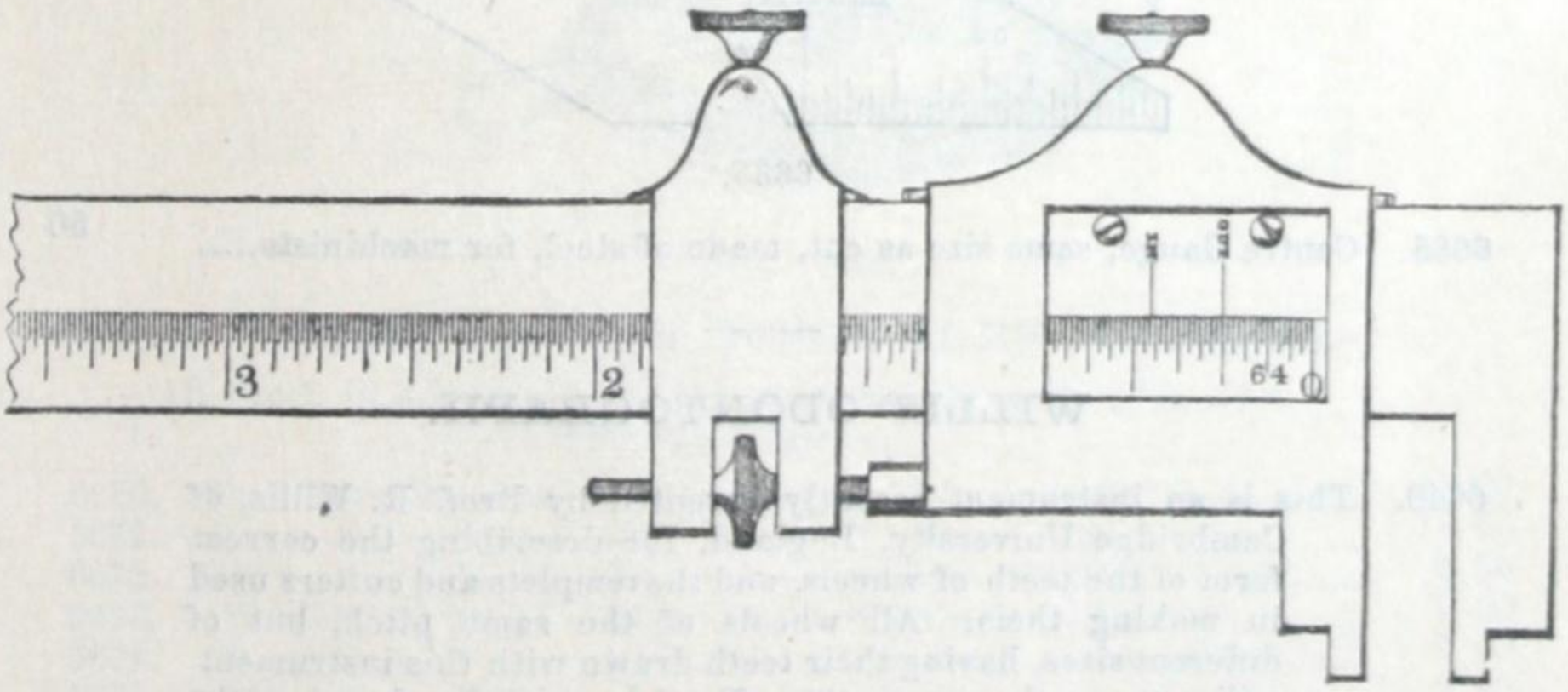
FRONT SIDE.



6620.

No.		Price.
6620.	Vernier Caliper, 6 inches long. The above cut is a fac-simile of one side of the Vernier Caliper, which reads to thousandths of inches. The other side reads to 50th and 64th of an inch, without a Vernier. This instrument is furnished with both inside and outside Calipers, and points, to transfer the distance with dividers. An explanation accompanies each instrument. These instruments are made of steel, and have the points tempered, in Morocco Box.....	$25 00

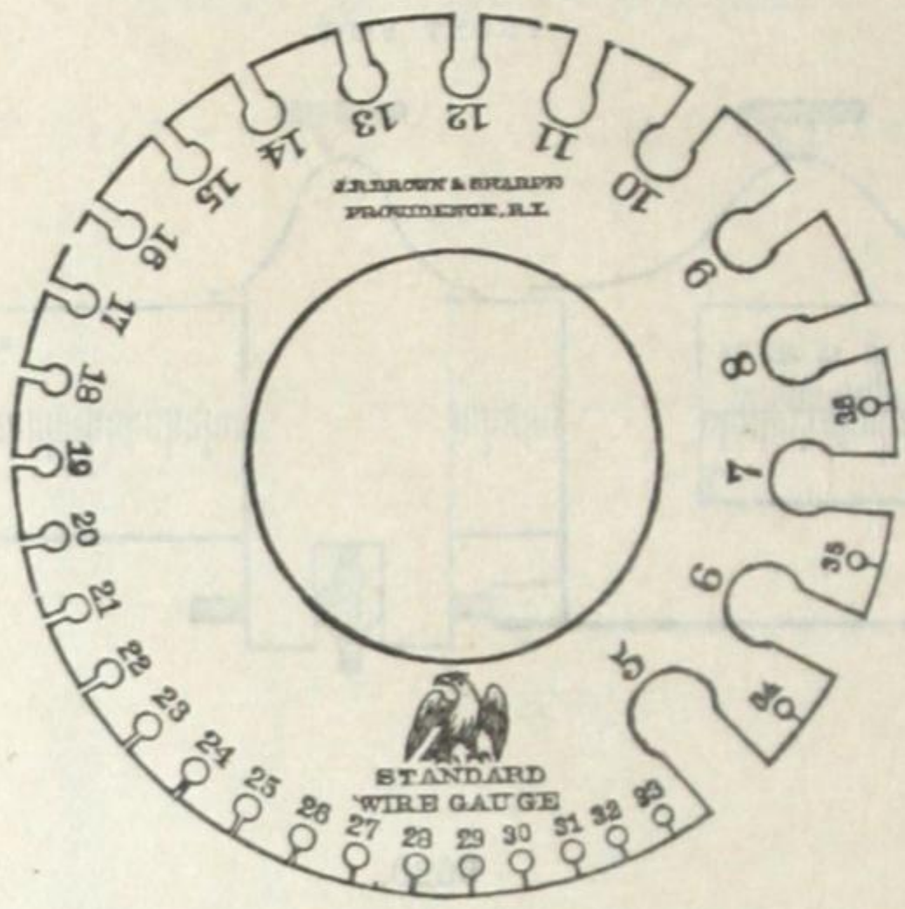
BACK SIDE.



6621.

6621.	Vernier Caliper, 12 inches long, same as 6620, in Morocco Box,	$30 00

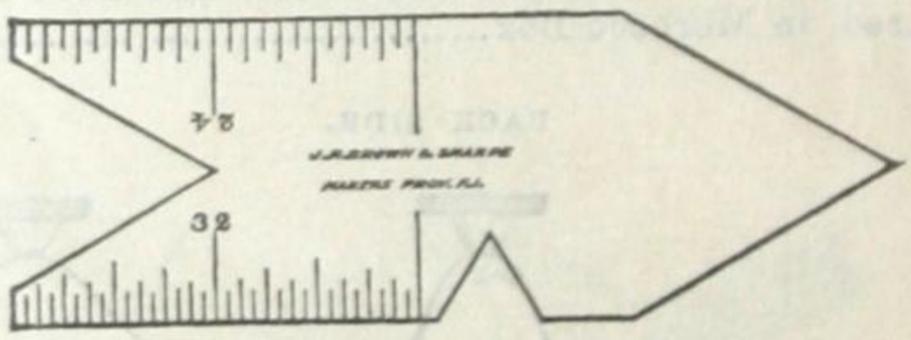
STANDARD WIRE GAUGES.



6630.

No.		Price.
6631.	Round Gauges, sizes 0 to 36	$6 00

CENTRE GAUGES.



6635.

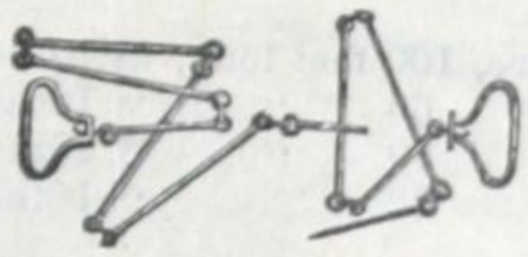
6635.	Centre Gauge, same size as cut, made of steel, for machinists.....	50

WILLIS' ODONTOGRAPH.

6640.	This is an instrument recently invented by Prof. R. Willis, of Cambridge University, England, for describing the correct form of the teeth of wheels, and the templets and cutters used in making them. All wheels of the same pitch, but of different sizes, having their teeth drawn with this instrument will run together correctly, No. 1 is used for drawing the teeth of small wheels by diametrical pitch when only a single arc is required. Price, $3 50, with drawings and directions for use. No. 2 is for drawing the teeth of larger wheels by circular pitch, where it is necessary to have separate arcs for flanks and faces. Price, $3 50, with drawings and directions for use. Price per pair.....	6 00

Surveyor's Instruments.

Surveyor's Chains.



6650.

No.		Price.
6650.	2 pole, Oval Rings, No. 9, iron wire	$1 75
6651.	4 " " " 8, "	3 50
6652.	4 " " " 12, steel wire	6 75
6653.	50 feet, " " 7, iron wire	3 00
6654.	50 " " " 12, steel wire	4 00
6655.	100 " " " 7, iron wire	5 00
6656.	100 " " " 12, steel wire	7 25
6060.	2 pole, No. 12, steel wire, brazed links	7 00
6061.	4 " " " " "	14 00
6062.	50 feet. " " " "	8 00
6063.	100 " " " " "	15 00

Tape Measures.

6670. 6685.

CHESTERMAN'S STEEL TAPE MEASURE.

All Steel, in Leather Case, the most Accurate, Durable, and Portable Measure.

6670.	Steel Tape Measure, 100 feet long, in 10ths or 12ths, each	18 00
6671.	" " " 66 " " 10ths " 12ths, "	12 50
6672.	" " " 50 " " 10ths " 12ths, "	9 50
6673.	" " " 33 " " 10ths " 12ths, "	7 00
6674.	" " " 10 " " 10ths " 12ths, "	3 50
6675.	" " " 6 " " inches	2 40
6676.	" " " 6 " " inches and metres	2 60
6677.	" " " 3 "	1 75

The 3, 6 and 10 feet are with German Silver Cases. The 33, 50, 66 and 100 are Leather Cases. These Steel Tapes are the most accurate Measure, we can furnish, of their length.

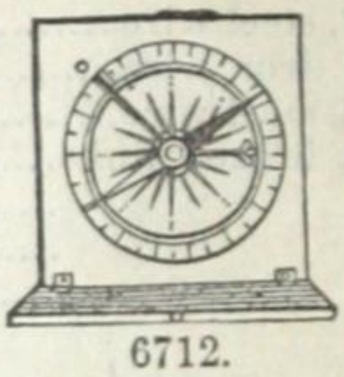
CHESTERMAN'S METALLIC TAPE MEASURES.

In Leather Cases, made of Linen Thread, interwoven with Fine Brass Wire, not so liable to stretch as the usual Linen Tape, and better calculated to withstand the effect of moisture

No.		Price.
6685.	Metallic Tape Measure, 100 feet long, in 10ths or 12ths, each.....	$5 50
6688.	" " " 66 " " 10ths " 12ths, "	4 00
6689.	" " " 50 " " 10ths " 12ths, "	3 50
6690.	" " 33 " 10ths " 12ths, "	2 75

Pocket Compasses.

6700. 6701.



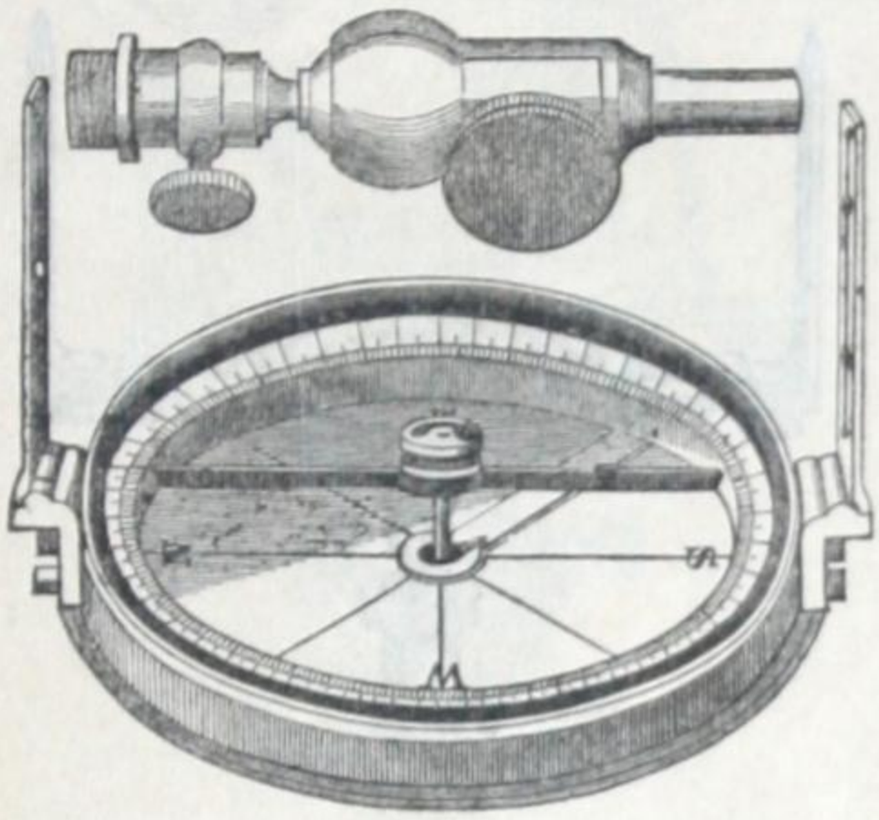
6712.

6702. 6703.

6700.	Pocket Compass, brass, form of watch, 1 inch diameter.....	75
6701.	" " " " " 1 " " with stop	1 25
6702.	" " " " " $1\frac{5}{8}$ " " stop and agate centre.....	1 50
6703.	Pocket Compass, brass, form of watch, $1\frac{5}{8}$ inches diameter, stop, agate, and hunting case.....	2 00
6710.	Charm Compass, $\frac{1}{2}$ inch diameter.....	40
6712.	Mahogany Pocket Compass, with stop, and cover on hinge. This is an excellent Compass and easily repaired.....	1 25
6715.	Fine London Pocket Compasses, fire gilt, porcelain dial, agate centre, made like a watch.....1 inch diameter.....	6 00
	$1\frac{1}{2}$ inch diameter.....	7 50

These are the very best Pocket Compasses that we can get; they are the kind used by Army Officers in Great Britain.

6718.	Night Pocket Compass, about 2 inches diameter, glass dial, which can be illuminated from below by the light of a pipe.....	9 00
6719	Geological Compass, with pendulum to give the angle of inclination.....	6 00
6720.	Dipping Needle Compass, used for finding Iron Ore, with morocco case. This, though the best article made is not entirely satisfactory.....	14 00



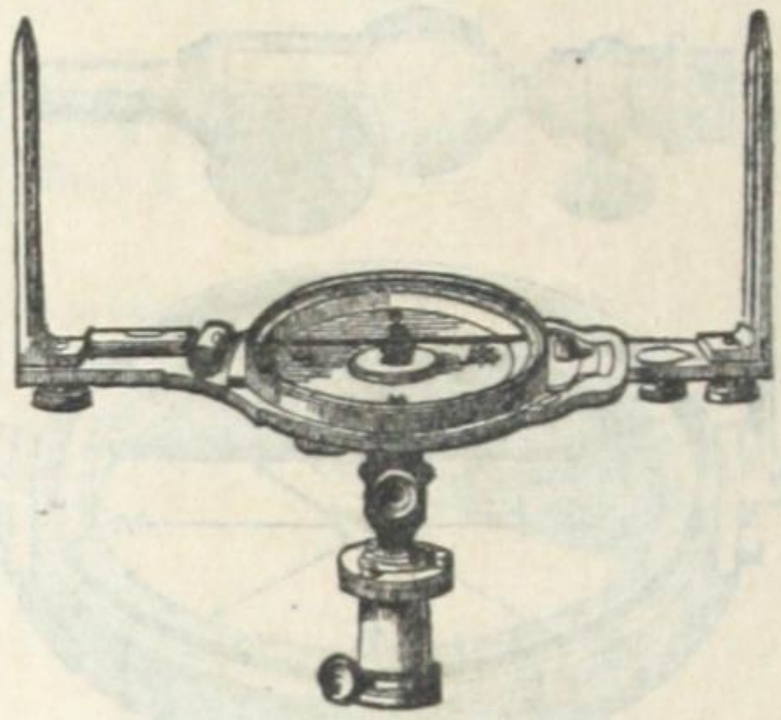
6725. 6726.

6725. Compass of Brass, 2½ inches diameter, divided to degrees, with stop, sights, and ball and socket joints, in neat morocco cases, each..... $12 00

6726. Same as 6725, but 3½ inches in diameter..... 14 00

A very useful pocket Instrument for the Engineer or Surveyor, in making rough surveys.

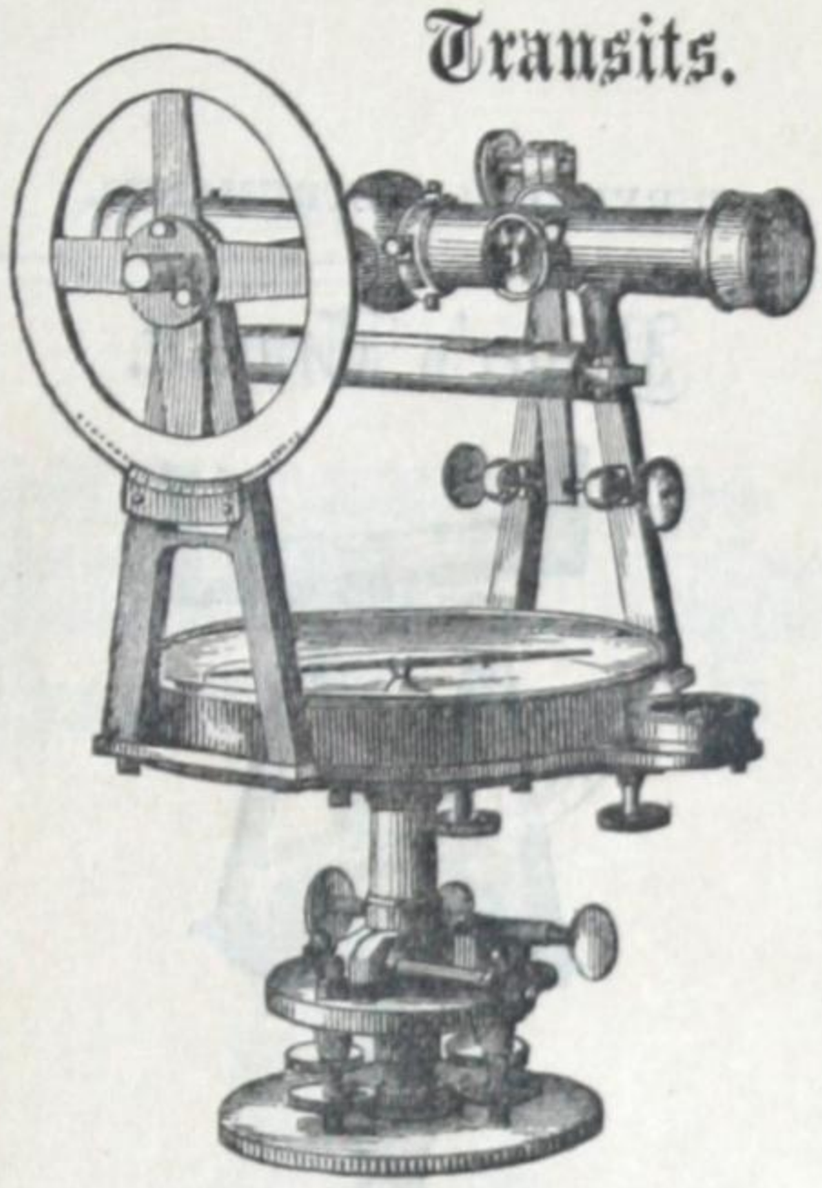
Surveyor's Compasses.



6727

6727.	Surveyor's Compass, 4 inch needle, 10 inch plate, two straight levels and outkeeper	$30 00
6728.	Surveyor's Compass, 4½ inch needle, 12 inch plate, two straight levels and outkeeper	35 00
6729.	Surveyor's Compass, 5 inch needle, 14 inch plate, two straight levels and outkeeper	40 00
6730.	Surveyor's Compass, 5½ inch needle, 15 inch plate, two straight levels and outkeeper	45 00
6731.	Surveyor's Compass, 6 inch needle, 16 inch plate, two straight levels and outkeeper	50 00
6732.	Vernier plate can be added to any of the above for	10 00
6733.	Plate for variations of needle can be added for	10 00
6734.	Plate to read full circle, independent of needle, reading to minutes	15 00
6735.	Telescope to attach at pleasure, so as to use either sights or Telescope	30 00
6736.	Telescope with level, either permanent or detachable	35 00
6737.	Jacob's Staff	2 50
6738.	Compass Tripod	8 00
6739.	Ball and socket, without Tangent Screw	6 00
6740.	" " with " "	15 00
6741.	Marking Pins, per set of 11	2 00
6742.	Tripod, with head with leveling screws	20 00
6743.	Leveling Rod, New York pattern	15 00

Transits.



6753

6744. Engineer's Transit. Flat centre, with outside verniers to plates, reading to decimals or minutes. Vertical adjustment to telescope. Needle, 4½ or 5 inches. Graduations, 6¼ or 6¾ inches. Tangent to plates. Improved attachment to tripod. Screws pack in box..... $185 05

6745. Same as 6744, with the addition of level to telescope, and clamp and tangent or opposing screws to axle..... 210 00

6746. Same as 6744, with the addition of level to telescope, clamp and opposing or tangent screws to axle, and arc for vertical angles..... 225 00

6747. Engineer's Transit. Long centre. Two outside verniers reading to minutes; or, one decimal and one minutes. Needle, 4½ or 5 inches. Graduations, 6¼ or 6¾ inches. Tangent to plates. Vertical adjustment to telescope. Improved attachment to tripod. Screws pack in box..... 200 00

6748. Same as 6747, with the addition of level to telescope, and with clamp and opposing or tangent screws to axle..... 225 00

6749. Same as 6747, with the addition of level to telescope, and clamp and opposing screws to axle, and vertical arc..... 240 00

6750. Surveyor's Transits, with telescope, two straight levels, 5 inch needle, reads angles independent of needle to single minutes. Leveling screws, Tripod, &c..... 115 00

6751. Surveyor's Transit, same as 6750, but has also level to Telescope, arc for vertical angles and opposing screws..... 150 00

6752. Engineer's Transit. Long centre. Hollow castings giving strength with lightness. Needle, 5 inches. Double opposite verniers to horizontal limb. Erecting telescope, 10¾ inches long. Tangent to plates. Platinum hairs. Clamps on telescopic axis, arranged with sighting slits and index marks for right angle sighting. Tripod, head and levelling screws pack in box..... 185 00

6753. Same as 6752, with level to telescope, clamp and tangent movement to axis of telescope and vertical arc..... 235 00

6754. Small Mining and Reconnoisance Transit, with level, vertical arc, &c., (similar in every respect, excepting size and weight, to No. 6753.)..... 195 00

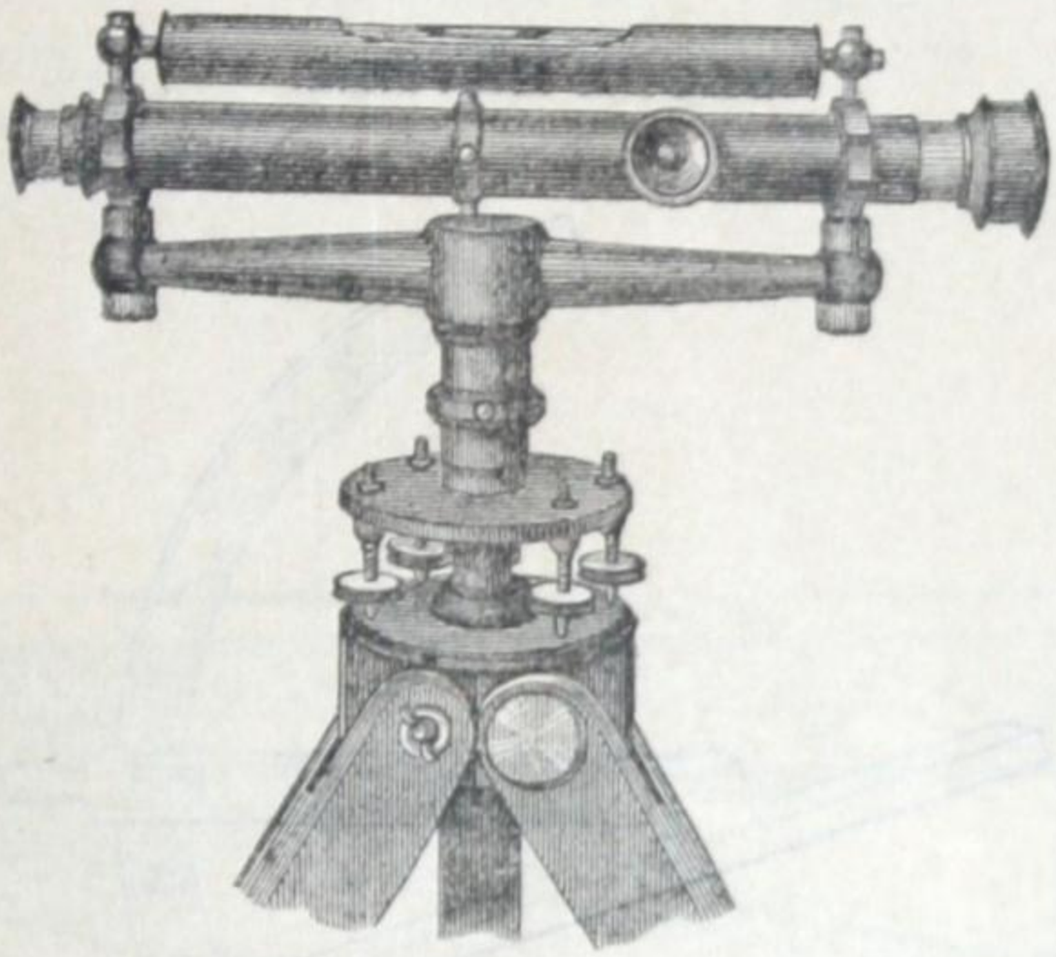
6755. Solar Transit, same as No. 6753, with the addition of a variation plate, stadia hairs, and the solar apparatus underneath the main plate. All the graduations on silver plates. 300 00

Miner's Transit.

6756

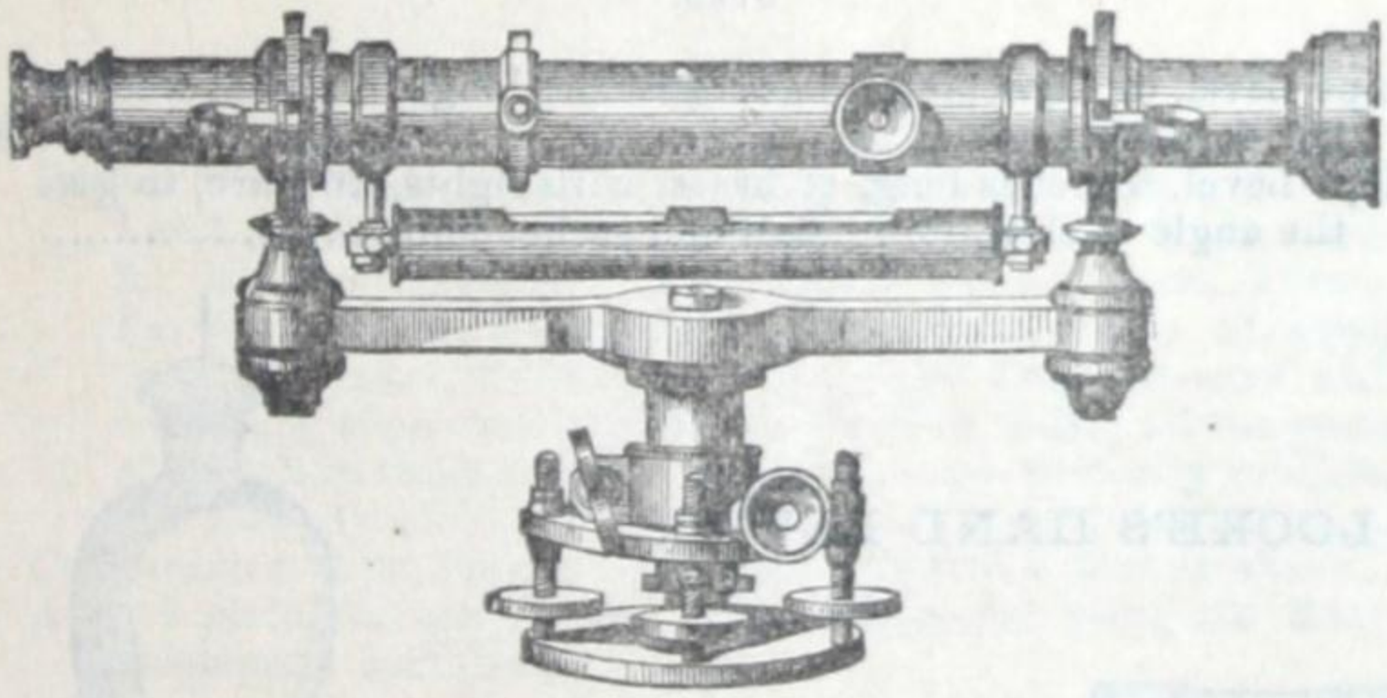
6756. **Small Transit, with cross slit sights. A cheap and portable Instrument, weighs 34 ounces; needle 2½ inches, ball and socket joint; distance between the sights about 4½ inches. Packs in a box about 7 inches square..... $40 00**

Engineer's Level.



6765.

6765. Miner or Builder's Level, 10 inch Telescope, Tripod with leveling screws. Weight with Tripod, about 16 pounds.... $60 00



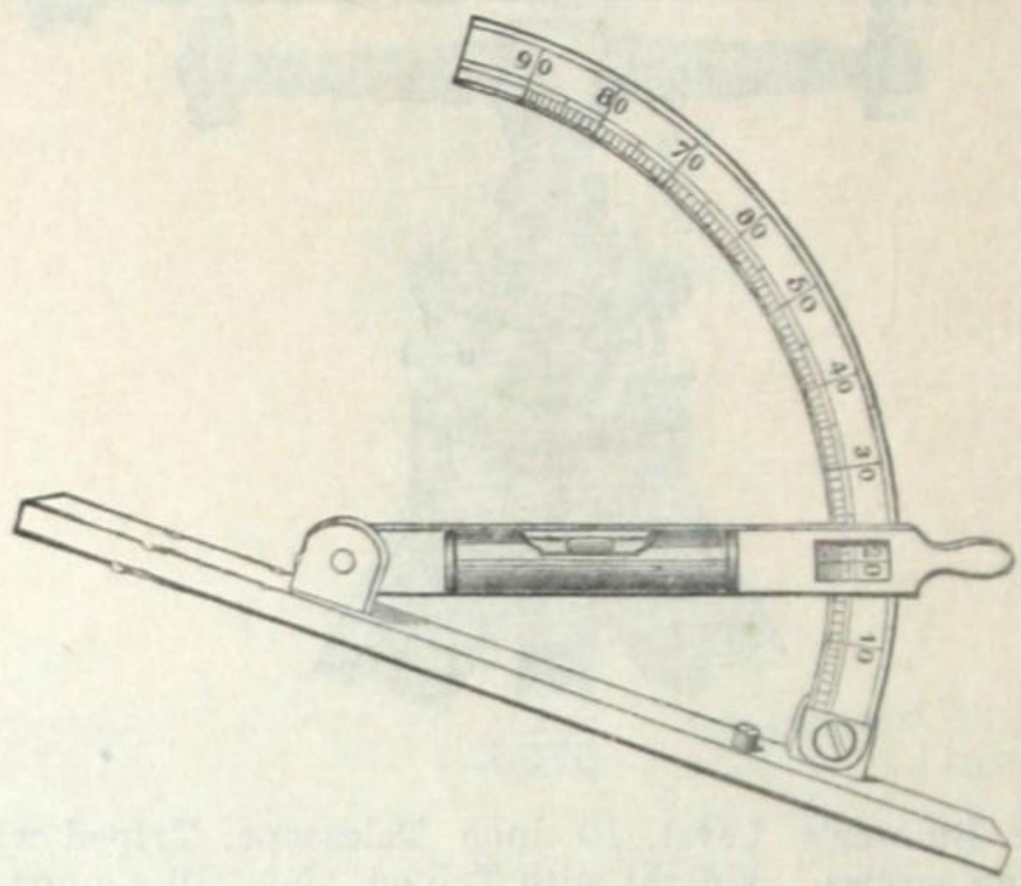
6767

6766. Engineer's Y Level, 12 inch Telescope, reversible on the wyes, Clamp and Tangent movement, Tripod with leveling screws. 100 00

6767. Best Engineer's Level, same form as 6766 but has 17 inch Telescope, and consequently will be more delicate in its measurements..... 140 00

Levels.

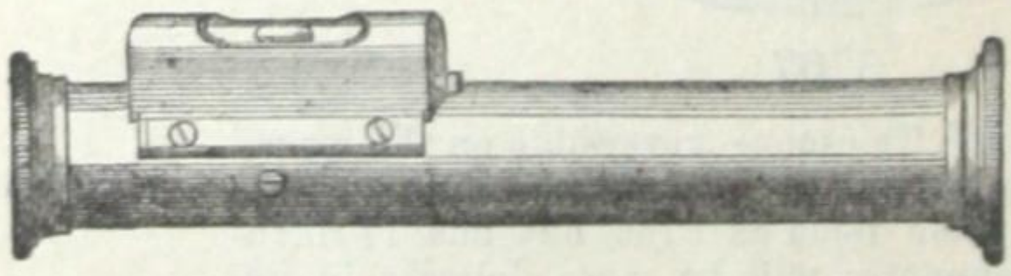
SLOPE LEVELS.



6795.

No.		Price.
6795.	Slope Level, or Clynometer, base 8½ inches long, in a neat wooden box for Engineers	$12 00
6797.	Slope Level, 6 inches long, of brass, with sights, and arc, to give the angle of elevation. Ball and socket joint	16 00

LOCKE'S HAND LEVEL.

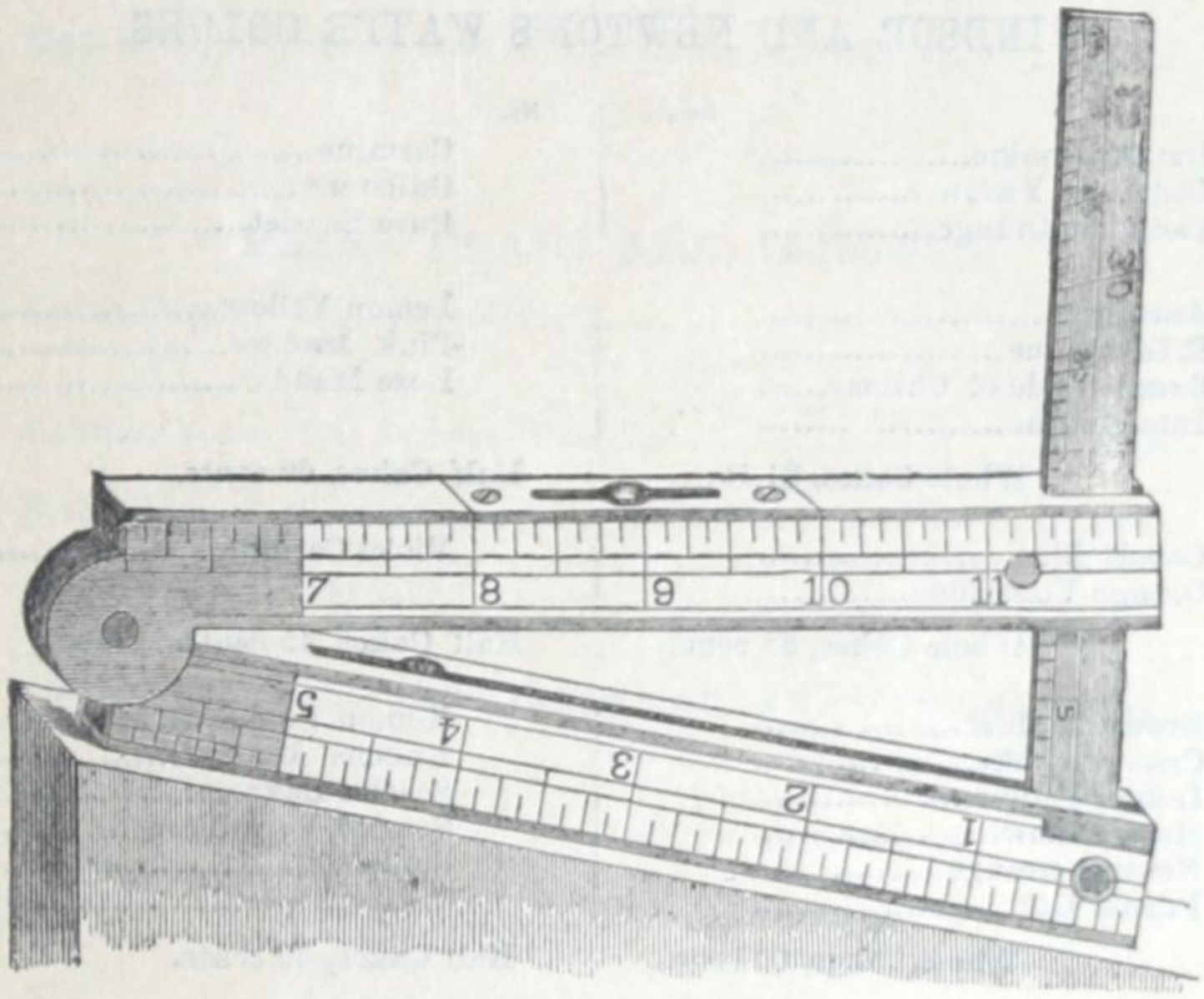


6800.

6802

6800.	Locke's Hand Level, made of German Silver	12 00
6801.	" " " " Brass	10 00
6802.	Plumb Bobs, bronze, with screw cap and steel point	2 50
6803.	" " " without " " "	2 00
6804.	" " iron " "	

Combination Clynometer Rule.



6810.

No.		Price.
6810.	Combination Clynometer Rule; being the very best form of Slope Level yet invented. It combines within itself—Slope Level for Miners, Carpenters' Rule, Spirit Level, Square, Plumb, Bevel Indicator, Brace Scale, Draughting Scale of equal parts, T Square, Protractor Right Angle Triangle—and with a straight edge can be used as a Parallel Ruler, all the parts of which in their separate application are perfectly reliable. One foot—two fold. Boxwood	$8 50
6811.	Combination Rule, Ivory. One foot—two fold—same as above	8 00

A Book giving directions and explanations, for using the Rule, accompany each Rule.

WINDSOR AND NEWTON'S WATER COLORS.

No.		Price.	No.		Price.
6850.	Burnt Carmine			Carmine	
	Cadmium Yellow			Gallstone	
	Cadmium Orange			Pure Scarlet	
	Aureoline			Lemon Yellow	
	French Blue			Pink Madder	
	Green Oxide of Chrome			Rose Madder	
	Intense Blue				
	Whole Cakes, $1.15.			Half Cakes, 60 cents.	
	Cobalt Blue			Violet Carmine	
	Orange Vermillion				
	Whole Cakes, 85 cents.			Half Cakes, 45 cents.	
	Brown Madder			Roman Sepia	
	Crimson Lake			Rubens' Madder	
	Indian Yellow			Scarlet Lake	
	Mars Yellow			Scarlet Vermillion	
	Neutral Orange			Sepia	
	Purple Lake			Warm Sepia	
	Whole Cakes, 60 cents.			Half Cakes, 30 cents.	
	Antwerp Blue			Ivory Black	
	Chinese White			King's Yellow	
	Constant White			Lamp Black	
	Bistre			Light Red	
	Blue Black			Naples Yellow	
	British Ink			Neutral Tint	
	Brown Ochre			Olive Green	
	Brown Pink			Orange Chrome	
	Burnt Roman Ochre			Payne's Grey	
	Burnt Sienna			Prussian Blue	
	Burnt Umber			Prussian Green	
	Chrome Yellow			Raw Sienna	
	Deep Chrome			Raw Umber	
	Dragon's Blood			Red Lead	
	Emerald Green			Roman Ochre	
	Flake White			Sap Green	
	Gamboge			Terra Vert	
	Hooker's Green, No. 1			Vandyke Brown	
	" " " 2			Venetian Red	
	Indigo			Vermillion	
	Indian Red			Yellow Lake	
	Italian Pink			Yellow Ochre	
	Whole Cakes, 30 cents.			Half Cakes, 15 cents.	

INDIA INK.

6860.	Small Sticks, oval, lion's head	per stick,	50
6861.	" " square, gilt	"	25
6862.	Good quality	"	75
6863.	Very best quality	"	3 00

No.		Price

COLORED PENCILS.

6870.	Red, Blue, Green, Yellow or Black.....each	$ 12

PAINT SLABS AND SAUCERS.

6880.	China Cups, 1 inch diameter.....each	5
6881.	" " 2 " " ..... "	10
6882.	" " 3 " " ..... "	20
6888.	Cabinet Nests of 6, $2\frac{1}{4}$ inch diameter.....per nest	75
6890.	" " 6, $2\frac{3}{4}$ " " ..... "	1 25
6895.	Slant Tiles, 3 divisions.....each	30
6896.	" " 6 " ..... "	70
6897.	" " 4 slant and 1 flat division.....	50

Tiles for India Ink, 1 long slant and 3 round wells.

6900.	Size, $1\frac{5}{8}$ by $2\frac{7}{8}$ inches.....each	20
6901.	" $2\frac{5}{8}$ by 4 " ..... "	40

BRUSHES.

6920.	Usual Camels' Hair Brushes, in quills, assorted,	
	Small to medium.....per dozen	25
	Medium to large..... "	50
6921.	Fine Camels' Hair Brushes, with tin ferules and wood handles, for fine water color painting, assorted,	
	Small to medium,.....per dozen	1 00
	Medium to large..... "	1 50
6922.	Camel's Hair Brushes, for washing, best quality, polished wood handles, assorted, Small to medium.....per dozen	3 00
	Medium to large..... "	4 00
6923.	Red Sable Brushes, in quills, assorted,	
	Small to medium.....each	10 to 20
	Medium to large.....each	25 to 50
6924.	Red Sable Brushes, with albata ferules and wood handles, assorted,	
	Small to medium.....each	20 to 50
	Medium to large.....each	75 to 2 00

INDIA RUBBER, MAPPING PENS, &c.

6930.	White, prepared.....per piece	6
6931.	Pure Gum..... "	15
6932.	Erasing Rubber..... "	25
6933.	Mouth Glue..... "	5
6934.	Erasing Knife.....each	50
6935.	Gillot's Mapping Pens, 12 on card, with handle,.....per card	85
6936	" Lithographic Crow Quill Pen, 12 on card, with handle, "	1 00

No.		Price.

LEAD PENCILS.

6940.	A. W. Faber's superior Siberian Lead Pencils, B. HB. & H., each	$ 20
	Per dozen	2 00
6941.	A. W. Faber's Hexagonal Gilt, Nos. 1, 2, 3, 4.....each	15
	Per dozen	1 50
6942.	A. W. Faber's black, round and gilt, Nos. 1, 2, 3, 4.....each	10
	Per dozen	1 00
6943.	A. W. Faber's black, round and gilt Union, Nos. 1, 2, 3, 4, each	07
	Per dozen	60
6944.	A. W. Faber's black, round and gilt Star, Nos. 1, 2, 3, 4, each	05
	Per dozen	50
6945.	Small Pencils for the Dividers.....each	05

Engineers' Stationery, &c.

WHATMAN'S TURKEY MILL DRAWING PAPER.

7000.	Demy,	20 X 15 inches.....	per sheet	$ 05
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7005.	Atlas,	33 X 26 "	"	30
7006.	Double Elephant,	40 X 26 "	"	40
7007.	Antiquarian,	52 X 31 "	"	1 25

ENGINEERS' DRAWING PAPER IN ROLLS.

7010.	White, extra thick, 40 inches wide, in rolls, per yard.....	25
7011.	" " 54 " " "	35
7012.	" " 59 " " "	40

DRAWING PAPER ON MUSLIN.

7015.	In rolls 8 yards long, and 40 inches wide, per yard.....	1 00
7016.	" 8 " " 54 " "	1 40
7017.	" 8 " " 59 " "	2 00

FRENCH TRACING PAPER.

7020.	In sheets. Royal, 19 X 25 inches, per quire.....	1 50
7021.	" Super Royal, 21 X 26 inches per quire.....	2 00
7022.	" Double Elephant, 28 X 40 inches, per quire.....	3 00
7023.	In rolls 11 yards long and 43 inches wide, per yard.....	18
7024.	" 22 " " 43 " "	18

TRACING OR VELLUM CLOTH.

No.		Price.
7030.	In rolls 18 inches wide and 24 yards long, per yard	$ 35
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7032.	" 36 " " 24 " "	60
7033.	" 42 " " 24 " "	75

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Buff Tint, Strong and Thick.

7040.	Double Thick, 36 inches wide, in rolls, per yard	15
7041.	" " 44 " " "	18

PROFILE AND CROSS-SECTION PAPER.

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7045.	Profile Paper, B, ruling 43 X 17 inches, horizontal ruling, 30 to the inch, per sheet	40
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