

REFERENCE

CATALOGUE LIBRARY

1860  
Acct 52555

AUG 22 1938

C681.2085

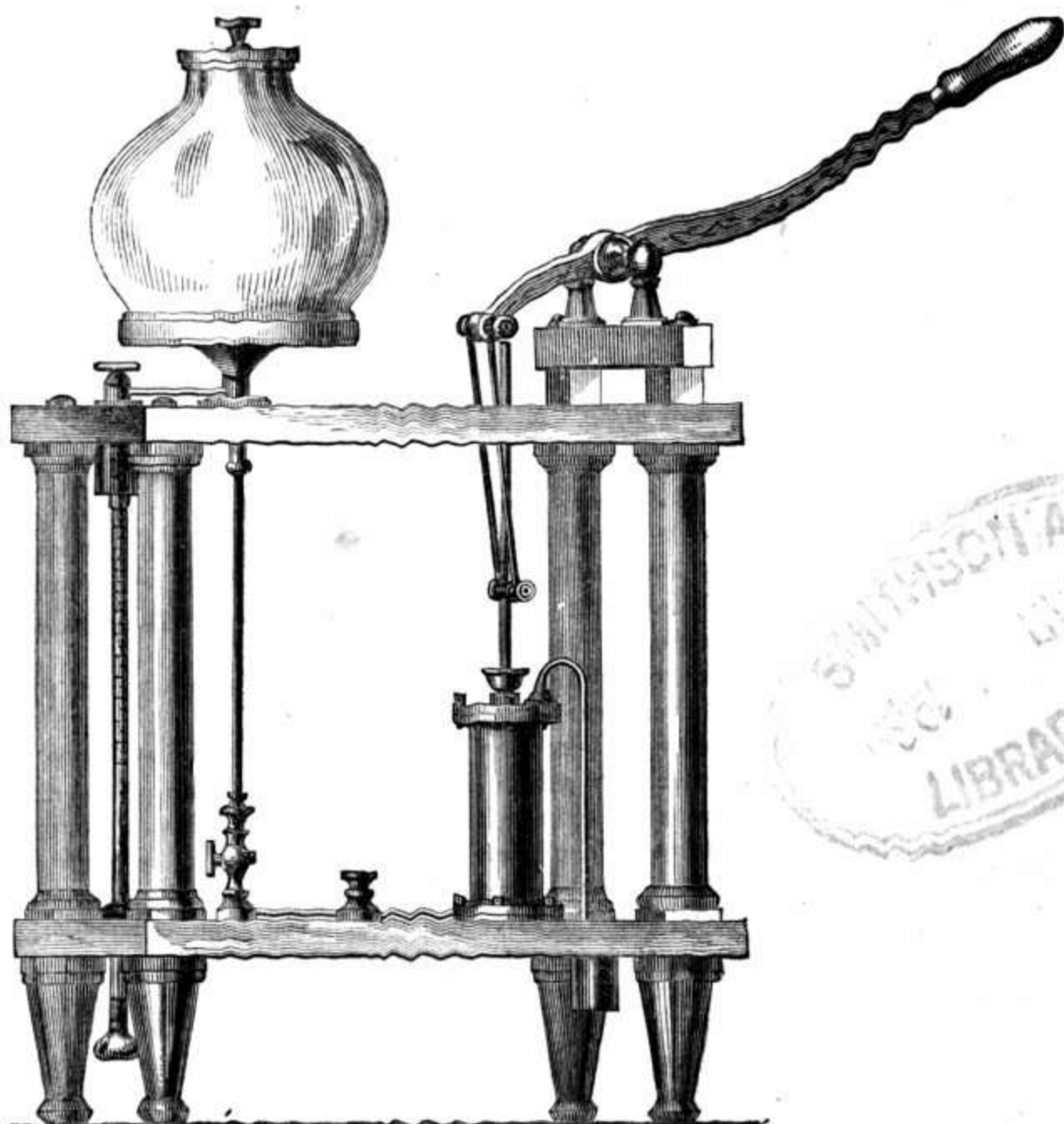
R472e

ms (pre-1900)

(E. S. RITCHIE'S

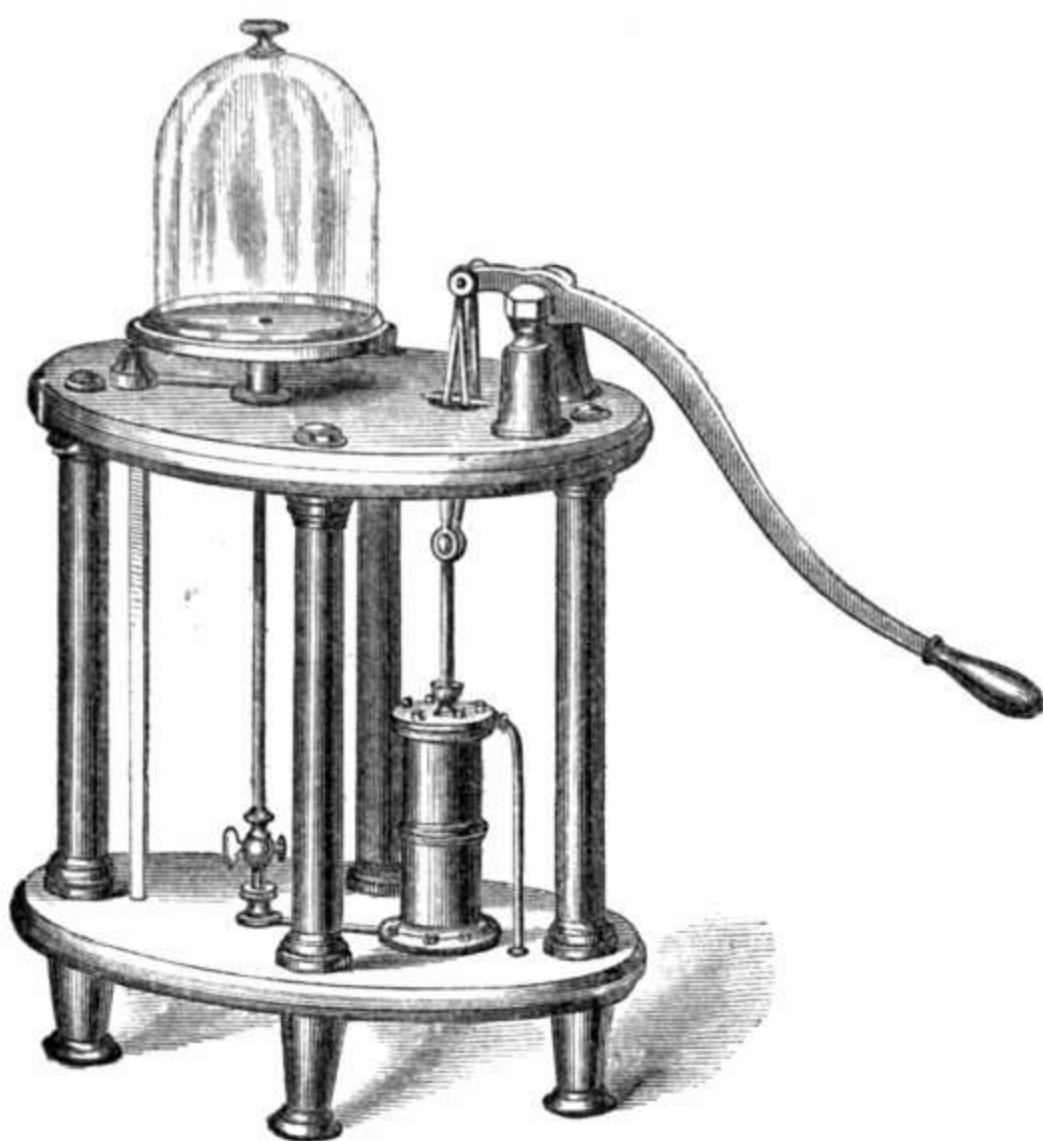
# CATALOGUE.

PNEUMATICS.



SWITSCHEAN  
LIBRARY

Nos. 1-3.



No. 4.

### THE AIR PUMP.

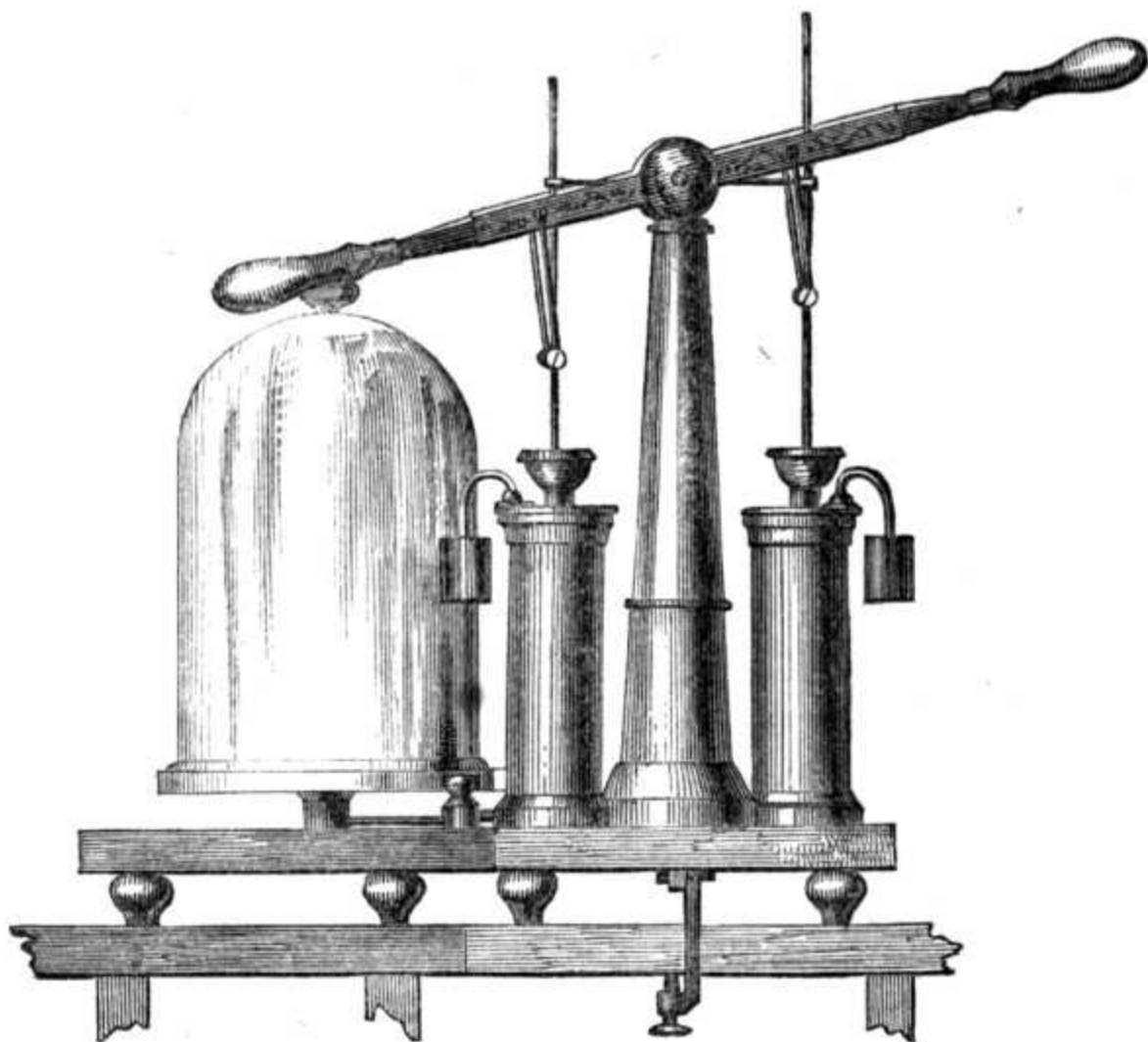
In the construction of the air pump I have endeavored to combine the requisites of the best instrument — simplicity, efficiency, with convenience of form and ease of action. My pumps are made on the principle of Leslie, with simple lever movement. I have perfected machinery for polishing the inside of the barrel, and for making every part in the most perfect manner.

The piston is packed in an improved manner, insuring a perfect contact with the barrel, with slight friction; its valve cannot be misplaced.

The exit and most important valve is of new and improved construction. It is a simple disk of oiled silk, the weight of which alone resists the escape of the air, while its elasticity prevents the least leakage, and which, by its position on the top of the barrel, admits of easy access. The dome covering this valve can be removed by the fingers, and is constructed so that oil cannot accumulate above the valve nor escape to soil the pump, and so that the valve can be relieved from atmospheric pressure whenever an extraordinary degree of rarefaction is required.

The barometer gauge is of improved construction, and is placed within another glass tube, greatly lessening the danger of accidents, while the space between prevents the possibility of the mercury being drawn over into the pump, or oil into the gauge. No packing screws intervene between the stop cock and receiver.

The plate is of brass, ground perfectly plane. A few drops of oil are sufficient to insure a contact with the receiver.

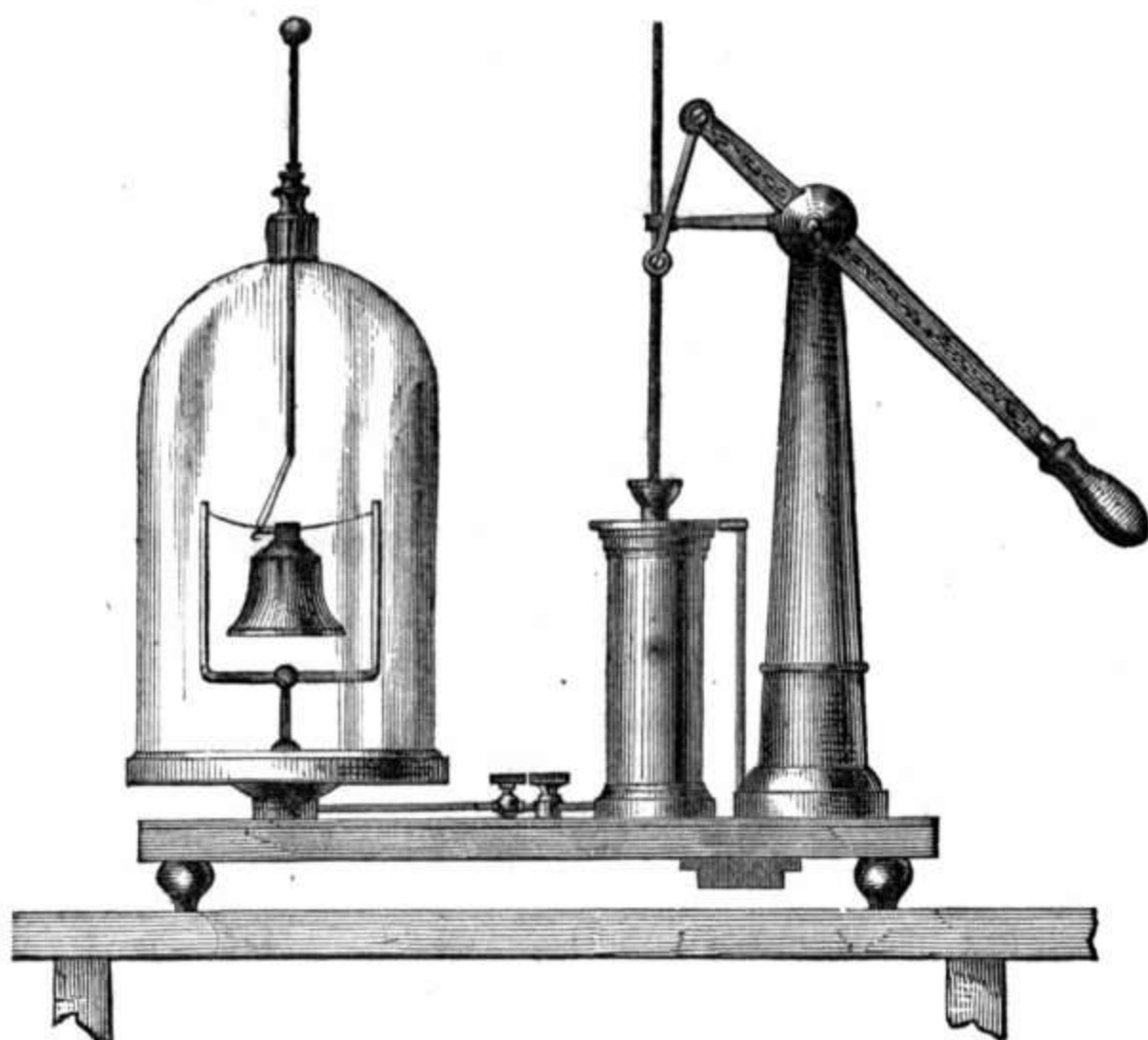


No. 6.

The frame is substantially made of best solid St. Domingo mahogany ; which I shall use in future, unless to order, in preference to cherry wood stained in imitation of rosewood, (without increased price,) the latter has proved not to wear as well.

The wood work in all the instruments is thoroughly varnished, rubbed, and polished. Much care has been taken to procure the best lacquer, which is put on in such manner as to preserve the polish of the brass work for a long period. All the stands mentioned in this Catalogue are made of solid mahogany, with brass screw sockets. If marble stands are desired, the difference of price will be added.

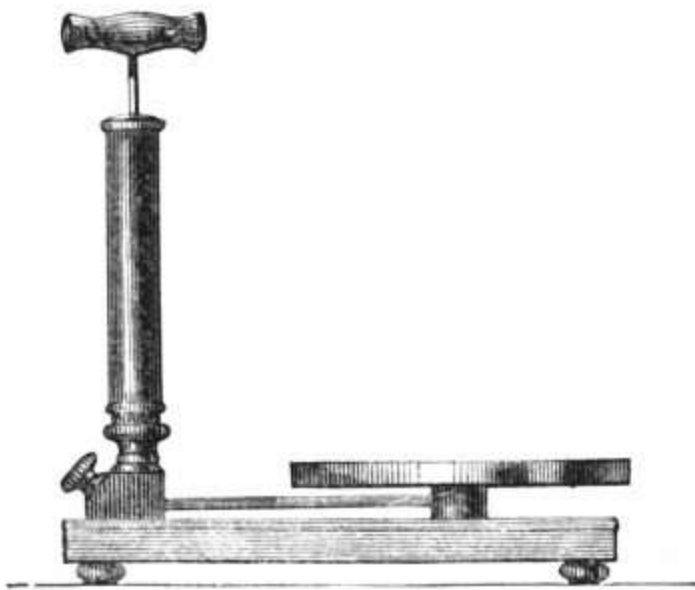
NUMBER	PRICE
1. Air Pump, (Smithsonian.) Frame of rosewood, polished ; plate 15 inches in diameter ; barrel 13 by $4\frac{1}{2}$ inches. The instrument is finished in an elaborate manner. One is in the hands of Professor Henry, at Washington ; another I have lately constructed for the University of Mississippi,.....	300.00
2. Air Pump ; frame of rosewood, polished ; plate 15 inches, barrel 13 by $4\frac{1}{2}$ inches ; improved barometer gauge. The frame is 34 by 22 inches ; the plate is elevated 48 inches from the floor ; highly finished,.....	150.00
3. Air Pump ; frame of solid mahogany, polished ; in all other respects similar to No. 2,.....	125.00



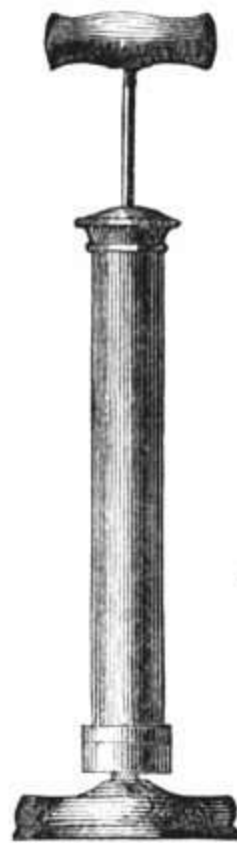
No. 7.

NUMBER	PRICE
4. Air Pump; frame of solid mahogany, of oval form; in all other respects similar to No. 5, with extra finish, .....	100.00
5. Air Pump; frame of St. Domingo mahogany, polished; plate 12 inches in diameter, barrel 12 by 3½ inches; improved barometer gauge, valves and exit tube. The frame is 31 by 19 inches, and the plate is elevated 43 inches above the floor. This size has been highly approved as a most convenient and efficient instrument, .....	85.00
6. Air Pump; basement of mahogany; two barrels; plate 8 inches, barrel 7½ by 2 inches; works by double lever. It has little advantage over No. 7, .....	40.00
7. Air Pump; basement of mahogany, polished; plate 8 inches, barrel 7½ by 2 inches, with improved valves and exit tube. The basement is 20 by 14 inches; the plate is elevated but 5 inches from the table, giving great steadiness to the bell glass, which is also in most convenient position for use, while the lever is conveniently placed for ease of action. As high degree of rarefaction is obtained as by any other size, and all experiments are well performed by its use, .....	25.00
With basement of verd antique marble, .....	30.00
8. Air Pump; mahogany basement; barrel 7 by 1½ inches, plate 6 inches; the pump is also a condenser. See No. 11, .....	10.00

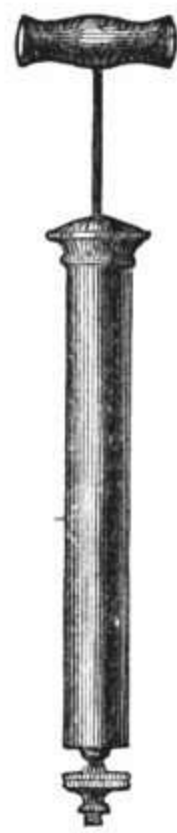




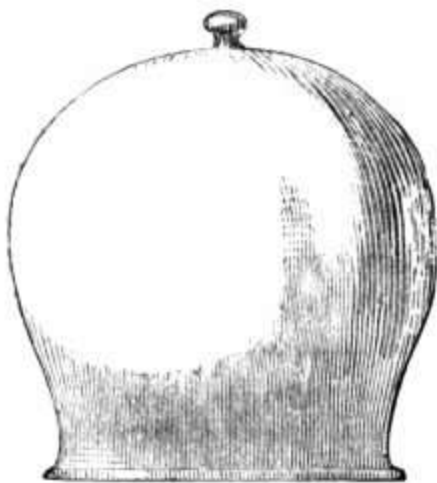
No. 8.



No. 10.



No. 11.



No. 12.

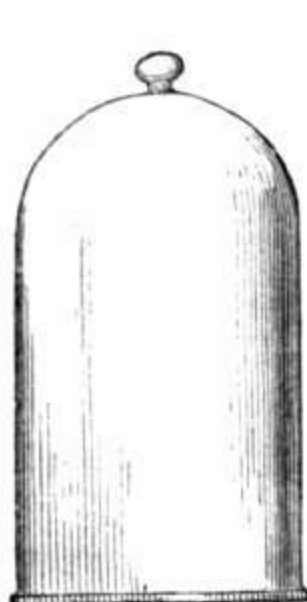


No. 13.

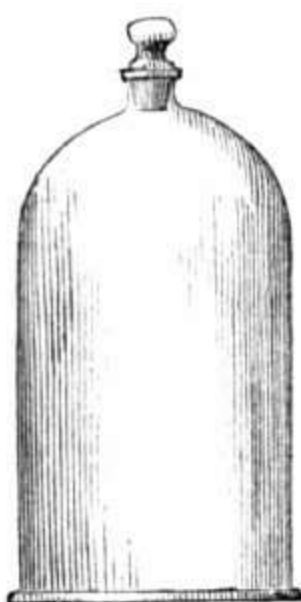


No. 14.

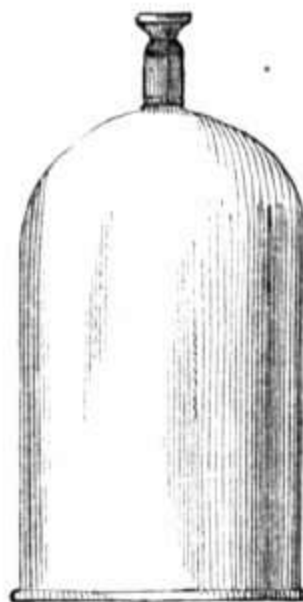
NUMBER	PRICE
9. Basement, with screw to fit pump plate, stop cock, and vent plug. The plate from pump No. 1 to 5 may be removed from its frame and placed upon this basement upon the lecture table, and connected with the pump by a flexible hose.	
With mahogany basement for 15 inch plate, 15.00 ; for 12 inch do.,.....	10.00
With marble basement for 15 inch plate, 18.00 ; for 12 inch do.,.....	12.00
Flexible hose, with couplers, 8 feet, 3.00 ; 12 feet,.....	4.00
10. Double Acting Condenser and Exhauster; barrel 7 by 1½ inches; the change is effected by simply turning the base half round,.....	8.00
11. Condenser; barrel 7 by 1½ inches. By reversing the piston and valve it acts as an exhauster, .....	5.00
12. Swelled Bell Glass; five sizes; one gallon, 1.25; two gallons, 2.00; four gallons, 3.50; eight gallons, 7.00; ten gallons,.....	8.00
13. Cylindrical Open Top Bell Glass; two quarts, 1.50; one gallon, 2.50; two gallons,.....	4.00



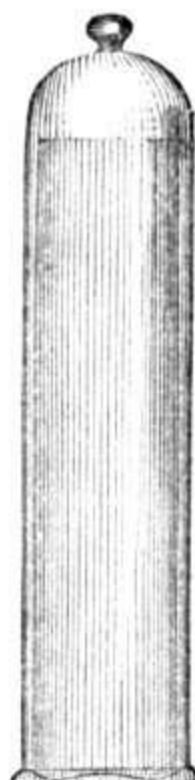
No. 15.



No. 16.



No. 17.



Nos. 19 &amp; 20.



No. 18.



No. 21.

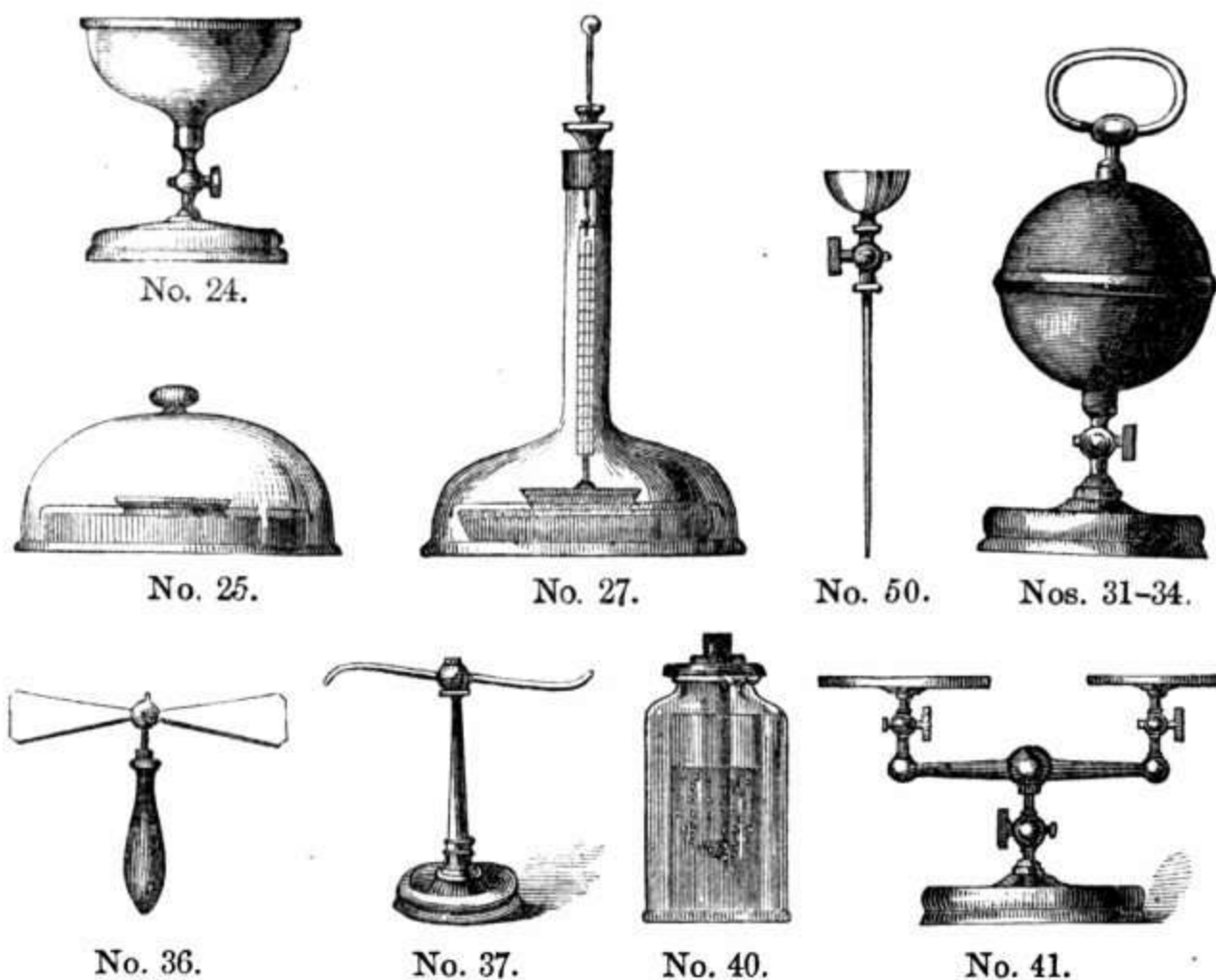


No. 22.



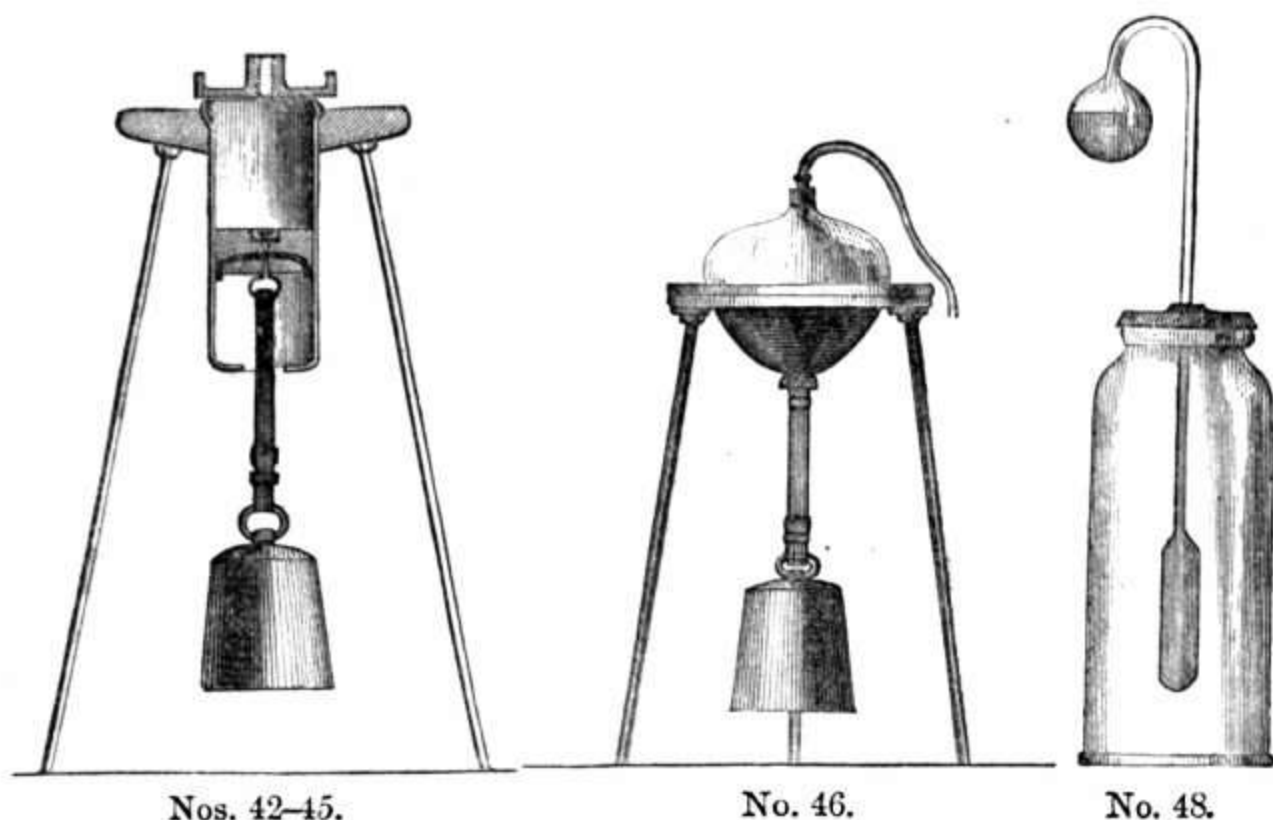
No. 23.

NUMBER	PRICE
14. Swelled Open Top Bell Glasses, with glass covers; capacities, one gallon, 2.00; two gallons, 3.00; four gallons, 4.00; eight gallons, 8.00; ten gallons, 9.00; twelve gallons, .....	12.00
15. Plain Bell Glasses; eight sizes; half pint, 30 cents; pint, 50 cents; quart, 75 cents; two quarts, 1.00; gallon, 2.00; two gallons, 3.00; four gallons, 4.00; six gallons, .....	5.50
16. Bell Glasses with glass stoppers; eight sizes; half pint, 40 cents; pint, 60 cents; quart, 1.00; two quarts, 1.25; three quarts, 1.50; gallon, 2.25; six quarts, 2.50; two gallons, .....	3.50
17. Bell Glasses, with brass screw caps, to receive a stop cock, connector, sliding rod, &c.; six sizes; two quarts, 1.50; three quarts, 2.00; four quarts, 2.50; six quarts, 3.00; eight quarts, 3.50; twelve quarts, .....	4.50
NOTE. — This is the most convenient form in use.	
18. Straight Jars for four quart bell glasses, 75 cents; for eight quart, ....	1.00
19. Tall Bell Glasses; 18 by 4 inches, 1.50; 22 by 4½ inches, 2.00; 28 by 5 inches, .....	3.00
20. Jars for do. (suitable for Hydrometer, &c.) 75, 1.00, and, .....	1.25
21. Hand Glass, to show pressure of the air, for mercury tunnel, &c., .....	.75
22. Swelled Hand Glass, or Bladder Glass, .....	1.00
23. Cupping Glass, with cap and stop cock, .....	1.50
24. Bladder Cup and Cap, to use with condenser and condensing chamber, or under a bell glass; is used for the sheet rubber experiment, &c.; 3½ inch, 75 cents; 4½ inch, 1.50; with stand, .....	2.00
25. Freezing Apparatus; bell glass, pan for acid, improved silvered water cup and stand; 6 inch, 2.50; 8 inch, 4.00; 10 inch, 5.00; 12 inch, 6.00; 15 inch, .....	8.00



NUMBER	PRICE
26. Freezing Apparatus; bell glass, pan for acid, with seven silvered water cups for different kinds of water, rain, spring, impregnated with salts, &c.; 12 inch, 7.00; 15 inch, .....	9.00
27. Freezing Apparatus; with thermometer and bell glass with brass cap, to use with sliding rod; 8 inch, .....	6.00
28. Freezing Apparatus; bell glass with brass cap, acid pan, water cups, tunnel, stop cock and jet; 6 inch, 4.00; 8 inch, .....	5.50
29. Bell Glass, with glass bulb and tube, and spirit thermometer; for freezing mercury by the cold produced by the evaporation of ether, .....	4.00
NOTE.— These beautiful experiments require a high degree of exhaustion, but can be easily performed by all my pumps in fifteen to thirty seconds' time.	
30. Tubes and Bulbs filled with mercury, for breaking, after being frozen, 15 to 25 cents each.	
31. Hemispherical Cups, very heavy, with ball and socket joints, large turned handles, stop cock and stand; 6 inch, .....	15.00
32. Hemispherical Cups; with stop cock, handles, and stand; 5 inch diameter inside, .....	7.00
33. Hemispherical Cups; with stop cock, handles, and stand; 3 inch diameter, .....	5.00
34. Hemispherical Cups, with stop cock, handles of cast brass, and stand; 2½ inch diameter, .....	3.50
35. Stand, Lever, and Fulcrum; used with hemispherical cups, for weighing a column of air, .....	5.00
36. Inertia Wheel, vanes, which are placed edgewise or crosswise, on axle, 50 cents, and .....	1.00
37. Revolving Jet and Stand, 1.00, and .....	1.25
Revolving Jet and Fountain, in vacuum, .....	2.50
38. Double Revolving Jet, revolves in opposite directions, .....	2.00





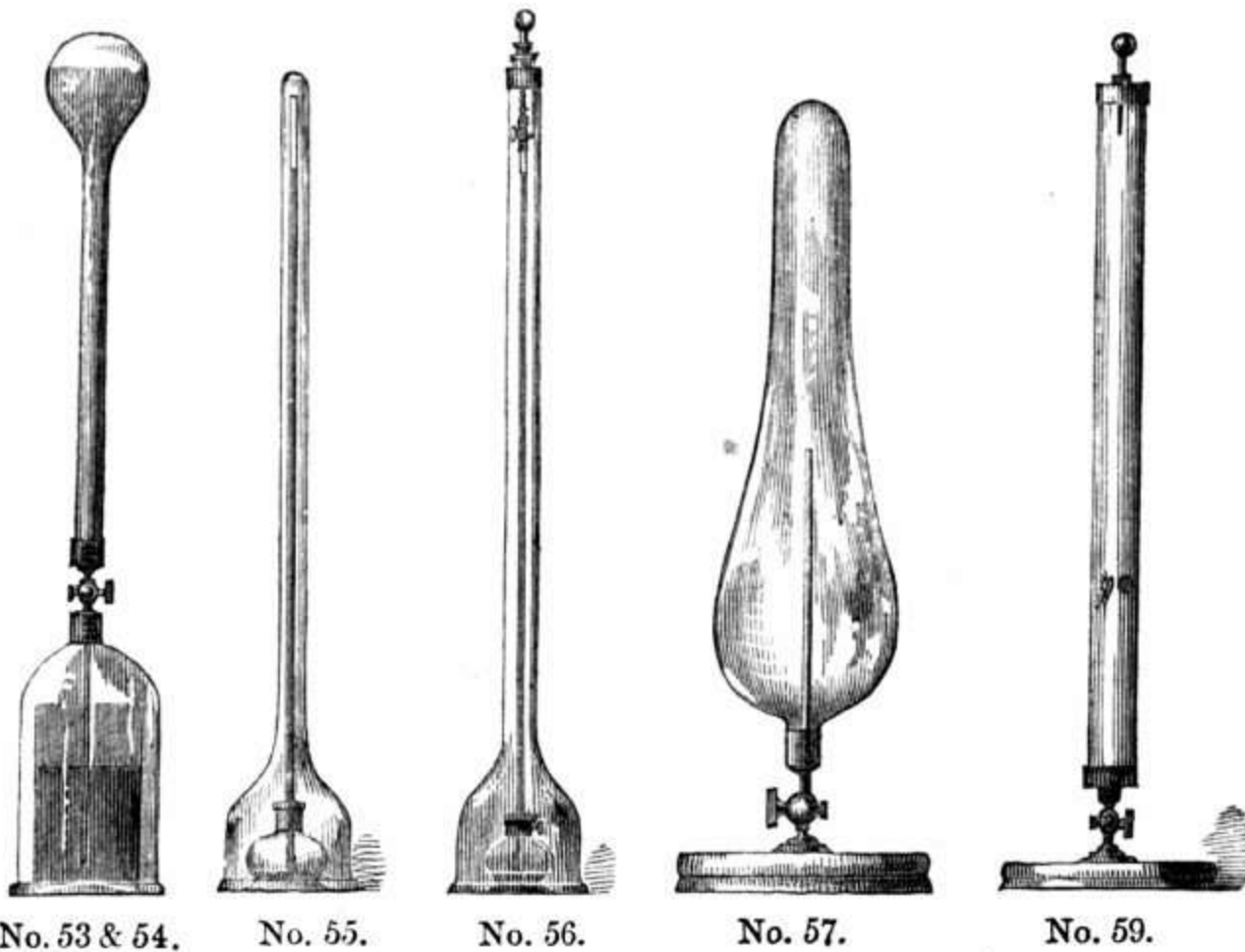
Nos. 42-45.

No. 46.

No. 48.

NUMBER	PRICE
39. Bell for Vacuum, with stand; the bell is entirely insulated, 1.25, .....	2.50
40. Brass Plate and Wood Cylinder, illustrating the porosity of wood, pressure of air, &c., .....	1.00
41. Double Transferrer, with five inch plates, eight inch bar, three stop cocks, on stand, .....	10.00
42. Upward Pressure Apparatus; tripod stand, 3 feet high, glass cylinder, 12 by 4½ inches, with piston, 5 inch brass plate, and strap for connecting weight, .....	10.00
43. Upward Pressure Apparatus; tripod stand, 30 inch, cylinder, 10 by 3½ inches, 4 inch brass plate, and strap, .....	7.00
44. Upward Pressure; tripod stand, 30 inch, cylinder, 9 by 3 inches, brass plate, 3½ inches, and strap, .....	5.00
45. Upward Pressure; stand 30 inch, cylinder 8 by 2¾ inches, plate and strap, .....	4.00
NOTE. — These illustrate also downward or lateral pressure and the elasticity of air, and are strong and durable.	
46. Upward Pressure Apparatus; glass bell; brass cap, with India rubber bag to which weights are attached; tripod stand and strap, .....	5.00
47. Lungs Glass; illustrating the mechanical action of the lungs, 2.00 and .....	3.00
48. Cryophorus in Vacuo; with brass plate and bell glass; the water is frozen in the outer ball, from the condensation of the vapor in the ball within the bell glass, 5.00 and .....	6.00
49. Flexible Water Hose, with screw and jet, .....	1.00
50. Tunnel, Stop Cock, and Jet, for introducing mercury, acid, ether, alcohol, water, &c., into an exhausted bell glass, 1.50 and .....	2.00
51. Apparatus for exploding gunpowder in vacuum; used also for other purposes; 3.00 and .....	5.00
52. Lock for striking flint and steel in vacuum, 2.00 and .....	3.00

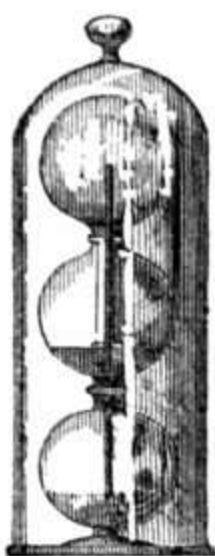




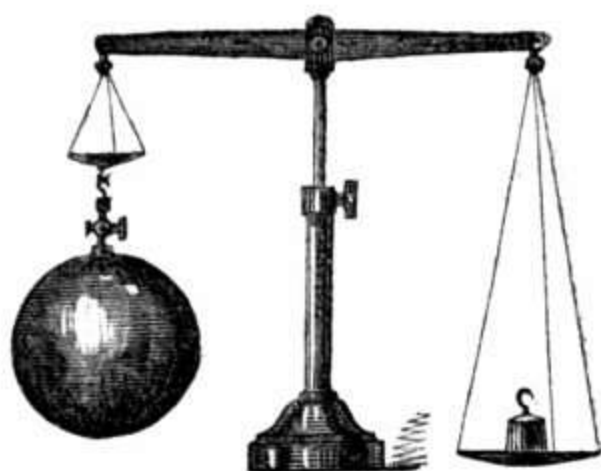
NUMBER	PRICE
53. Bolt Head, with brass cap; 24 inch, 1.00; 30 inch, .....	1.50
54. Jars to use with Bolt Head, &c.; 2 quart, 75 cents; 4 quart, .....	1.00
55. Barometer in vacuum; bell glass 33 inches high, tube, cup, and cap, ..	3.00
56. Barometer Apparatus, improved; bell glass and tube, with brass caps, sliding rod, stop cock, hook, vent screw, .....	7.00
57. Artificial Fountain, or fountain in vacuum; with stop cock, and jet, and stand; 15 inch, 3.00; 20 inch, 4.00; 26 inch, .....	6.00
NOTE.—The receivers are heavy and strong. Continue the experiment by condensing air into it and applying a jet on the outside.	
58. Guinea and Feather Apparatus; with tall conical receiver, with sliding rod, plate, drop tables, &c.; 3 feet, 7.00; 4 feet, .....	10.00
59. Guinea and Feather Tube; improved, capped at each end, with stop cock and stand, and made heavy and strong for showing the resistance of condensed air, fitted for Aurora Tube for electricity; 2½ feet, 4.00; 3 feet, 6.00; 4 feet, 7.00; 5 feet, 8.00; 6 feet, .....	9.00
60. Apparatus illustrating the weight and buoyancy of air, gas, &c., 3 inch glass globe, stop cock, stand steel beam, with grain and ounce weights, scale pans, and counterpoise, to use in open air and under bell glass, and with compressed air or exhausted. [The scales and weights can be used for other purposes,] 4.50; with brass globe, ....	6.00
61. Revolving Jet and Fountain in vacuum, with valves by which the water returns to the chamber as the air is let into the bell glass, and the experiment repeated, .....	3.50
62. Wood Cylinders and Weights, for sinking in water by exhaustion or condensation, .....	.25
63. Single Transferrer; has a brass capped two-quart bell glass, stop cock, brass plate, jet, and small bell glass; (is made up of parts before enumerated,) .....	5.00



No. 60.



No. 65.



No. 67-69.



No. 70.



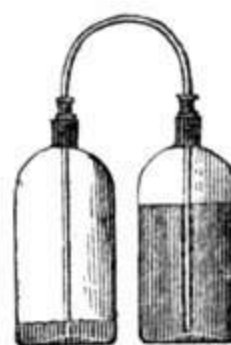
No. 71 &amp; 72.



No. 74.

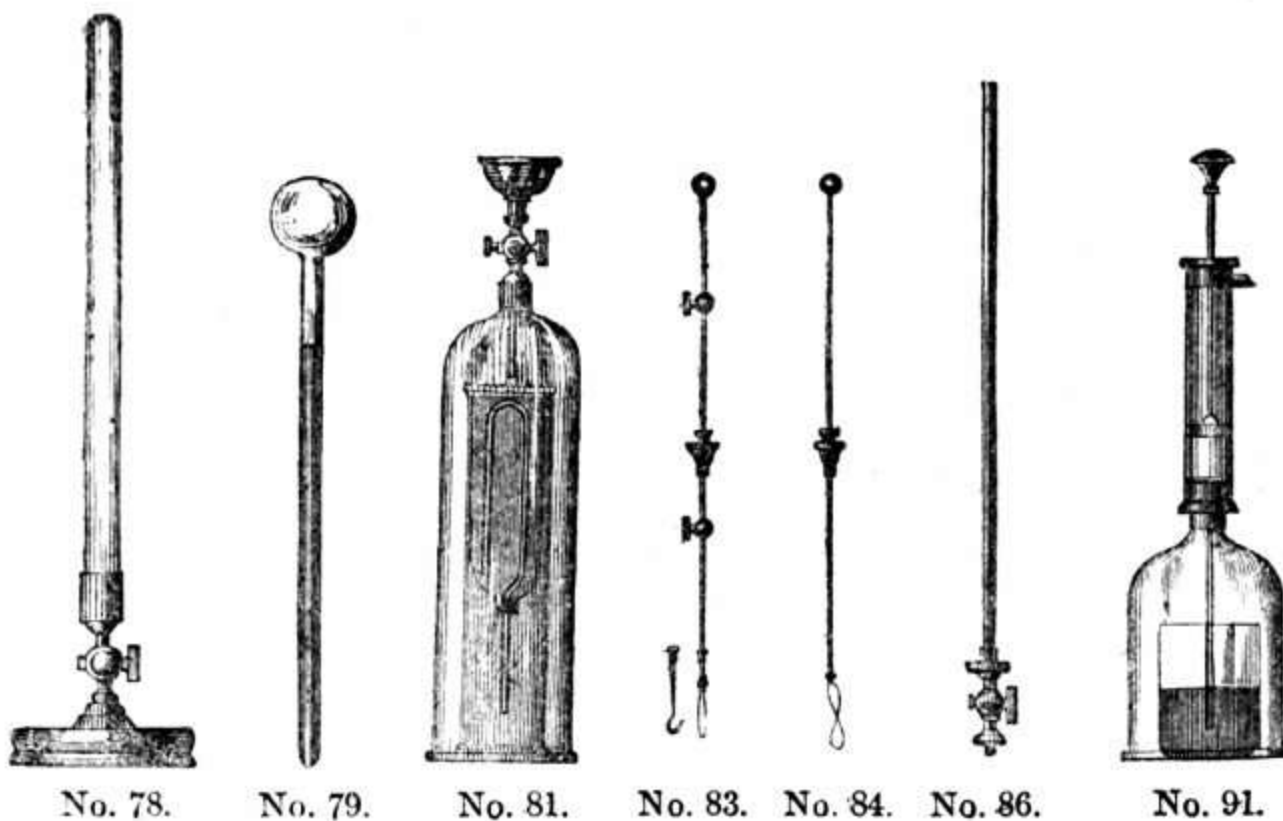


No. 75.



No. 77.

NUMBER	PRICE
64. Expansion Fountain in vacuum, or by condensation open and closed globes, brass capped, with cock and jets, .....	3.00
65. Treble Globe, or liquid transferrer; parts of this can be used for other experiments, .....	3.00
66. Scales for weighing air, gas, &c.; brass beam, 18 inch; elevating stand and binding screws; copper globe, 6 inch; scale pans and bows, sensitive to one tenth of a grain, fitted for specific gravity, .....	18.00
67. Stand, with graduated scale beam, and 6 inch copper globe, for weighing air, gas, &c., .....	12.00
68. Small size, as above, with 4 inch globe, .....	8.00
69. Weighing Air and Specific Gravity Scales; 6 inch copper globe; 24 inch fine wood beam, with an elevating stand and binding screws, to adapt to hydrostatic experiments, .....	12.00
70. Mercury Tunnel, for showing porosity of wood, pressure of air, electric luminous shower, &c., 50 cents, 75 cents, and .....	1.00
71. Bursting Squares, for expansion or pressure; per dozen, boxed, .....	1.50
72. Wire Guard, for bursting squares, .....	.75
73. Brass Cap Valve, for bursting squares, .....	.25
74. Expansion Apparatus; pint bell glass, bolt head and jar, 75 cents; with quart bell, .....	1.00
75. Siphon Vacuum Gauge, in glass case, with stand, .....	2.50
76. Bacchus Experiment, mounted in brass, .....	5.00
77. Bacchus Illustration, glass globes, with caps and tube, 1.50, .....	3.00



NUMBER	PRICE
78. Water Hammer; strong glass tube, with brass cap, stop cock, and stand, (for exhaustion,) .....	3.00
79. Water Hammer; tube, hermetically sealed, .....	1.00
80. Flexible Rubber Hose; with brass screws to attach to pump; for passing oxygen; 3 feet, 1.50; 4 feet, .....	2.00
81. Siphon in vacuum, with capped bell glass, tunnel, stop cock, and jet, ..	4.00
82. Sliding Rod and Brass Plate, with fixtures, .....	5.00
83. Sliding Rod and Packing Screw, with regulating binding screws and hook and pincers, .....	2.00
84. Sliding Rod and Packing Screw, with ball handle and hook and pincers; (used with Electrics,) .....	1.00
85. Sliding Rod; with packing screws, with ball handle, 1.00, .....	1.25
86. Air Gun Barrel and Balls to use with condenser, 50 cents and .....	1.00
87. Improved Vane and Mill, for use in air and in vacuum; illustrates resistance of the air, .....	7.00
88. Sheet Rubber Bag, with cap and hook, 1.25; with stop cock, .....	2.00
NOTE. — For large Rubber Bags, see Chemicals.	
89. Apparatus illustrating the absurdity of suction, 36 inches high, .....	5.00
90. Large Siphon Barometer, with brass cap and stop cock, for exhausting, ..	5.00
91. Illustrates the pressure of air necessary to the working of a Lifting Pump. (See <i>Hydraulics</i> .)	
92. Single Transferrer; has a brass capped two-quart bell glass, stop cock, brass plate, jet, and small bell glass; (is made up of parts before enumerated,) .....	5.00
93. Condensing Chamber of heavy hammered copper, with dome and side sockets, and interior tubes; 4½ inch diameter, 250; six inch diameter, .....	4.00
94. Large Copper Condensing Chamber, — globe form, with foot, — ten inches diameter, with stop cock and interior jet, .....	10.00
95. Improved Glass Condensing Chamber; capacity two quarts, one inch thick; screw cap, with two inch opening, and wrench, .....	10.00

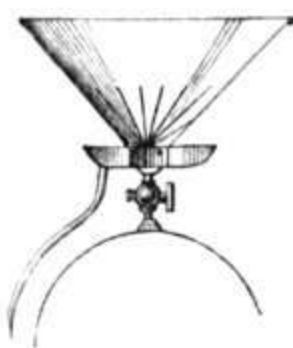




No. 93.



No. 95.



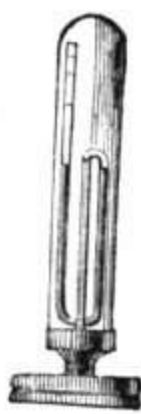
No. 100.



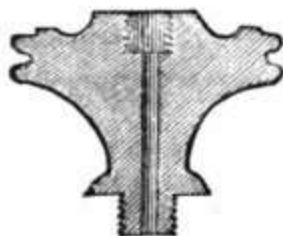
No. 101.



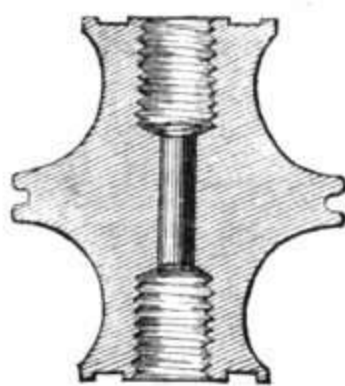
No. 102.



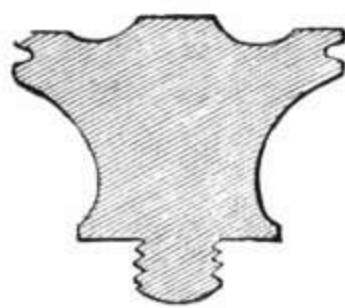
No. 103.



No. 107.



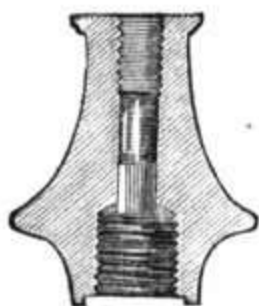
No. 108.



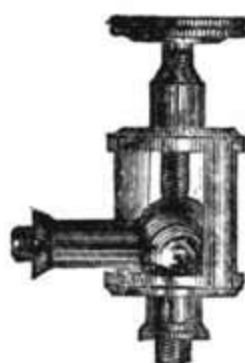
No. 110.

NUMBER	PRICE
96. Pressure Gauge, for experiments with glass chamber, .....	1.00
97. Square Vials, for experiment with condensed air in glass chamber, per dozen, .....	1.00
98. Horizontal Connecting Piece, for glass chamber, .....	.50
99. Bell, for condensed air in glass chamber, .....	1.00
100. Pneumatic and Hydrostatic Paradox, (for supporting a ball on a jet of air or water,) includes paradox tunnel and balls, 1.50; water pan and tube, 75 cents; stop cock, with interior and exterior jets, 2.00 .....	4.25
101. Plate Paradox, with mica disk; the disk, though lying loose upon the plate, cannot be blown off, 1.00 and .....	1.25
102. Pipe Paradox, with Balls, 1.00 and .....	1.25
103. Condensation Gauge and Stand, siphon form, in glass case, .....	2.50
104. Stop Cock, large screw; 3 inch, 1.00; 3½ inch, 1.25; 4 inch, 1.50; 4½ inch, 2.00; 5 inch, .....	2.50
105. Stop Cock, small screw, 1½ inch, .....	.75
106. Iron Stop Cocks to use with mercury, same prices.	
107. Connecting Screw; fits pump plate, .....	.50
108. Double Interior Screw Coupling, .....	.50
109. Guard Screw; fits pump plate, .....	.50
110. Screw Plug for closing brass caps, &c., exterior screws, .....	.50
111. Double Interior Coupling, large and small screw, .....	.50
112. Gallows Connector and Tip; exterior screws, .....	1.25
113. Gallows Connector and Tip; interior screws, .....	1.25
114. Long Connector for connecting Revolving Jet, &c., inside a bell glass, to a stop cock in the cap or brass plate, .....	.50
115. Pear Gauge, for determining the actual bulk of air exhausted from a bell glass, (without sliding rod,) .....	3.00



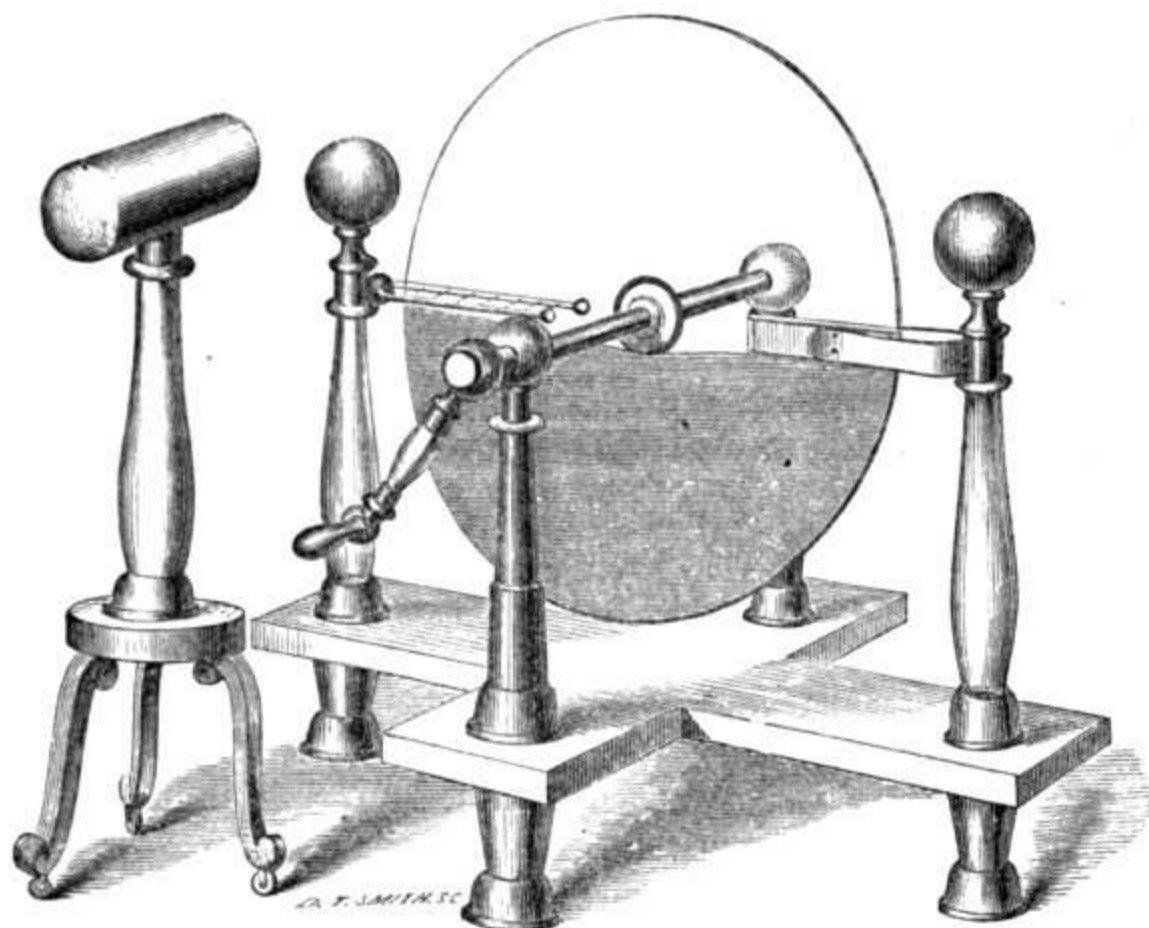


No. 111.



No. 112.

NUMBER	PRICE
116. Brass Cylinder and Piston, with weight, to illustrate the power of expanding air,.....	4.00
117. Bell Glass; graduated to cubic inches for measuring air or gas for weighing; capacity, 200 cubic inches,.....	3.00
118. Graduated Bell Glass, as above, 1.00 cubic inches, with cap, .....	2.50
119. Glass Balloon and Car, in glass jar, three sizes; 15 inch jar, 3.00; 18 inch, 4.00; and 24 inch,.....	5.00
120. Hydrostatic Balloon; small rubber bag, to use in tall bell and jar, ...	5.00
121. Glass Flask, with cap and stop cock, for boiling water in vacuum, or under pressure, (see <i>Chemicals</i> ,) 2.00 and .....	3.00
122. Small Thermometer to suspend in the flask, 75 cents and .....	1.00
123. Spring Safety Valve, for the above flask, .....	1.00
124. Wood Cylinders, and weight for sinking when the air is removed from the pores,.....	.25
125. Leather Collars, for stop cocks, assorted, per hundred, .....	.50
126. Oil, prepared to use with Philosophical Instruments, 25 cents, and ....	.75
127. Brass Caps, for bell glasses, from one half to two inches diameter, from 15 cents to .....	.60

**ELECTRICITY.**

No. 2-5.

THE Electrical Machine is constructed upon the most approved principle. The rubbers and prime conductor are each insulated, so that positive and negative electricity may be experimented with. I have made improvements in the rubber, greatly increasing the power of the instrument. In the larger machines the amalgam is spread upon a film of netted silk, with a cushion of finest wool felt.

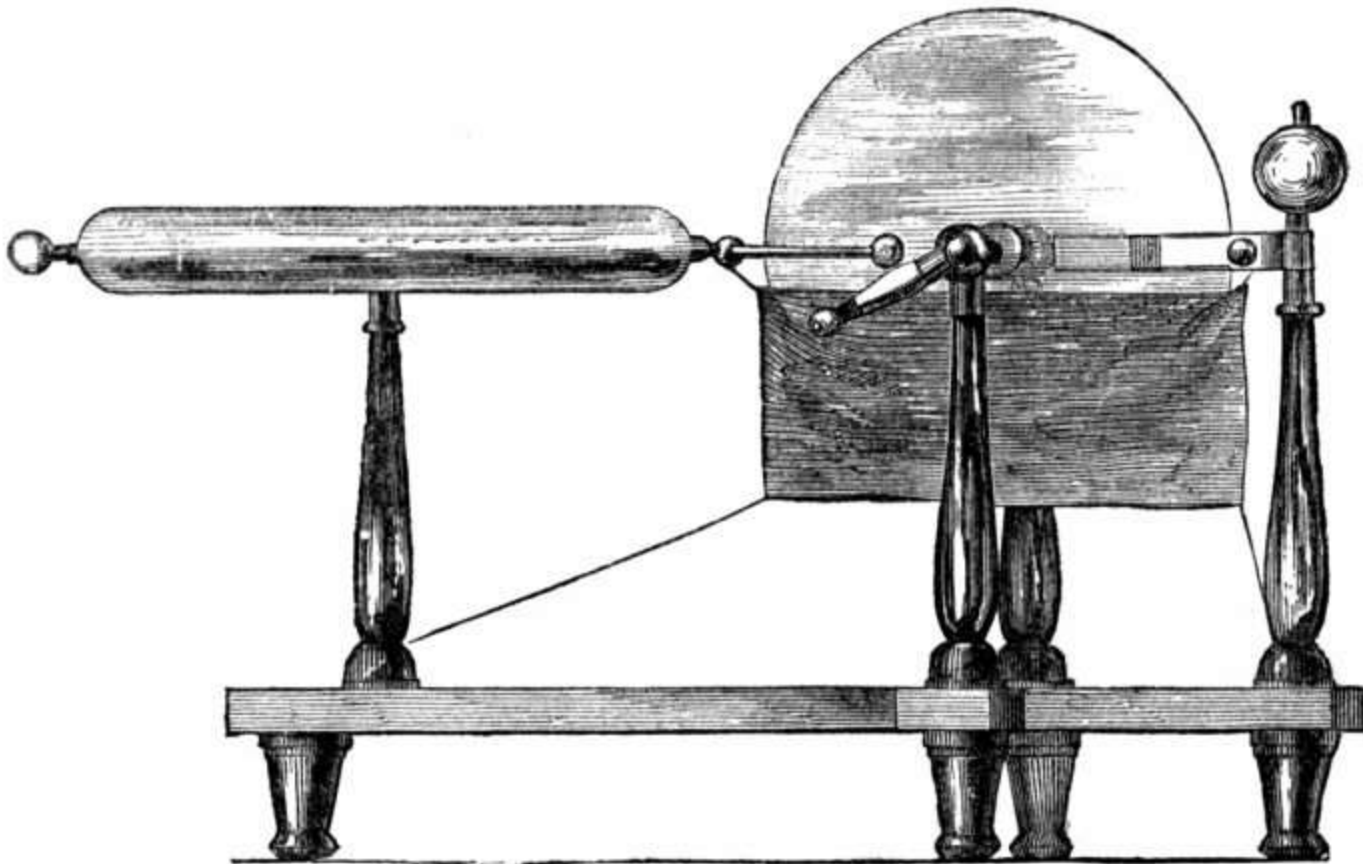
The Prime Conductor is supported upon its pillar by conical fittings, so that it is very firm, yet easily removed. I have made a series of experiments with glass plates, from the French and English manufactories, to decide which is best for excitation, and the least affected by hygrometric states of atmosphere; and I have imported directly the plates for all sizes of instruments.

The Basements will in future be made of rosewood or best St. Domingo mahogany, varnished, rubbed, and polished.

In the large machines, it is very desirable to have the large conductor on a separate basement. It is much more convenient. It can be attached to either the positive or negative balls. In many experiments its use is not required.

Electrical Machines, with plates of larger dimensions, will be made to order. I have made one for the University of Mississippi with two plates of six feet diameter each, with four pairs of rubbers, elaborately finished.

Cut Glass Pillars will be put upon Nos. 2 to 7, at additional cost of \$6 to \$15, which add to the beauty of the instrument without injury to its strength or efficiency.



No. 5-9.

NUMBER	PRICE
1. Electrical Machine; rosewood basement, with two plates, 48 inches in diameter, four pair 15 inch improved rubbers, prime conductor 66 by 8 inches on separate basement, six insulated pillars, insulated crank, highly finished, .....	\$300.00
2. Electrical Machine; rosewood basement, plate 54 inches in diameter, rubbers 18 inches, positive and negative balls 8 inches diameter, prime conductor 66 by 8 inches mounted upon a separate basement, insulated crank, .....	225.00
3. Electrical Machine; mahogany basement, plate 48 inches in diameter, rubbers 15 inches, positive and negative balls 8 inches in diameter, prime conductor 60 by 8 inches on separate tripod basement, insulated crank, .....	175.00
4. Electrical Machine; mahogany basement, plate 42 inches in diameter, rubbers 13 inches, positive and negative balls 8 inches, prime conductor 54 by 8 inches on tripod basement, insulated crank, .....	160.00
Electrical Machine, with same dimensions, with the prime conductor upon same basement, .....	135.00
5. Electrical Machine; mahogany basement, plate 36 inches in diameter, rubbers 12 by 2 inches positive and negative balls 7 inches, prime conductor 48 by 7 inches, on tripod basement with casters, insulated crank, .....	150.00
Machine with same dimensions, with the prime conductor mounted on same basement, .....	125 00





No. 10.



No. 11.



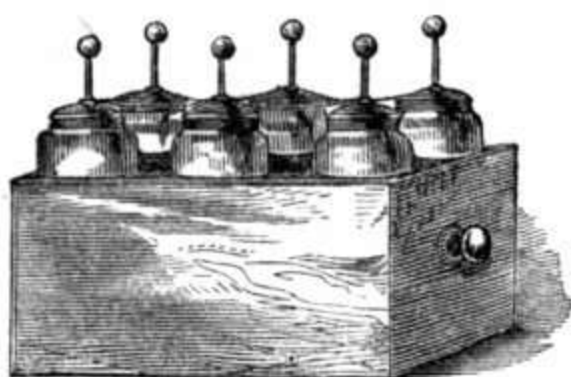
No. 13.



No. 14.



No. 15.



No. 16.



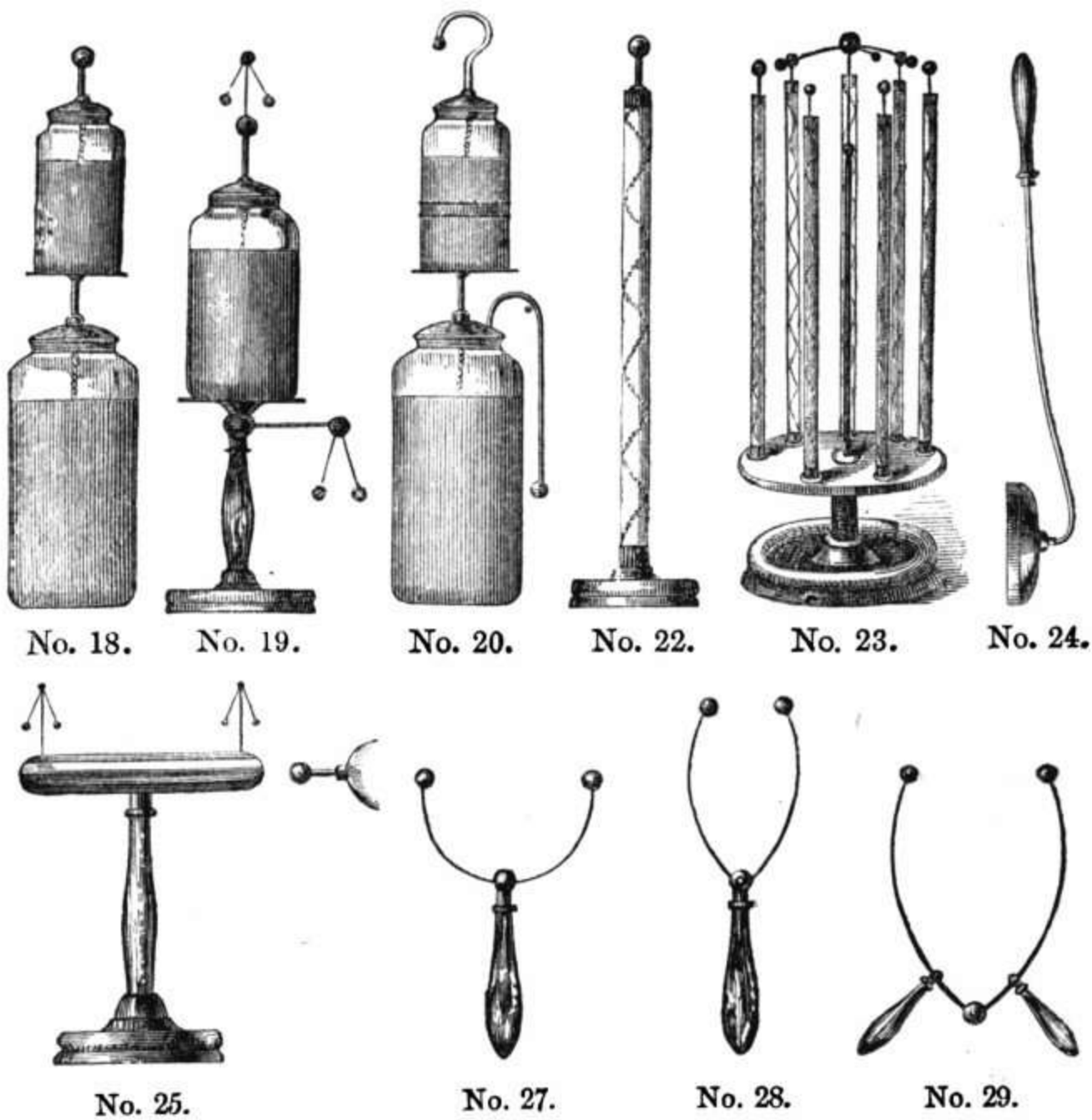
No. 17.

## NUMBER

## PRICE

- |   |       |
|---|-------|
| 6. Electrical Machine ; mahogany basement, plate 30 inches, rubbers 10 by 2 inches, prime conductor 36 by 6 inches, negative do. 6 inches, with double separable sets of points, basement 5½ by 3 feet, the shaft is 44 inches from floor, insulated crank. This size of machine has been highly approved, and is a very efficient instrument,..... | 85.00 |
| 7. Electrical Machine ; mahogany basement, plate 24 inches, rubbers 8 by 1½ inches, prime conductor 18 by 4 inches, negative do. 4½ inches ; the basement is 52 by 25 inches, the shaft 28 inches above the table,.....   | 50.00 |
| 8. Electrical Machine ; mahogany basement, plate 20 inches, rubbers 6½ by 1½ inches, prime conductor 16 by 3½ inches, negative do. 4 inches, basement 40 by 19 inches, .....  | 25.00 |
| 9. Electrical Machine ; mahogany basement, plate 16 inches, prime conductor 14 by 3¼ inches, negative do. 4 inches, basement 35 by 17 inches,.....  | 20.00 |
| 10. Leyden Jars ; 2, 3, 4, and 8 pints, 1.00, 1.50, 2.00, and.....  | 3.00  |
| 11. Atmospheric Leyden Jar ; with crooked stem and ball for suspension, movable ring with points ; one quart, 2.00 ; two quarts, .....  | 3 00  |
| 12. Leyden Jar with Sliding Discharger ; two quarts, 4.00 ; four quarts,...   | 5.00  |
| 13. Leyden Jars ; improved form, with movable coatings ; one and two quarts, 2.50 and .....   | 3.50  |
| 14. Electrometer Jars ; one and two quarts, 1.50 and .....  | 2.50  |
| 15. Diamond or Luminous Jars ; the spots are perforated to show the points on both sides ; two and four quarts, 3.00 and .....  | 5.00  |
| 16. Electric Batteries ; neatly cased, four 1 quart jars, 6.00 ; six 1 quart jars, 8.00 ; four 2 quart jars, 10.00 ; six 2 quart jars, 14.00 ; four 4 quart jars, 12.00 ; six 4 quart jars, .....   | 18 00 |
| 17. Electric Sportsman and Birds ; used with electrometer jar, 75 to 1.00. Electric Birds ; per dozen, 50 cents and .....   | .75   |

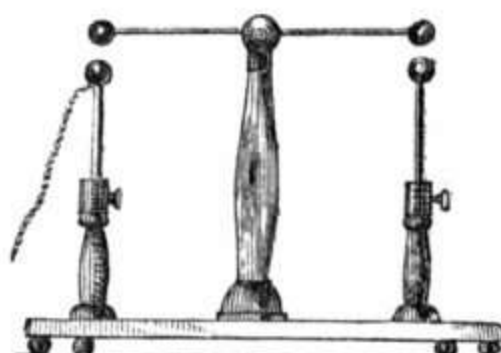




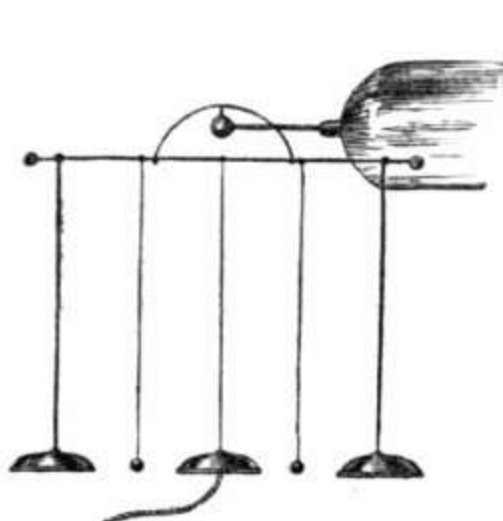
NUMBER	PRICE
18. Double Leyden Jars; one and two quarts; illustrates several important principles,.....	3.50
19. Insulating Stand; with jar and electrometers,.....	4.00
20. Improved Set of Leyden Jars; two quart jar fitted as electrometer jar, a plate which screws upon the stem in place of the ball, supports a one quart jar with atmospheric ring; the set answers for Nos. 10, 11, 14, and 18,.....	4.50
21. Leyden Jar; with outer coat of filings, showing the zigzag lines of the current; one, two, three, and four quarts; 1.00, 2.00, 3.00,.....	4.00
22. Spiral Spotted Tube and Stand; two feet, 2.50; three feet,.....	3.00
NOTE.—The Spots are on the <i>inside</i> of the tube. The tube may be excited with a silk handkerchief.	
23. Set of Six Spiral inside Spotted Tubes; with centre insulated pillar, and revolving discharger mounted on mahogany stand; with two feet tubes, 20.00; three feet,.....	25.00
24. Electric Spoon; for igniting ether, 75 cents,.....	1.25
25. Insulated Conductor; stand and electrometers, for induction by influence,.....	7.50
26. Insulated Director, or Discharger; with ball and point, 1.50 and .....	2.00
27. Plain Discharger; large glass handle, 2.00 and .....	2.50
28. Jointed Discharger; large handle, best form, .....	3.50



No. 30.



No. 31.



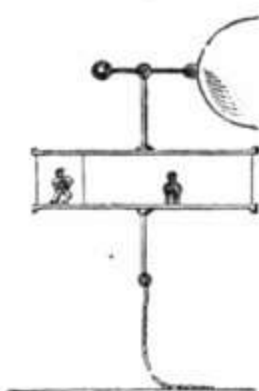
No. 32.



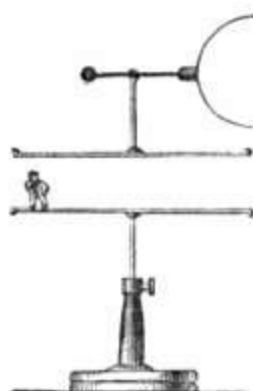
No. 34.



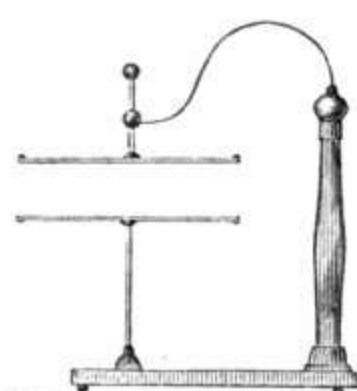
No. 35.



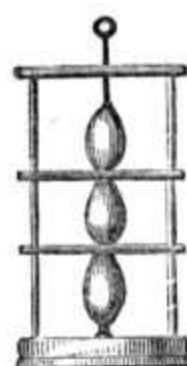
No. 36.



No. 37.



No. 38.



No. 39.

NUMBER	PRICE
29. Jointed Discharger; with two handles,.....	3.50
30. Universal Discharger; large insulated table, swelled pillars with universal joints, sliding rods with balls, points, and pincers; mahogany basement, 6.00 and .....	8.00
31. Balance Electrometer; 16 inch beam, adjustable.; for measuring attraction and repulsion, and for the gradual discharge of a Leyden jar,...	4.00
32. Electrical Bells; set of three 3 inch bells, with frame, to suspend to conductor, .....	3.00
33. Set of Five Bells; on insulated stand handsomely mounted,.....	7.00
34. Set of Nine Bells; mounted on mahogany stand, with large insulating pillar; very handsomely mounted, .....	12.00
35. Leyden Jar; with bells and stand,.....	5.00
36. Dancing Image Plates; eleven inches diameter, to suspend to prime conductor, .....	2.00
37. Dancing Image Plates; eleven inches, on adjusting stand, .....	3.00



No. 41.



No. 42.



No. 43.



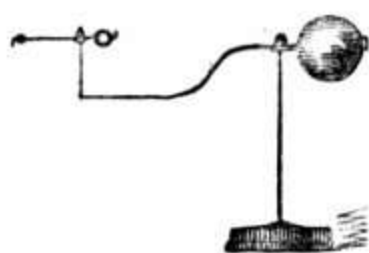
No. 44.



No. 46.



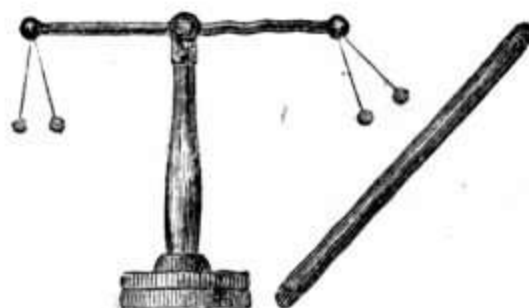
No. 47.



No. 49.



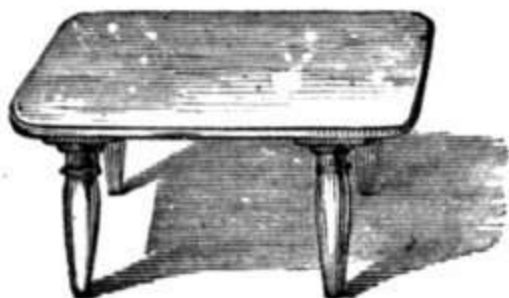
No. 52.



No. 53.

NUMBER	PRICE
38. Dancing Image Plates ; on insulating and adjusting stand, 4.00 and...	6.00
39. Stand for Illuminating Eggs ; 1.50 and.....	3.00
40. Dancing Images ; of pith. painted, per pair.....	.50
41. Pith Ball Electrometer and Stand, 50 cents. 75 cents, and .....	1.00
42. Quadrant Electrometer and Stand, 2.00 and .....	3.00
43. Gold Leaf Electrometer with evaporating cup and point, 2.00 and ....	3.00
44. Improved Gold Leaf Electrometer ; with evaporating cup. point. and condensing plates : brass stand ; very sensitive.....	5.00
45. Atmospheric Electrometer ; with air thermometer.....	6.00
46. Plate to attach to sliding rod for dancing pith balls, .....	.50
47. Electrical S. (or Flier) and Stand ; with four points, 50 cents ; eight points, .....	.75
48. Compound Electric S ; with point and insulated stand. 2.00, and .....	3.00
49. Electric Seasons Machine , with point and stand ; is placed in the cen- tre hole of the prime conductor, .....	1.50
50. Electric Seasons Machine, or Tellurian ; mounted on insulated stand, large size, .....	6.00
51. Electric Seasons Machine ; mounted on insulating stand, smaller size,	3.00
52. Sulphur Cone and Cup ; 75 cents and .....	1.00
53. Insulated Bar, with electrometers, to illustrate induction by influ- ence, .....	3.00
54. Insulating Stool ; mahogany, 16 inches square. and braced. large swelled glass legs with brass screw caps, 8 inches high, finely finished,	6.00
55. Insulating Stool ; mahogany, 8 inch swelled legs ; neatly finished, ....	4.00
56. Revolving Bell Glass ; with point and movable ring. 2.00 and.....	2.50





No. 54.



No. 56.



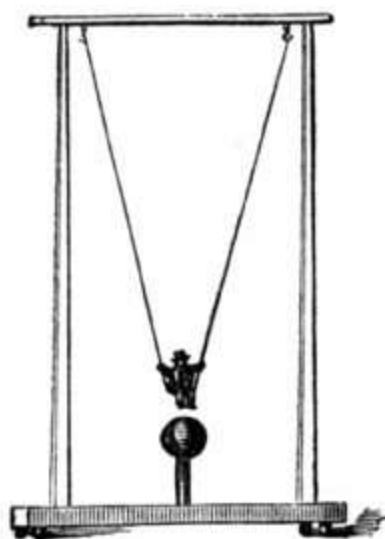
No. 57.



No. 59.



No. 61.



No. 62.



No. 63.



No. 65.



No. 66.

## NUMBER

## PRICE

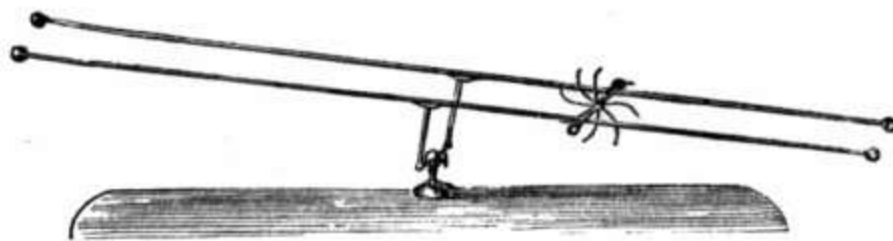
- |   |       |
|---|-------|
| 57. Globe with Sliding Rods, Cocks, and Stand; for passing the current through vacuum, gasses, &c.; globe 10 inches diameter, ..... | 8.00  |
| 58. Miser's Plate; 12 and 18 inches square; plain, 75 cents and 1.00; in mahogany frame, 1.50 and .....                             | 2.00  |
| 59. Luminous Bell; two sets of points to attach to pump plate, and to the sliding rod; for the points, 1.00, .....                  | 1.50  |
| 60. Electrophorus; eleven inches, with cover and handle, .....  | 5.00  |
| 61. Electrophorus: eleven inches, mounted on insulating stand, with cover, and handle, and elastic bag, and jet, 6.00 and .....     | 8.00  |
| 62. Electric Swing and Image, 2.00 and .....  | 3.00  |
| 63. Ivory Mortar and Ball; for decomposing oil, .....   | 2.00  |
| 64. Electrical Cannon; mounted in brass, .....  | 4.00  |
| 65. Powder Bomb; illustrates the effect of passing the current through water, .....   | 1.25  |
| 66. Electric Swan and Basin; 1.00 and .....   | 2.00  |
| 67. Northern Light, or Aurora Tube; from three to eight feet long, and mounted, 4.00 to .....                                       | 10.00 |

NOTE. — See Guinea and Feather Tube in *Pneumatics*.

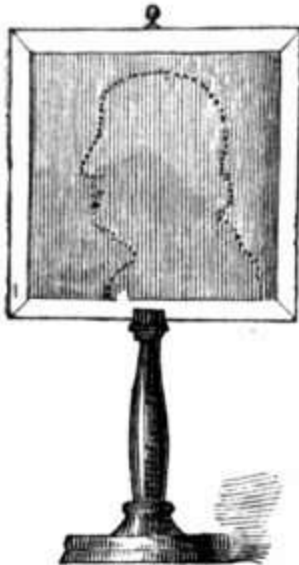




No. 68.



No. 70.



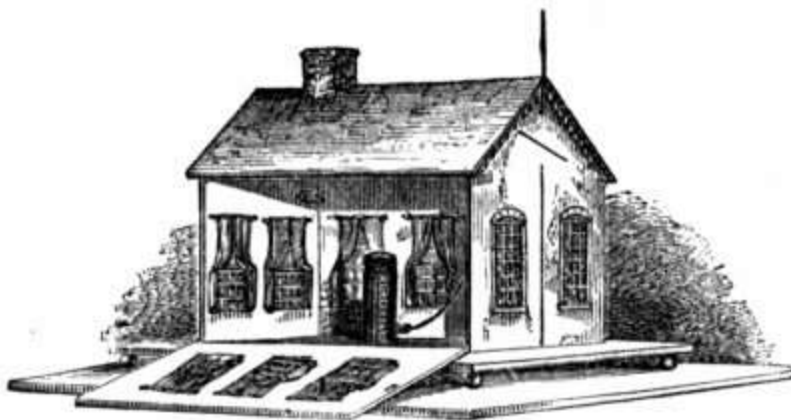
No. 74.



No. 71.



No. 72.

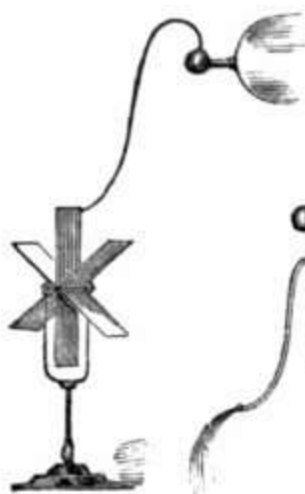


No. 76.



No. 77.

NUMBER	PRICE
68. Brass Electrical Gas Pistol; with curved mahogany handle; fitted also for voltaic pistol, 3.00 and .....	4.00
69. Electrical Gas Pistol; plain, .....	.50
70. Electric Wheel and Inclined Plane; 2.00 and .....	4.00
71. Sliding Directing Rod; three and four feet long, 2.00 and .....	3.00
72. Luminous Letters; six and twelve inches square, on silk and in frame; <i>seen by day or night</i> ; per letter, 50 cents and .....	.75
73. Luminous Star; on glass, mounted, 2.50 and .....	4.00
74. Profile of Franklin; spotted on glass, and mounted, 2.50 and .....	4.00
75. Illustration of the Leyden Jar; plate of glass, with coatings and electrometers on each side, mounted like No. 74, .....	4.00
76. Thunder House; illustrating the lightning rod; the house is held together by magnets, and is blown down by the discharge of a gas pistol within; complete, .....	5.00



No. 78.



No. 79.



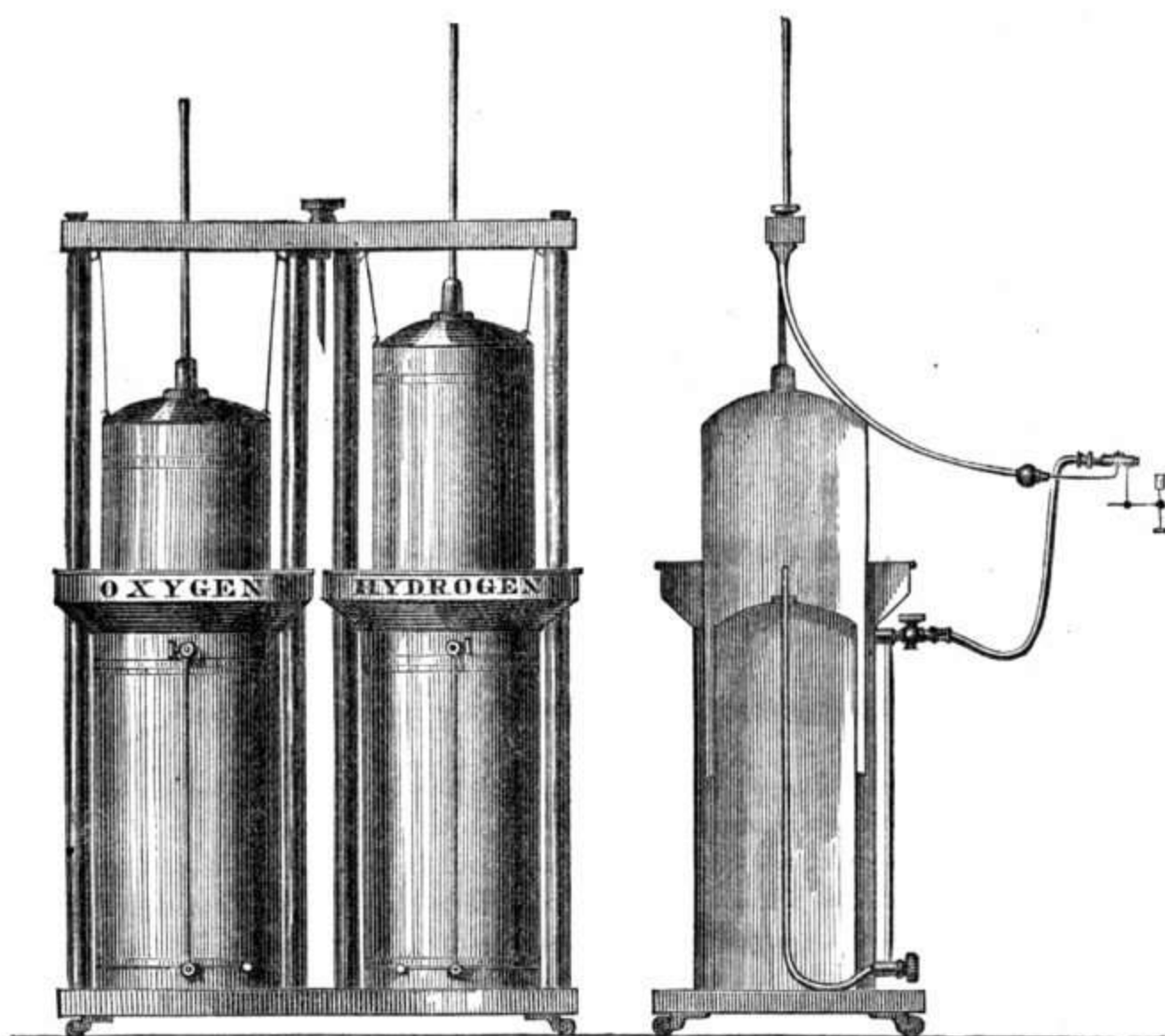
No. 80.



No. 81.

NUMBER	PRICE
77. Hydrogen Gas Generator ; (see <i>Chemicals</i> .).....	3.00
78. Electric Float ; wheel and point, 1.00, .....	1.50
79. Electric Siphon and Bucket, 1.00 and .....	2.00
80. Abbe Nollet's Globe ; bell glass with thick glass globe and loose cap to admit water ; to be placed on plate of air pump, showing very beautiful and varied effects ; two quart bell, 3.00 ; four quart bell,.....	5.00
81. Globe ; with sliding rods, stop cock and stand, .....	8.00
82. Coulomb's torsion Electrometer, for accurately measuring small quantities of electricity, 8.00 and.....	12.00
83. Electrical Gamut of eight bells with revolving clapper, 12.00 and.....	15.00
84. Apparatus for igniting phosphorus, 3.00 and.....	4.00
85. Model of Obelisk to illustrate the lightning rod, .....	3.00
86. Apparatus for piercing a card or plate of glass, by the discharge of a Leyden Jar,.....	2.50
87. Hollow Sphere of Coulomb to show that the electricity resides on the exterior surface—globe, 5 inches diameter on insulating pillar and mahogany basement ; an opening in the top admits the test needle,..	4.00
88. Test needle ; a slender rod of glass or gum lac, with disk of gold foil, .....	.50
89. Apparatus for illustrating the tension of electricity ; four brass insulated globes of diameter one to four inches, adjustable at different distances, on mahogany basement, 8.00 and .....	10.00
90. Condenser, two insulated disks of brass movable on mahogany basement,.....	5.00
91. Apparatus to illustrate the theory of the Leyden Jar ; two disks of metal with insulated handles and plate of glass, 4.00 and.....	5.00
92. Apparatus for passing the charge of a jar or battery through water, insulated pillars with sliding rods, gutta percha basins and mahogany basement,.....	5.00
93. Artificial Spider, for attraction and repulsion,.....	.50
94. Brass Ball, on insulating stand,.....	1.00
95. Apparatus for Decomposing and Recomposing Water ; strong glass receiver capped at each end, with sliding rods and balls ; insulating stand, with graduated jar measuring the gases evolved by the water displaced ; the balls are movable to admit platinum points for galvanism, (see <i>cut in Magnetism</i> .).....	8.00
96. Amalgam ; per box 25 cents and.....	.50

## CHEMISTRY.

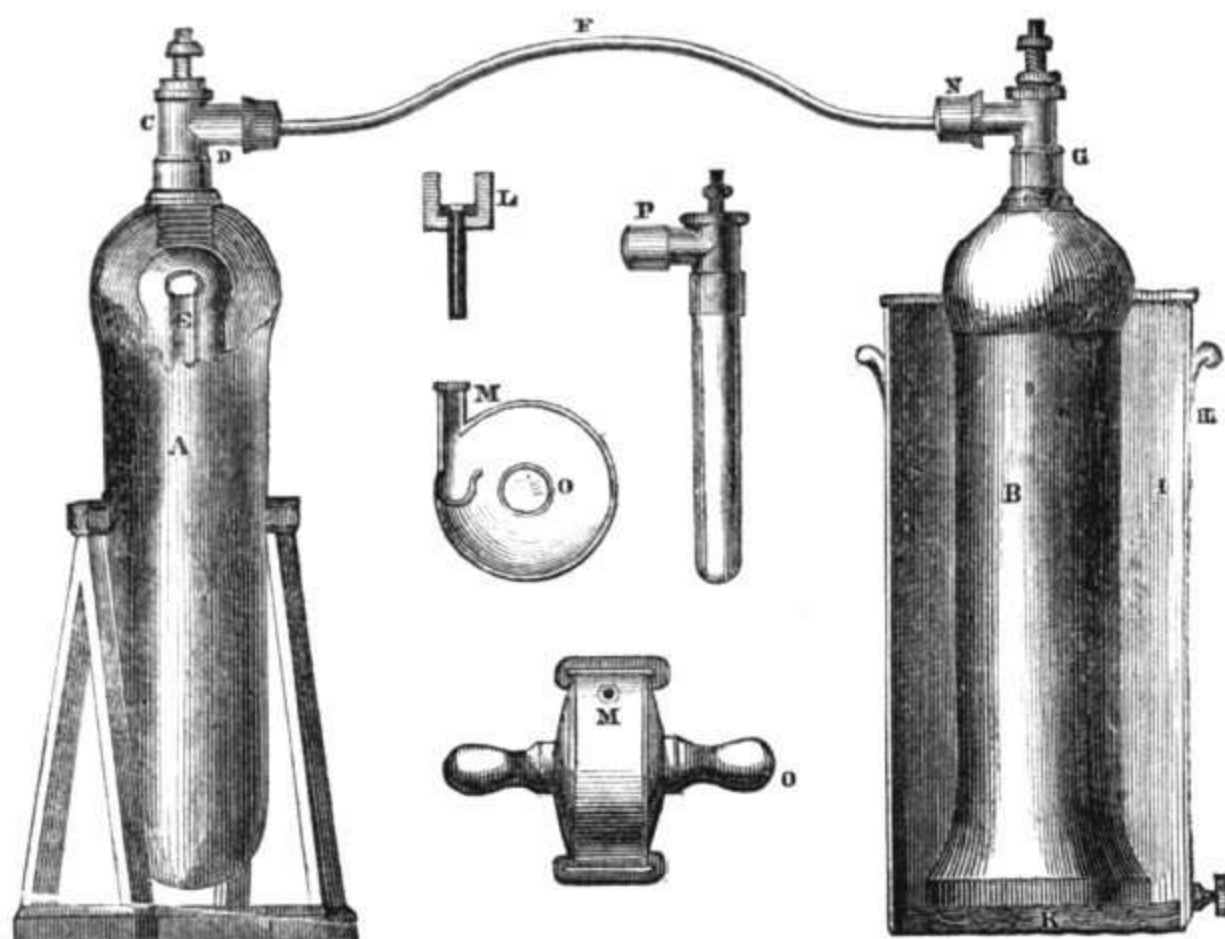


## NUMBER

## PRICE

1. Pair of Copper Gasometers ; each bell of 30 gallons' capacity, copper interior cylinders, thus requiring but a small quantity of water, brass tubes with stop cocks, rubber hose with jets, compound blow pipe with adjustable holder and calcium light fixtures, inlet pipes with screws, plugs, (the generators may be attached while in use,) cylindrical weights for pressure ; the frame stands on casters, the posts enclose the balance weights ; thoroughly made and finished, and neatly painted and lettered, .....150.00
2. Pair Copper Gasometers ; same arrangement and finish, each bell 15 gallons, ..... 60.00
3. Pair Copper Gasometers ; same arrangement and finish, each bell 7 gallons, ..... 35.00
4. Pair Gasometers of Zinc ; same arrangements, size, and finish, as No. 2 ; very durable and more economical, ..... 45.00
5. Pair Gasometers of Zinc ; size and finish of No. 3, ..... 25.00





APPARATUS FOR GENERATING, LIQUEFYING, AND SOLIDIFYING CARBONIC ACID GAS.

PRICE

Much care has been bestowed in perfecting this most valuable and interesting apparatus.

A glance at the instruments will insure confidence in their perfect security, completeness of arrangement, and perfection in workmanship.

The Generator, A, is about two gallons' capacity,  $1\frac{1}{4}$  inches thick, of the finest and strongest *gun metal*, weighs about 175 pounds, is mounted on a heavy iron stand, and arranged to revolve on centres, by which means the materials for generating the gas are mixed within.

The Receiver, B, is of the same weight, capacity, and metal, stands on a floor or basement, connects with the generator by means of a copper tube and screw couplers, F and N.

A strong Glass Receiver for retaining and exhibiting the gas as a liquid.

Two Brass Cases, connected to receiver by coupler L, quart and pint, with ventilated insulating handles; connect with the main receiver by *socket fitting*, M; are so constructed as to break the force of the liquid as it issues from the receiver, which is deposited as a pure white snow in the case.

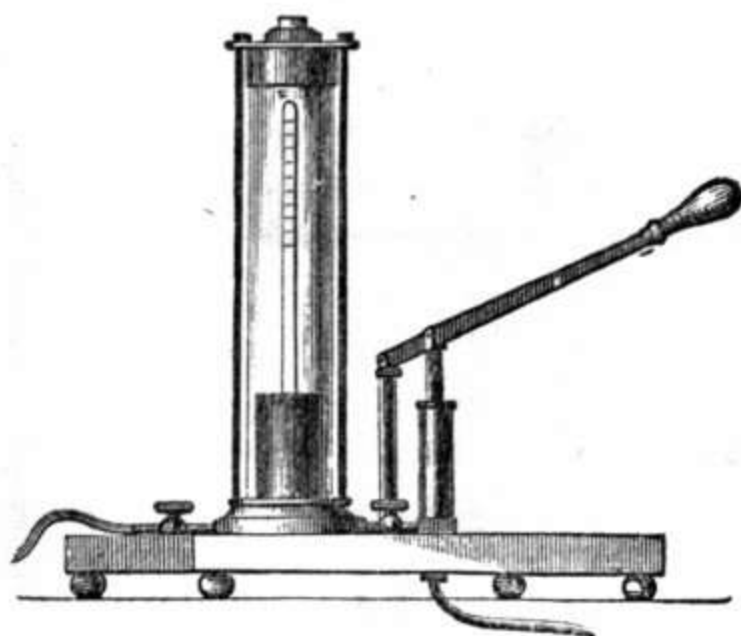
Cylindrical Copper Cistern, E, contains three pounds of sulphuric acid; is lowered into the receiver after pouring in the soda and water.

Hook and Handle for do. Funnel.

Copper Basin in which to mix three pounds bi. carb. soda with two quarts warm water, constituting, with the acid, one charge for the generator.

Large Iron Wrench; Mallet; Two hand Wrench; Wrench for the vent screws; Drawing Jet; Cylindrical Brush; Copper Cistern, into which the main receiver is set, and surrounded with ice and salt.

Ten charges will fill the receiver with liquid, which will yield about fourteen cases of the solid *carbonic acid*, .....\$125.00



### APPARATUS FOR LIQUEFYING GAS BY HYDRAULIC PRESSURE.

#### PRICE

This beautiful instrument for experimenting on gases that liquefy under 12 atmospheres consists of

A strong glass cylinder, with brass basement and cap, secured by iron rods; a brass plug closes the top; an iron cistern for mercury, into which a graduated glass tube, closed at the top, is inserted, to contain the gas.

A pump by which water is forced into the cylinder and the gas compressed.

Mahogany Basement and Pan for water; valve, stop cock, hose, and jet, \$30.00

### CHEMICAL SCALES AND WEIGHTS.

My Scales have been so long in use by many of the best practical chemists of the country, that I feel no reluctance in offering them as every way suited to the present high demand for accurate performance.

The Beam is twelve inches long, hollow, conical formed, light, and inflexible.

Movable Pans,  $3\frac{1}{2}$  inches diameter, and suspension bows. Length of beam adjustable.

The Knife Edge centre bearing rests on an agate plane  $1\frac{1}{4}$  inches long, and is raised by *cam* motion. The centre of gravity is adjusted and beam balanced in the most simple manner.

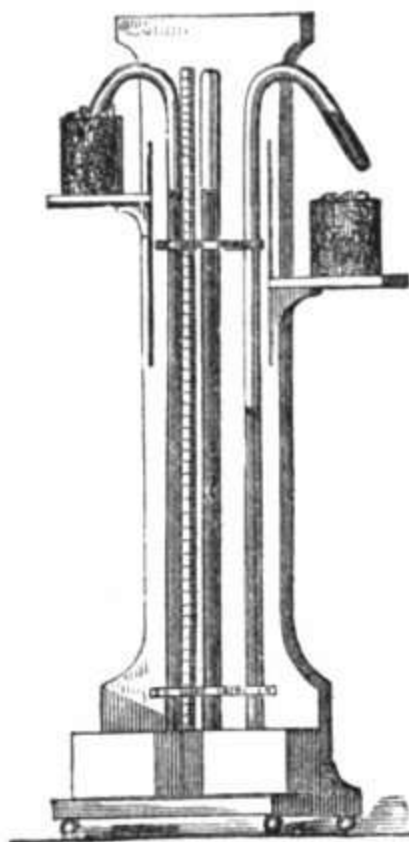
Case, twenty inches long, ten wide, sixteen high, glazed front and rear, rising doors, marble basement, and levelling screws.

Case of Weights, (thirty,) from 1-100 grain to 5 grains, of platina; from 10 to 1200 grains, in brass cylinders, electro gilt, with brass pliers,..... 60.00

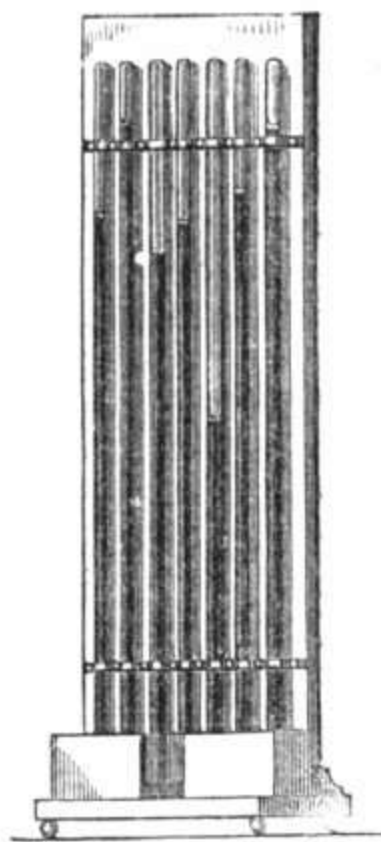
Case of Weights, as above, ..... 12.00



No. 1.



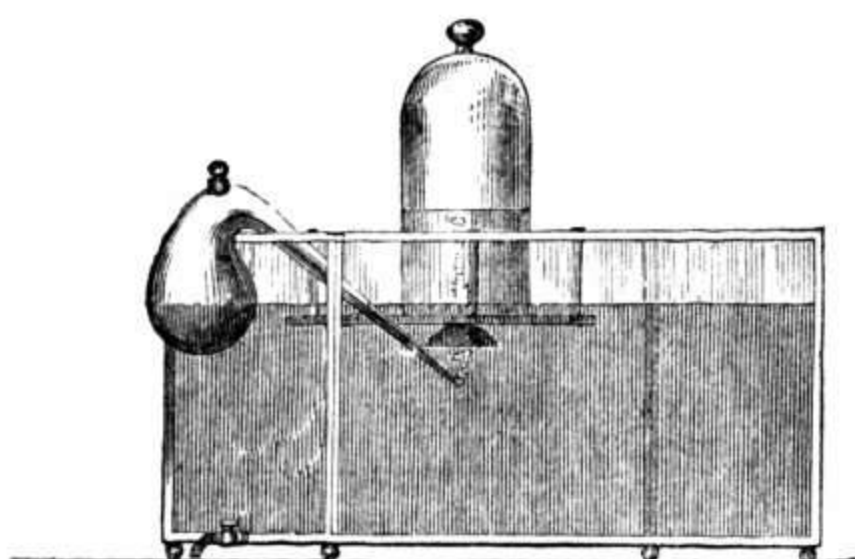
No. 2.



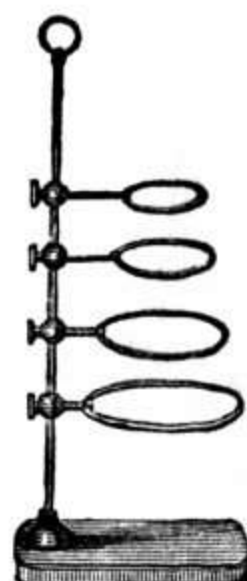
No. 3.

NUMBER	PRICE
1. Tall Mercury Cistern; in frame, with graduated glass tube, for illustrating the tension of gases. 10 00 and .....	15 00
2. Apparatus to show the tension of vapors; Iron Mercury Cistern, with glass front, two bent barometer tubes, with platforms and jars for freezing mixture, one straight tube, graduated scale.....	25 00
3. Apparatus to show the different tensions of Gases; Iron Mercury Cistern, with glass front, seven barometer tubes, held by screw clasps, graduated scale, .....	20.00
4. Lead Tube; with screw connections, 4 feet, .....	1 50
5. Vulcanized Rubber Tube; or hose, with screws, 4 feet. ....	2.00
6. Pair of Radiating Cubes: sides painted different colors, with shields; one has a tube for air thermometer .....	2.00
7. Conductometer; with iron, brass, copper, lead, tin, and glass rods, 1.50 and.....	2.00
8. Conductometer; of a cheaper form, .....	1.00
9. Apparatus for non-conducting powder of liquids, used with lamp stand, price 1 00 and .....	1.50
10. Platina Pendent Spoon and Rod, 1.00; Copper do., .....	.25
11. Pendent Sockets for tapers, &c., .25 and .....	.50
12. Platina Forceps, 2 00 and .....	3.00
13. Set 3 wire Gauze, for experiments with flame. ....	.50
14. Chemical Furnace; lined, rings or glass holders, tube holes, and sand bath, 10.00, 15.00, and .....	20.00
15. Iron Tube; adapted to furnace, with screws for decomposing water. 75 cents and .....	1.00
16. Hydrogen Balloons; of gold beater's skin, 12 inch, 1.00; 15 inch, 2.00; 18 inch, 3.00; 20 inch, 4.00; with net, 2.00 extra.	
17. Cryophorus; large size, very superior, .....	2.00

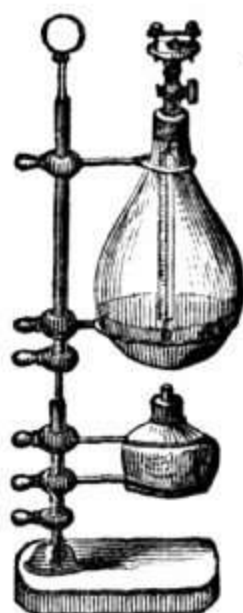




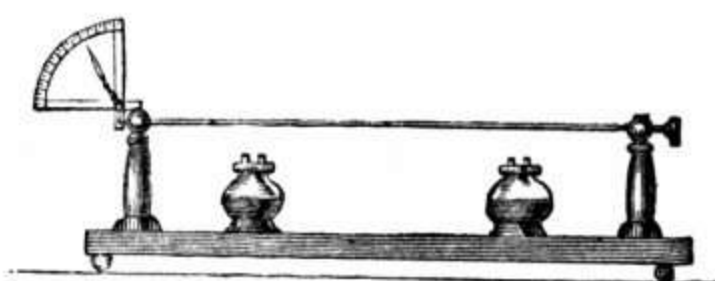
No. 18.



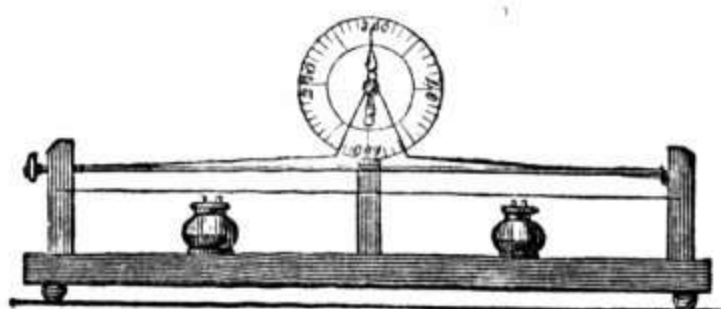
No. 20.



No. 21.



No. 22.



No. 23.

NUMBER	PRICE
18. Pneumatic Cisterns ; of plate glass, by which the operation is visible, 30 to .....	45.00
19. Pneumatic Cisterns ; of copper or wood, made to order—of all sizes and forms, from 5.00 to .....	50.00
20. Lamp Stand ; with four bows and binding screws, .....	2.00
21. Lamp Stands ; with four bows on tubes, with binding screws, which can be readily elevated and depressed, 3.00 and.....	3.50
22. Pyrometer ; with brass and iron rods, lamps, quadrant and needle,....	3.50
23. Pyrometer ; brass and iron rods for expansion, lamps, frame with dial ; very perfect and sensitive, 3.00 and .....	4.00
24. Elevating Stands ; with table tripod and bughorn, .....	1.50
25. Gas Bags ; of pure vulcanized rubber, spherical, with socket and stop cock, ten to eighteen inches diameter, 3 00 to.....	8.00
26. Gas Gags ; of rubber cloth, one foot to three feet square, with socket and stop cock, 5.00 to .....	12.00
27. Chemical Thermometer ; with jointed scale, 40° to 600°, very accurate,	4.00
28. Chemical Thermometer ; 450°, plain scale, .....	2.50
29. Spirit Lamp ; with ground cap, .....	1.00
30. Aphlogistic Lamp ; with platina coil, 1.00 and.....	2.00



No. 31.



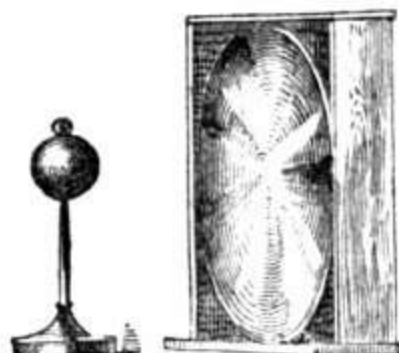
No. 32.



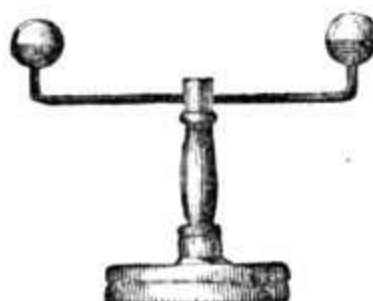
No. 33.



No. 35.



No. 37.

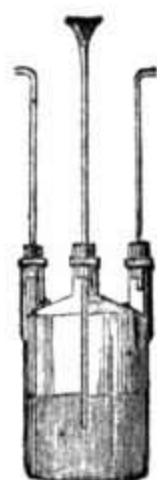


No. 39.

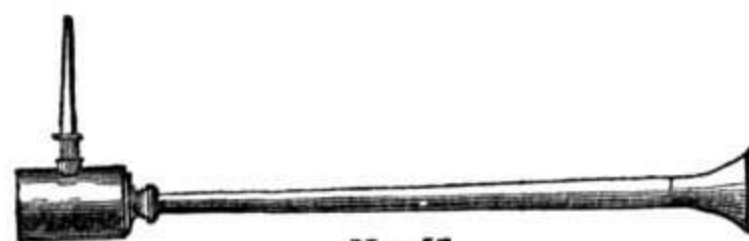


No. 43.

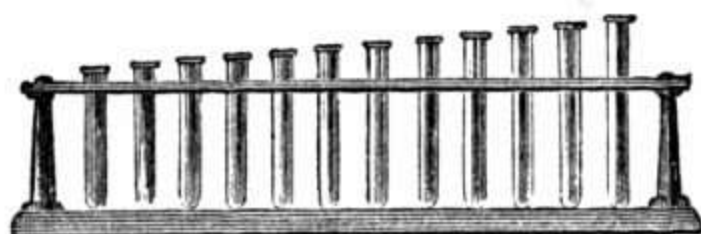
NUMBER	PRICE
31. Malleable Iron Retort and Tube; pint, 2.00; two pints, 2.50; three pints,.....	3.00
32. Copper Retort or Flask; screw cap, may be attached to gasometers by gallows screws, for generating oxygen with spirit lamp, quart, .....	2.50
33. Hessian Crucibles; in nests of five,.....	.20
34. Glass Mortar and Pestle; 50 cents, 75 cents and .....	1 00
35. Porcelain Mortar and Pestle; 1.00, 1.50 and.....	2 00
36. Iron Mortar and Pestle; 1.25 1.50 and .....	1.75
37. Pair Planished Reflectors; 13 inch, in cases which serve for stands, iron ball and stand,.....	6 00
33. Spirit Boiler, or Palm Glass: mounted to use with No. 37 .....	2 00
39. Palm Glasses; which boil by warmth of the hand,.....	.75
40. Graduated ounce measure, 75 cents, 1.00 and .....	1 25
41. Graduated measure: ten cubic inches, .....	1.25
42. Graduated Cubic Inch Tubes; 50 cents and.....	.75
43. Fire Syringe; 7 inch cylinder, with box tinder, .....	1 50
44. Fire Syringe; with stop cock, tinder cavity, .....	3 00
45. Bulb and Tube; for condensation of mixed liquids, .....	.75
46. Two Bulbs and Tube; for condensation, .....	1 00
47. Graduated 60 Drop Tube, on foot, .....	.75
48. Cast Iron Mercury Cisterns,.....	1.00
49. Platina Spatula: 1.50, 2.00 and.....	2 50
50. Steel Spatula: 25 cents and .....	.50
51. Assortment of Test Rods: eight,.....	.50
52. Glass Stirring Rods; six, 37 cents and .....	.75
53. Davy's Safety Lamp, .....	5 00
54. Ring and Ball; for expansion. 1.50 and .....	2.00



No. 55.



No. 57.



No. 59.



No. 62.

NUMBER	PRICE
55. Woolf's Bottles, one, two, and three pints, 1.00, 1.50, and .....	2.00
56. Plain Mouth Blowpipe; of brass, .....	.50
57. Blowpipe; with condensing bulb, 1.50; with ivory mouthpiece, .....	2.50
58. Test Tubes; glass, 4 to 12 inches, 8 cents to .....	.30
59. Test Tubes; with stand, one dozen, assorted, .....	2.00
60. Volta's Eudiometer, graduated, .....	1.50
61. Hope's Eudiometer, graduated, .....	3.00
62. Ure's Eudiometer, graduated, .....	2.50
63. Dropping Tube; 25 cents and .....	.30
64. Dropping Tube; with rubber air bag, .....	1.00
65. Hydrogen Generator; of copper, capacity one to ten gallons, 4.00 to..	10.00
66. Glass Flasks; Bohemian, with ring necks for corks, half pint, 25 cents;	
pint, 35 cents; quart, .....	.50
67. Glass Funnel; half pint, 25; pint, 35 cents; quart, .....	.50
68. Flat Bottom Flasks; gill, 20 cents; half pint, 30 cents; pint, 40 cents;	
quart, .....	.55
69. Globe Receivers; with ring neck, tube, and stopper, half pint, 35 cents;	
pint, 45 cents; quart, .....	.55
70. Tubulated Retorts; gill, 25 cents; half pint, 30 cents; pint, 35 cents;	
quart, .....	.50
71. Glass Evaporating Dishes; 15 cents to .....	.35
72. Porcelain Evaporating Dishes; 20 cents to .....	1.00
73. Wedgwood Evaporating Dishes; 15 cents to .....	.35
74. Hydrogen Gas Generator; with gas jet, platina sponge, and long jet for	
detonating gas, two quarts capacity, 4.00; four quarts, .....	6.00
75. Hydrogen Generator; in frame, with basement and fixtures, 8 quarts,	
8.00; 12 quarts, .....	12.00
76. Glass Alembics; pint, 1.75; quart, .....	2.50
77. Bologna Vials; per dozen, .....	1.00
78. Prince Rupert's Drops; per dozen, .....	.50
79. Long Necked Matrasses; half pint, 30 cents; pint, .....	.50
80. Air Thermometer; tube and bulb, 36 inch, .....	.50
81. Compound Bar; for unequal expansion, .....	.75
82. Cork borers; sets of three, .....	1.50



NUMBER	PRICE
83. Sheet Rubber ; piece, for square foot, .....	.25
84. Sheet Rubber vulcanized ; elastic and strong, 50 cents and .....	.75
85. Dissolved Rubber, in tin Boxes, 37 cents and .....	.50
86. Rubber Tubing ; very superior, per foot, .....	.25
87. Gallows Screws, Dr. Hare's. (See <i>Pneumatics</i> .) .....	1.25
88. Sefstroem's Retort Holder ; wood clamps, mounted on iron stand, 2.00,	3.00
89. Brass Cannon, for forming with potassium, and an icicle ; fitted also for electric cannon, 3.00 .....	4.00
90. Marsh's Arsenic Apparatus, .....	2.00
91. Cubic Inch Bottle, .....	1.25
92. Porcelain Crucibles ; glazed, with covers, 17 cts. to .....	.50
93. German Filtering Paper, per quire, .....	.50
94. Mouth Piece for Inhaling Gas, 75 cts. and .....	1.00
95. Adapters ; straight and bent, .....	.25
96. Safety Tubes, to use with Wolfe's bottles, .....	.50
97. Safety Tubes, bent, with bulbs, .....	.75
98. Sulphuretted Hydrogen Generator, with glass stop cock, .....	6.00
99. Crucible Tongs, .....	1.25

Chemical glass ware of Flint Glass, or Bohemian Glass, for use in the Laboratory ; of all descriptions, in great variety at moderate prices.

Files, nippers, &c., furnished at prices of hardware dealers.

## OPTICS.

I have lately visited London and Paris, to select and to make arrangements with the best makers of Optical Instruments to supply Institutions with Telescopes, Microscopes, Transit Instruments, and all instruments for Polarization of Light.

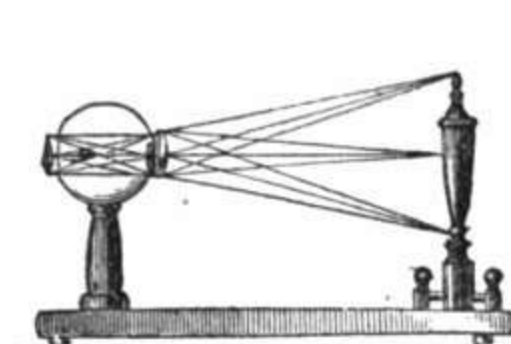
Objectives for Telescopes of over 3 inches I will import to order, and mount in a new and superior manner, and in simple or expensive style. I can furnish and mount those made by Mr. Alvin Clark, of Boston, whose objectives have been pronounced by scientific gentlemen to be equal to any imported.

Full descriptions and estimates for any instruments not included in Catalogue will be given on application.

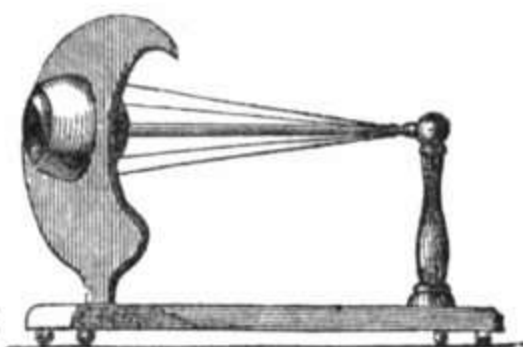
NUMBER	PRICE
1. Achromatic Telescope ; focal length 48 inches, object glass 3 inches, one terrestrial, three celestial powers, sun shade, rackwork adjustment ; tripod stand mounted entirely of brass, with mahogany case, .	100.00
2. Achromatic Telescope ; focal length 36 inches, object glass 2½ inches, one terrestrial, two celestial powers, sun shade, mounted and in case like No. 1, .....	55.00
3. Achromatic Telescope ; focal length 30 inches, object glass 1¾ inches, one celestial, one terrestrial powers, sun shade, mounted and in case like No. 1, .....	33.00
4. Achromatic Telescope ; focal length 24 inches, mounted, .....	25.00
5. Hand Spy Glasses ; of different styles and sizes, from 4.00 to .....	12.00
6. Achromatic Microscope ; Obehauser's and Nachet's make, with two or more eye pieces, and one or more systems of objectives ; each system with three achromatic pairs of lenses, with very delicate adjustment, condenser, reflector, and instruments, giving powers from 40 to 600 diameters, at prices from 35.00 to.....	100.00
7. Superior Achromatic Microscopes ; in similar form and mounting, by Parisian makers of less note, but well corrected and good instruments, selected with care, at prices from 18.00 to .....	50.00
8. Compound Microscope ; of large size, with rack adjustment, reflector and condenser, with three objectives, used separately or combined,..	12.00
9. Compound Microscope ; with three objectives, used separately or combined, in neat mahogany boxes, three sizes, 4.00, 5.00 and .....	7.00
10. Botanical Microscope ; in case, 1.50 and .....	2.50
11. Magnifying Glasses ; 75 cents to.....	1.50
12. Microscopic Objects ; very superior quality, each 37 cents, in mahogany boxes of twelve, 3.00 ; twenty-four,.....	5.00
13. Coddington Lenses ; in silver and tortoise shell, 4.00 to .....	9.00
14. Set of Six Neutralizing Lenses ; for illustration, viz., double, convex and concave ; plano, convex and concave ; meniscus, convex and concave ; 2½ inch diameter, very fine,.....	8.00
15. Set of four Neutralizing Lenses, viz., double and plano, convex and concave, 2½ inch diameter, 5.00 ; two inch, .....	4.00
16. Prism ; of optical glass in sections of flint, crown, and plate glass,.....	6.00



No. 23.



No. 23.



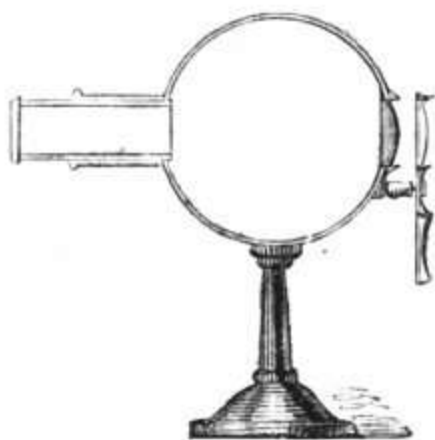
No. 23.

NUMBER	PRICE
17. Prism; of flint glass, well polished, four inches, 75 cents; six inches, 1.25; eight inches, .....	2.00
18. Plates for Newton's Rings, .....	1.09
19. Lenses made to order of any diameter, focal length, and form.	
20. German Mirrors; convex, concave, cylindrical, and multiplying, four inch, 1.25 and 1.50; six inch, 1.75 and .....	2.00
21. German Mirrors; convex and concave, in one frame with handle, ....	2.00
22. Multiplying Glass, in tube, .....	.50
23. Models of Human Eye; in three parts, viz., the eyeball dissected, and stand, the muscles of the eye, the cause of the long, short, and perfect sight, .....	12.00
24. Kaleidoscope; neatly mounted, 10 inch, .....	.75
25. Stereoscope of Prof. Wheatstone; this beautiful instrument illustrates the remarkable effects of binocular vision, 4.00 to .....	6.00
26. Diagrams on Glass, .....	1.00
27. Photographic Pictures on paper, .....	1.00
28. Photographic Pictures on glass, transparent, 1.00 to .....	1.75
29. Daguerreotype Pictures, including fine views, landscapes, &c., 1.00 to.	2.00
30. Daguerreotype Pictures, colored, 1.50 to .....	2.50
31. Nichol's Prisms, 5.00 and .....	6.00
32. Tourmaline Polariscopes, .....	5.00
33. Biot's Reflecting Polariscopes, 25.00 and .....	30.00
34. Improved Oxy-Hydrogen Polariscopes, to attach to Lantern, with polarizing and analyzing piles of glass, with tourmaline, to exhibit objects on screen, 50.00 to .....	75.00
35. Selenite objects in sliders, for do., 1.00 to .....	5.00
36. Plates of various crystals, 2.00 to .....	5.00
37. Double Image Prism, 2.00 and .....	4.00
38. Mirror of black glass in frame, 75 cts. and .....	1.50
39. Unannealed glass, 6 forms each, .....	1.50
40. Press for showing rings in Plates of glass, with 6 Plates, .....	4.00
41. Set of seven mirrors mounted to reunite the seven prismatic colors and recombine white light, 10.00 and .....	15.00
42. Prisms of crown and flint glass mounted to show the theory of achromatism, .....	6.00
43. Conical Prism to produce circular spectrum, mounted in brass, 7.00 and .....	9.00
44. Lenticular prisms made to order.	
45. Camera Obscura, 2.00, 3.00 and .....	5.00
46. Camera Lucida; mounted, 8.00 and .....	10.00
47. Claude Lorraine Glass, in frame, .....	1.00
48. Mounted Prisms; six inches, 3.00; eight inches, .....	4.00
49. Artificial Eye to show the application of spectacles to long and short sight, 5.00 and .....	7.00

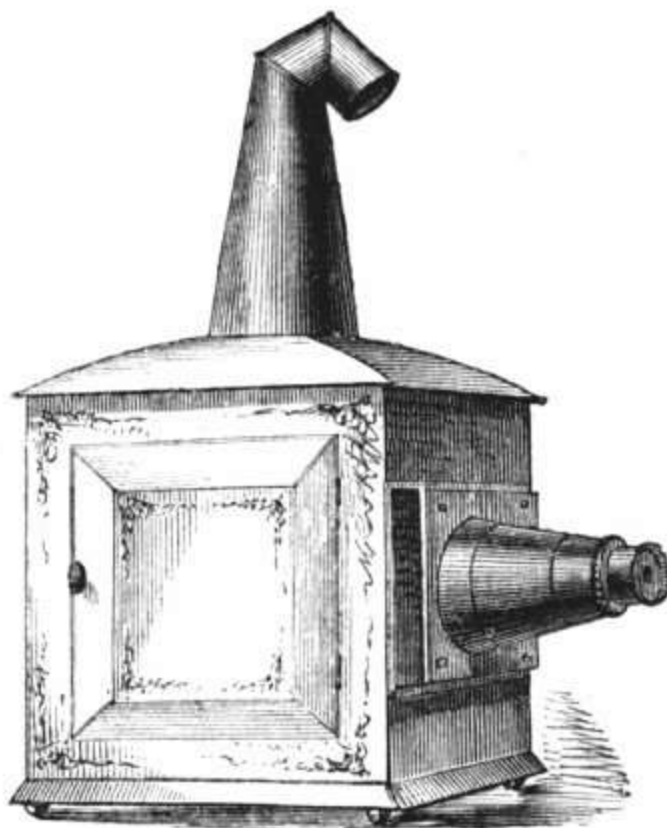




No. 48.



No. 49.



## MAGIC LANTERNS.

## PRICE

- Improved Magic Lantern, (larger than and superior to the English;) condensing lenses, four inches diameter, mounted in brass cell;  $2\frac{1}{2}$  inches meniscus magnifying lenses, solar lamps, silvered reflector, spring slider holder, and brass sliding tube. Pictures from  $2\frac{1}{2}$  to  $3\frac{1}{2}$  inches are shown clear and distinct, 8 to 12 feet diameter on screen,.. 25.00
- Lantern, with two 6 inch condensing lenses, with silver plated parabolic reflectors, in which paintings from three to five inches diameter may be used, ..... 35.00
- Oxy-hydrogen Calcium Light Attachment; with improved concentric jet, stop cocks, and gallows screws, with sixteen feet hose to attach to gasometers, ..... 14.00
- Microscope Attachment; with triple achromatic magnifiers of great power, which may be used separately or combined, giving three powers, and capable of showing minute objects, animalculæ in water, &c., with great distinctness on the screen, 25.00, with extra mounting, ..... 35.00
- The magic lantern, in its present improved construction, with microscope and calcium light, may be classed among the most valuable and perfect philosophical instruments.
- Dissolving View Apparatus; with two Lanterns, Calcium Light, and Microscope, with thirty feet hose, large and heavy rubber bags, capable of sustaining the lights for two and one half hours, with an improved dissolving apparatus, which requires no cut-off screens, and by which one or both lights may be used at pleasure, and with a saving of nearly half the gases, with complete generators and purifiers for the gases, mounted on platform, neatly packed in box, 150.00; with extra mounting, ..... 175.00
- Dissolving View Apparatus; with Solar Lamps, ..... 60.00

## SLIDERS FOR LANTERNS.

## NATURAL HISTORY.

*In Fifty-Six Sliders, including the following Sets, the whole in a Box.*

	PRICE
Class 1. Mammalia; 24 sliders, 100 pictures, .....	45.00
Class 2. Birds; in 7 sliders, 28 pictures, .....	14.00
Class 3. Amphibia; in 4 sliders, 16 pictures, .....	8.00
Class 4. Fishes; in 5 sliders, 20 pictures, .....	10.00
Class 5. Insects; in 8 sliders, 37 pictures, .....	16.00
Class 6. Worms and Shells; in 8 sliders, 36 pictures, .....	16.00
Set complete, .....	100.00

Each class, or set, sold separately, but sets are never broken.

## BOTANICAL ILLUSTRATIONS.

*In Fourteen Sliders, with Compendium.*

Fifty Diagrams, .....	30.00
-----------------------	-------

## SELECT SCRIPTURE SUBJECTS.

*In Twelve Sliders.*

Thirty-eight Diagrams, .....	25.00
------------------------------	-------

## KINGS AND QUEENS OF ENGLAND.

FROM WILLIAM THE CONQUEROR TO VICTORIA.

*In Nine Sliders.*

Thirty-four Diagrams, .....	15.00
-----------------------------	-------

## VIEWS OF PUBLIC BUILDINGS, &amp;c.

*In Four Sliders.*

## SLIDER I.

View of Saint Paul's Cathedral, London. — The Pavilion, at Brighton. — Southwark Bridge, London.

## SLIDER II.

View of Westminster Abbey. — View of the Cataract at Niagara. — Waterloo Bridge, London.

## SLIDER III.

Saint Peter's Church, at Rome. — Fingal's Cave. — The Pantheon, at Paris.

## SLIDER IV.

View of Mount St. Michael, Cornwall. — The Military Hospital, Paris. — View of the Island of Staffa, ..... 9.60

## ASTRONOMICAL DIAGRAMS.

*In Eleven Sliders, packed in a Box, with a Description.*

- |  |                                       |
|--|---------------------------------------|
| No.  | SLIDER I.                             |
| 1. System of Ptolemy.                            | 3. System of Tycho Brahe.             |
| 2. ————— Copernicus.                             | 4. ————— Newton.                      |
|  | SLIDER II.                            |
| 5. Telescopic View of the Moon.                  | 7. Telescopic View of Saturn.         |
| 6. Ditto of Jupiter.                             |                                       |
|  | SLIDER III.                           |
| 8. Comparative Sizes of the Planets.             | 10. Orbit of a Comet.                 |
| 9. Comparative Distances of the Planets.         | 11. The Comet of 1811.                |
|  | SLIDER IV.                            |
| 12. Signs of the Zodiac.                         | 14. Direct and Retrograde Motion.     |
| 13. Inclination of the Planets' Orbits.          |                                       |
|  | SLIDER V. ( <i>Lever, movable.</i> )  |
| 15. Rotundity of the Earth.                      |                                       |
|  | SLIDER VI.                            |
| 16. The Seasons.                                 | 18. The Earth's Shadow.               |
| 17. Phases of the Moon.                          |                                       |
|  | SLIDER VII.                           |
| 19. Cause of the Sun's Eclipse.                  | 21. Inclination of the Moon's Orbit.  |
| 20. Ditto Moon's ditto.                          |                                       |
|  | SLIDER VIII. ( <i>movable.</i> )      |
| 22. Eclipse of the Sun, with a Transit of Venus. |                                       |
|  | SLIDER IX. ( <i>movable.</i> )        |
| 23. Eclipse of the Moon.                         |                                       |
|  | SLIDER X.                             |
| 24. Spring Tide at New Moon.                     | 26. Neap Tide.                        |
| 25. Ditto Full Moon.                             |                                       |
|  | SLIDER XI.                            |
| 27. The Constellation Orion.                     | 29. Various Nebulæ.                   |
| 28. ————— Ursa Major.                            | 30. A Portion of the Milky Way, 18.00 |

## CONSTELLATIONS.

*In Six Sliders. Their situation with regard to the North Pole is denoted by an Arrow.*

- |   |             |
|---|-------------|
|   | SLIDER I.   |
| Aries. — Taurus. — Gemini. — Cancer.              |             |
|   | SLIDER II.  |
| Leo. — Virgo. — Libra. — Scorpio.                 |             |
|   | SLIDER III. |
| Sagittarius. — Capricornus. — Aquarius. — Pisces. |             |



## SLIDER IV.

Draco and Ursa Minor. — Cepheus and Cassiopea. — Andromeda and Triangula — Auriga.

## SLIDER V.

Perseus and Caput Medusæ. — Boötes and Canes Venetici. — Hercules and Cerberus. — Cygnus and Lyra.

## SLIDER VI.

Antinous and Aquilla. — Ophiucus and Serpens. — Canis Major and Minor. — Cetus, .....9.00

## ASTRONOMICAL DIAGRAMS.

*In a Set of Thirty-Three Inch Sliders, Double Glass, each Diagram framed separate.*

No.

- |  |   |
|--|---|
| 1. System of Ptolemy.                                | 12. Signs of the Zodiac.  |
| 2. ——— Copernicus.                                   | 13. Inclination of the Planets' Orbits.                         |
| 3. ——— Tycho Brahe.                                  | 14. Direct and Retrograde Motion.                               |
| 4. ——— Newton.                                       | 16. The Seasons.  |
| 5. Telescopic View of the Moon.                      | 17. Phases of the Moon.   |
| 6. Ditto at three different periods of its increase. | 18. The Earth's Shadow.   |
| 5. Ditto of Venus, with Phases, (three Views.)       | 19. Cause of the Sun's Eclipse.                                 |
| 5. Ditto of Mars.                                    | 20. Ditto Moon's ditto.   |
| 6. Ditto of Jupiter.                                 | 21. Inclination of the Moon's Orbit.                            |
| 7. Ditto of Saturn.                                  | 27. The Constellation Orion.                                    |
| 8. Comparative Sizes of the Planets.                 | 28. ——— Ursa Major.   |
| 8. Ditto, the colored Circle representing the Sun.   | 29. Various Nebulæ.   |
| 9. Comparative Distances of the Planets.             | 30. A Portion of the Milky Way.                                 |
| 10. Orbit of a Comet.                                | 30. A Diagram to show <i>Meridians, Parallels, and Circles.</i> |
| 11. Comet of 1811.                                   | 30. A Diagram, showing the various Zones.                       |

35.00

## REVOLVING ASTRONOMICAL DIAGRAMS.

THE MOTION PRODUCED BY RACK-WORK.

*In a Set of Nine Sliders, packed in Box, with a Lock.*

## SLIDER I.

The Solar System, showing the Revolution of all the Planets, with their Satellites round the Sun.

## SLIDER II.

The Earth's annual Motion round the Sun, showing the Parallelism of its Axis, thus producing the Seasons.

## SLIDER III.

This Diagram illustrates the cause of Spring and Neap Tides, and shows the Moon's Phases, during its Revolution.

## SLIDER IV.

This Diagram illustrates the apparent direct and retrograde Motion of Venus or Mercury, and also its stationary Appearance.

## SLIDER V.

A Diagram to prove the Earth's Rotundity, by a Ship sailing round the Globe, and a line drawn from the eye of an observer placed on an eminence.

## SLIDER VI.

This Diagram illustrates the eccentric Revolution of a Comet round the Sun, and shows the appearance of its Tail at different points of its Orbit.

## SLIDER VII.

The diurnal Motion of the Earth, showing the Rising and Setting of the Sun, illustrating the cause of Day and Night, by the Earth's Rotation upon its Axis.

## SLIDER VIII.

This Diagram illustrates the annual Motion of the Earth round the Sun, with the monthly Lunations of the Moon.

## SLIDER IX.

This Diagram shows the various Eclipses of the Sun, with the Transit of Venus; the Sun appears as seen through a Telescope, ..... 35 and 40

## REVOLVING DIAGRAMS.

*Set of Eleven Sliders, including the above, with addition of Two Sliders.*

## SLIDER X.

This Diagram illustrates the different eclipses of the Moon.

## SLIDER XI.

This Diagram shows the eclipses of Jupiter's Moons as seen by Telescope...40.00

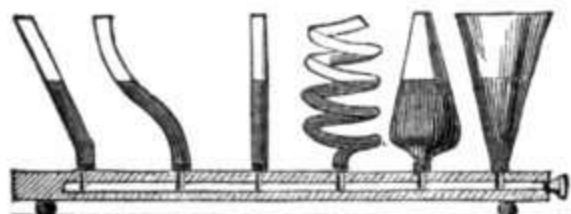
Chromatropes, or Artificial Fire Works; these sliders are very singular, and the effect similar to the Kaleidoscope. These pictures are produced by brilliant designs being painted on glasses made to rotate quickly or slowly, forward and backward. In great variety, 4.00 to ..... 6.00  
 Comic Sliders; movable, a large variety, each 1.25 to ..... 2.50  
 Set Select Humorous Subjects, in 12 sliders, 36 pictures, with descriptions, . 24.00  
 The Bottle; by Cruikshank, 8 sliders, ..... 45.00  
 Long Moving Sliders; with shipping, &c., 2.50 to ..... 5.00

Beautifully painted Views; on two and a half and three inch glass. Average price 4.50 and ..... 6.00

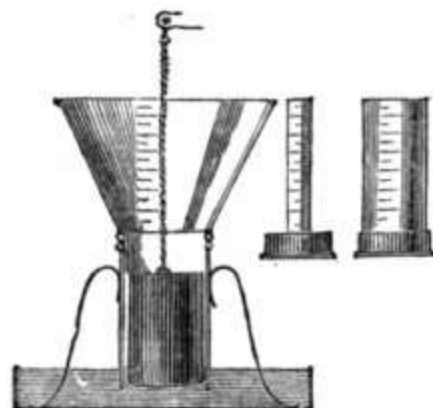
Sliders or Paintings. I keep a variety of beautiful paintings for single lanterns, or for dissolving views, both in single sliders or in pairs, or sets, viz., Scriptural Subjects, Landscapes, Views, Buildings, Interiors, &c., of 2½ and 3 inches diameter, painted by the best American and English Artists, at prices from 2.50 to 10.00 each. The average price of superior 3 inch paintings is ..... 5.50

I can furnish to order, paintings of any size or subject.

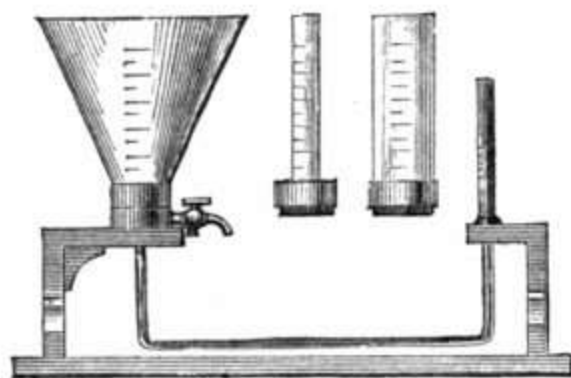
## HYDROSTATICS AND HYDRAULICS.



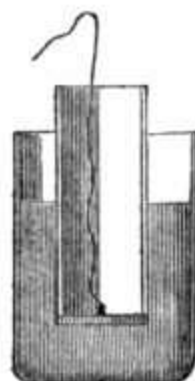
No. 1-3.



No. 6.



No. 7.



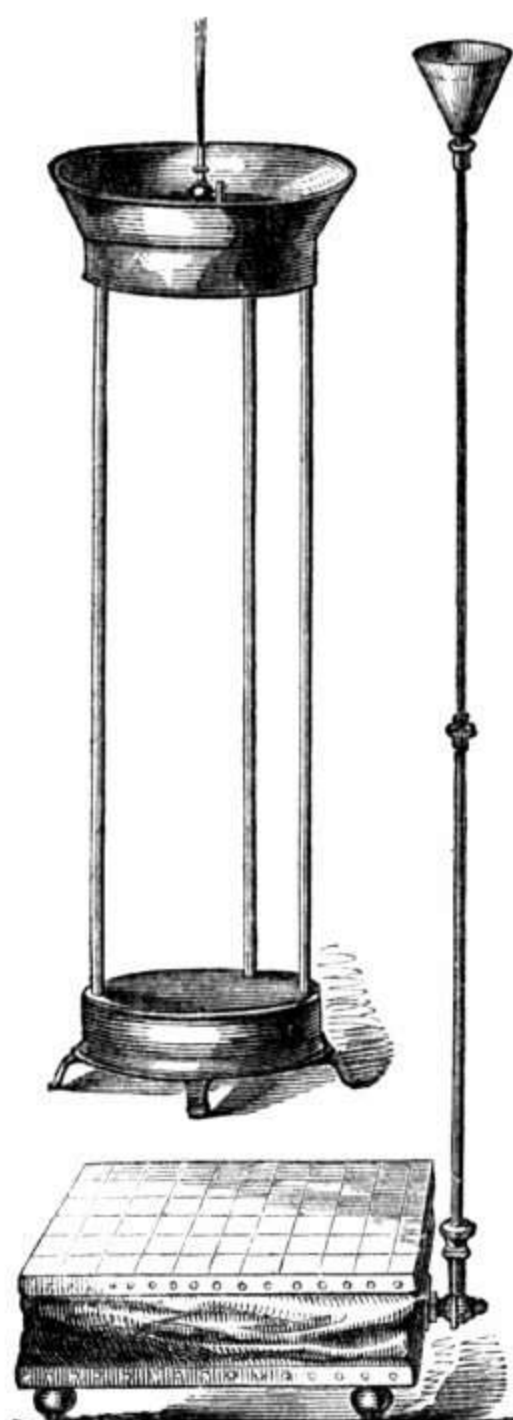
No. 8.



No. 10.

NUMBER	PRICE
1. Equilibrium Tubes ; set of six forms capped, mahogany base with brass sockets and tubes, .....	6.00
2. Equilibrium Tubes ; mahogany base, six tubes, brass capped, .....	4.00
3. Equilibrium Tubes ; four forms, mahogany base, .....	2.50
4. Hydrostatic Paradox ; with fixtures complete, largest size, .....	25.00
5. Hydrostatic Paradox ; two inch brass cylinder and plunger, glass funnel and tubes, with screw caps, and graduated ; beam 18 inch, brass elevating stand and binding screw ; fitted with pans for specific gravity, .....	18.00
6. The same ; without stand and scale beam ; it may be used with Nos. 67 and 69, <i>Pneumatics</i> , .....	8.00
7. Hydrostatic Paradox ; in which the column is balanced by mercury in opposite tube, .....	15.00
8. Apparatus illustrating upward pressure of fluids, Cylindrical Jar with plate, .....	2.50

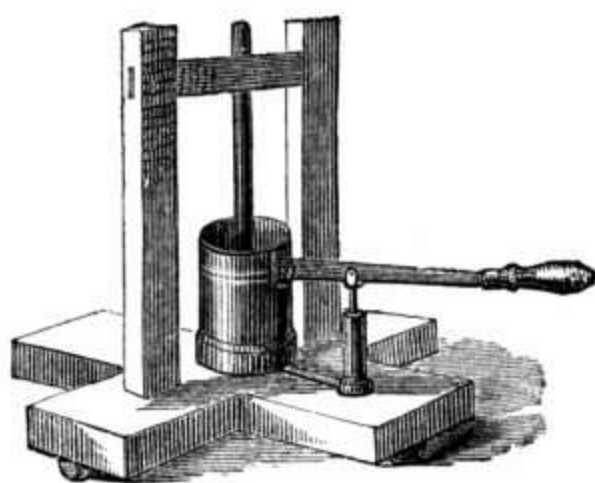




No. 17.

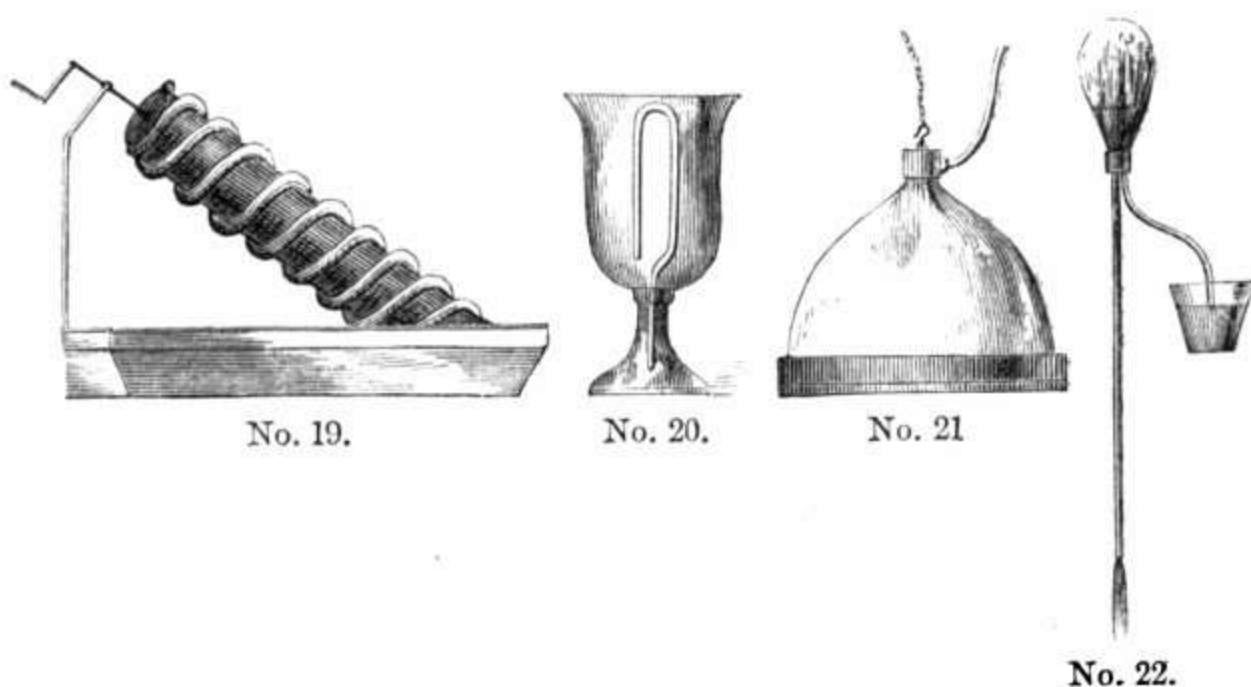


No. 13.



No. 18.

NUMBER	PRICE
9. Cylindrical Glass Jar, with Ball, Plate, and Hook ; illustrating upward and downward pressure of fluids ; small size, 2.00 ; large size,.....	4.00
10. Apparatus to show the buoyancy of fluid to equal its weight ; brass cup and cylinder to attach to specific gravity scales, .....	3.00
11. Forcing Pump, or Fire Engine ; with stand, cistern, and hose,.....	8.00
12. Lifting Pump ; glass barrel, with stand, cistern, and receiving tunnel,..	6.00
13. Both the above on one stand, with cistern, .....	12.00
14. Hiero's Fountain, of copper, 12 inches diameter, 40 inches high, with stop cocks and jets,.....	6.00
15. Hiero's Fountain, of glass, by which the operation is seen, 7.00 and	10.00
16. Hydrostatic Bellows ; twelve inches square or round, six feet brass tube, in two joints and funnel ; mahogany,.....	6.00
17. Hydrostatic Bellows ; as last, with two brass, one glass and square tube, funnel with screw connections, with large three-way water cock ; finely finished, .....	10.00
18. Hydraulic Press ; strong brass cylinder, 6 by 4 inches, with force pump, tubes, stop cocks, rubber hose jets ; mounted in strong frame with lever, 8 feet long, and fulcrum, (will lift half a ton,) .....	25.00



NUMBER	PRICE
19. Archimedes Screw Pump; with stand and cistern, 5.00 and.....	6.00
20. Siphon and Cup, or Tantalus's Cup; illustrates intermitting springs,..	1.50
21. Glass Model of the Diving Bell; with lead ring, 1.50; with cap and tube,	3.50
22. Vacuum Siphon, or Fountain Siphon, with Basins, 2.00 and.....	3.00
23. Graduated Glass Jar; two hundred cubic inches,.....	2.00
24. Hydrometers; graduated to Baumé's and others' scales for spirits, water, acid, &c., 1.00 and.....	1.50
25. Glass Hydrometer, large size, zero or water mark in the centre of the scale; is adapted to all liquids, .....	1.50
26. Hydrometer Jar; with foot and lip; ten cubic inches, 1.50; twenty cubic inches, 2.00; thirty cubic inches, 2.25; fifty cubic inches, .....	2.50
27. Graduated Tubes; for specific gravity, .....	.50
28. Set of Brass Weights; $\frac{1}{2}$ to 16 oz. avoirdupois. See <i>Mechanical Powers</i> ,	3.00
29. Brass Siphon, with Suction Tube; glass jar, stand, receiving basin, largest size, .....	5.00
30. Brass Siphon and Suction Tube, .....	1.50
31. Glass Siphon and Tube, .....	1.25
32. Wirtemberg Siphon, of glass, 50 cents and .....	.75
33. Barker's Mill; attach the revolving jet to tubes and funnel of bellows.	
34. Glass Model of the Centrifugal Pump, .....	6.00
35. Apparatus for Spouting Fluids; of copper, with stop cocks and two kinds of jets, mahogany basement,.....	10.00
36. Spirit Levels; mounted in brass, and cases three to fifteen inches, 1.50. 2.00, 2.50 and.....	3.00
37. Models of water-wheels, overshot, undershot, and breast-wheels; in frame, from 10.00 to .....	15.00

## STEAM.



No. 8.



No. 9.

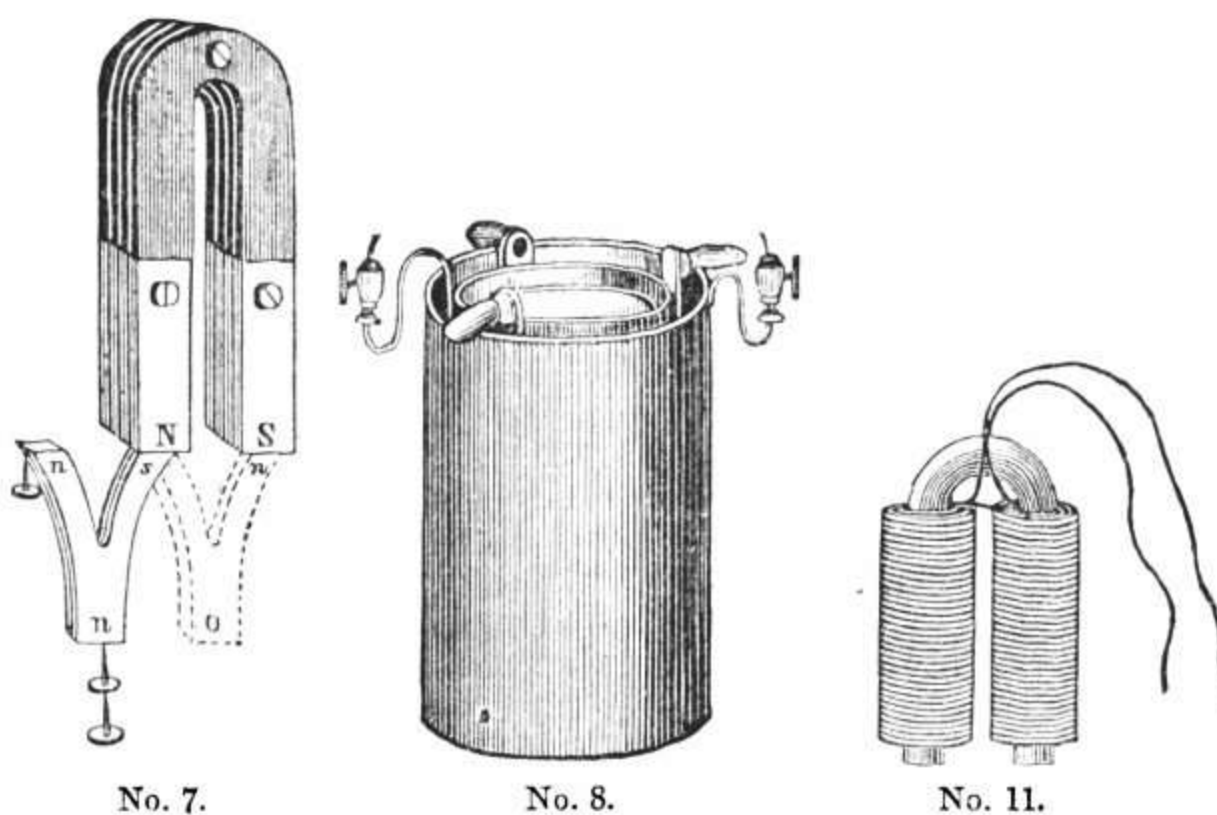
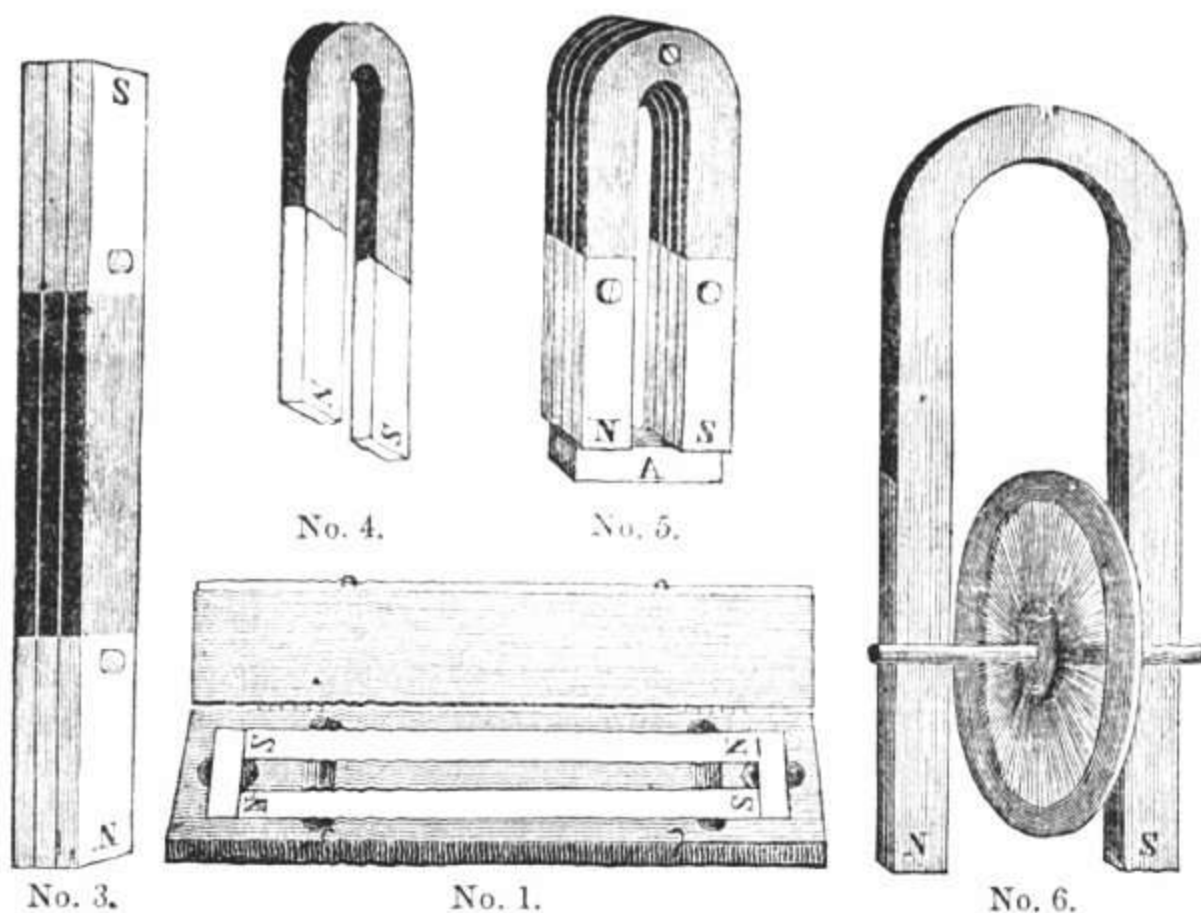


No. 3.

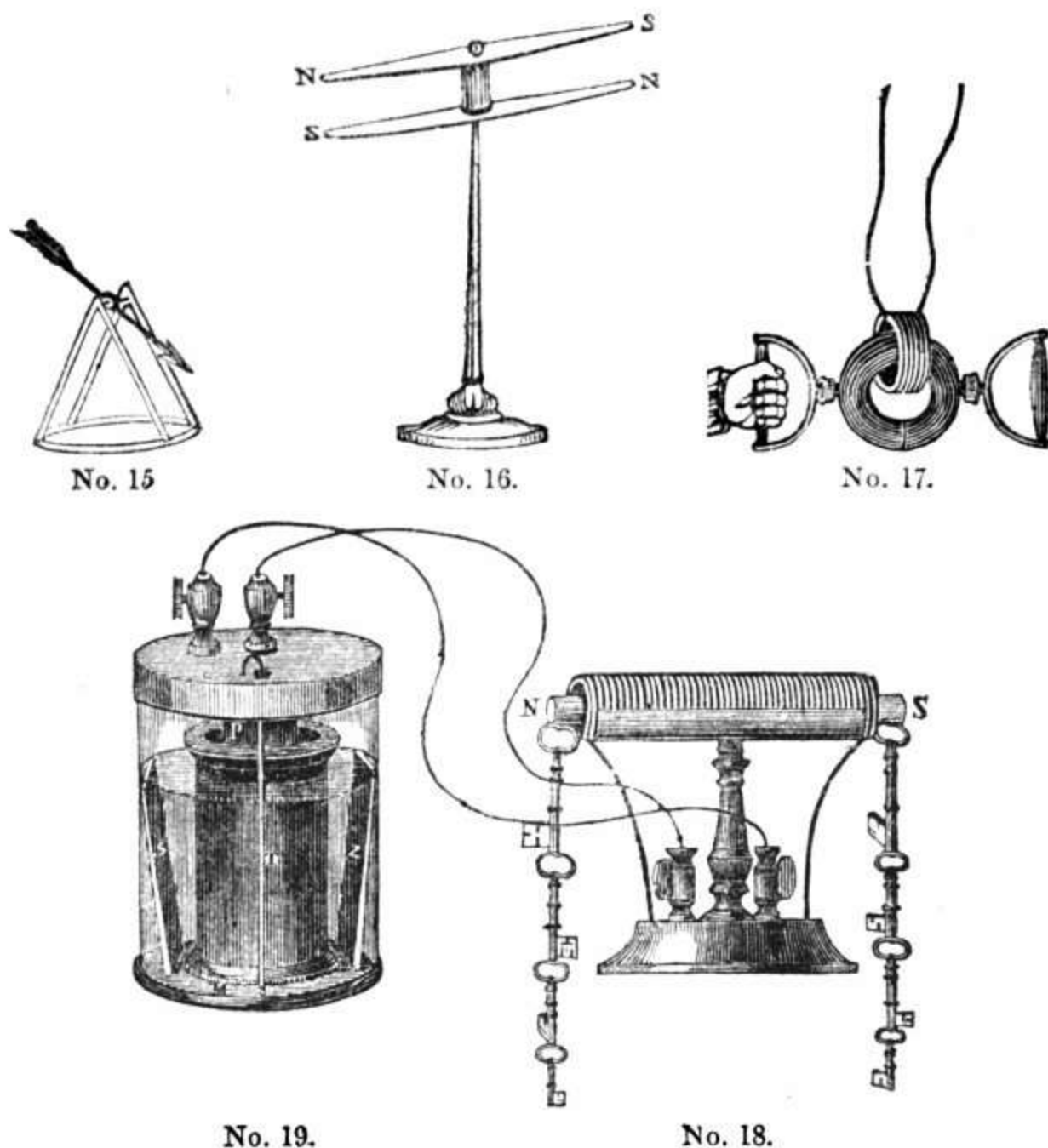
NUMBER	PRICE
1. Working Model of High Pressure Steam Engine ; heavy copper boiler, with guage and safety valve ; brass engine, and large balance wheel, cistern to receive and condense the steam, force pump, iron frame ; the whole on wood basement,.....	50.00
2. Moving Sectional Model ; of low pressure steam engine, .....	25.00
3. Marcet's Steam Globe ; $5\frac{1}{2}$ inches diameter, upper half and frame of brass, lower half of iron, and not injured by mercury, 36 inch condensation gauge and scale, graduated, steam thermometer in brass case, .....	35.00
4. Marcet's Steam Globe ; same as No. 3, except globe and stand ; entirely of iron, .....	25.00
5. Insulated Jet Attachment ; to charge Leyden Jar by electricity from steam with points for jar, .....	2.00
6. Improved Steam Flask ; with screw cap, stop cock, safety valve, steam thermometer inside ; used with lamp stand and spirit lamp,.....	6.00
7. Steam Balls, or Candle Bombs ; for exploding by candle, dozen, .....	.50
8. Steam Ball and Jet, or Eolopile of brass,.....	1.50
9. Wollaston's Illustration of Low Pressure Steam Engine ; copper globe boiler, brass cylinder, piston and rod, handle and safety valve, .....	3.00



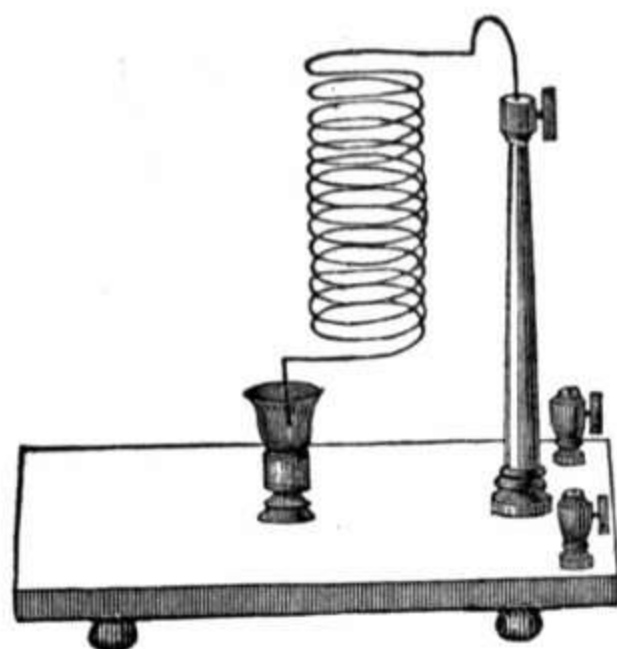
# MAGNETICS.



NUMBER	PRICE
1. Pair Bar Magnets and Armature; in Box 10 inch,.....	3.00
2. Single Bar Magnet and Keeper; 10 inch,.....	1.00
3. Compound Bar Magnet; 12 inch,.....	2.50
4. U Magnet and Armature; 50 cents, 1.00 and .....	1.50
5. Compound U Magnet; 2.00, 3.00 and .....	4.00
6. Wheel Armature; revolves on U magnet; 50 cents and .....	.75



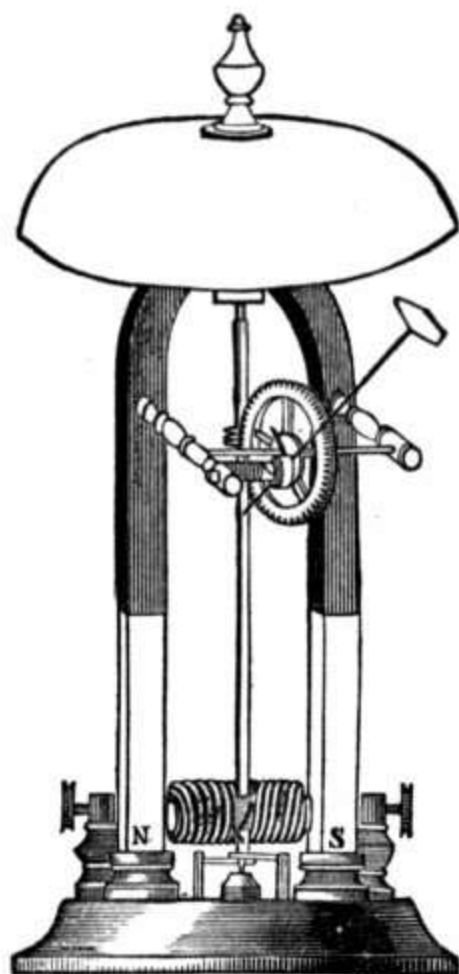
NUMBER		PRICE
7.	Bar, Star, and Y Armature; each 25 cents and.....	.50
8.	Sulphate of Copper Battery; 8 by 9½ inches,.....	8.00
9.	Sulphate of Copper Battery; 6 by 9 inches,.....	6.00
10.	Sulphate of Copper Battery; 4 by 5½ inches,.....	3.00
11.	Electro Magnet; of soft iron, with copper coil, 1.00, 1.50 and .....	2.00
12.	Electro Magnet; in frame, 8.00, 10.00 and .....	15.00
13.	Magnetic Needle; brass stand and point,.....	1.00
14.	Dipping Needle; 12 inch, universal joint, .....	4.00
15.	Dipping Needle; small size, brass stand, .....	1.00
16.	Astatic Needle; on stand, 1.50 and .....	2.00
17.	Electro Coil and Semicircular Magnets, 2.50 and .....	3.50
18.	Helix and Bar; on stand, 2.00 and.....	2.50
19.	Smee's Battery; per pair, 1.50 and.....	2.00
20.	Galvanic Battery; 25 cents, 50 cents, and 1.00; pair of <i>cast</i> zinc plates, 6 by 4 inches, in copper cells; is freed from acid, by being raised one inch, with crank windlass; a very efficient decomposing and igniting battery; mahogany frame, 25.00, 45.00 and .....	90.00
21.	Powder Cup; glass or brass cup, 25 cents and .....	.50
22.	Voltaic Pistol: for gas, 2.50 and.....	3.00
23.	De la Rives Ring, or Floating Battery, 1.00 and.....	2.00
24.	Galvanic Lamp,.....	2.50
25.	Revolving rectangle, .....	7.00



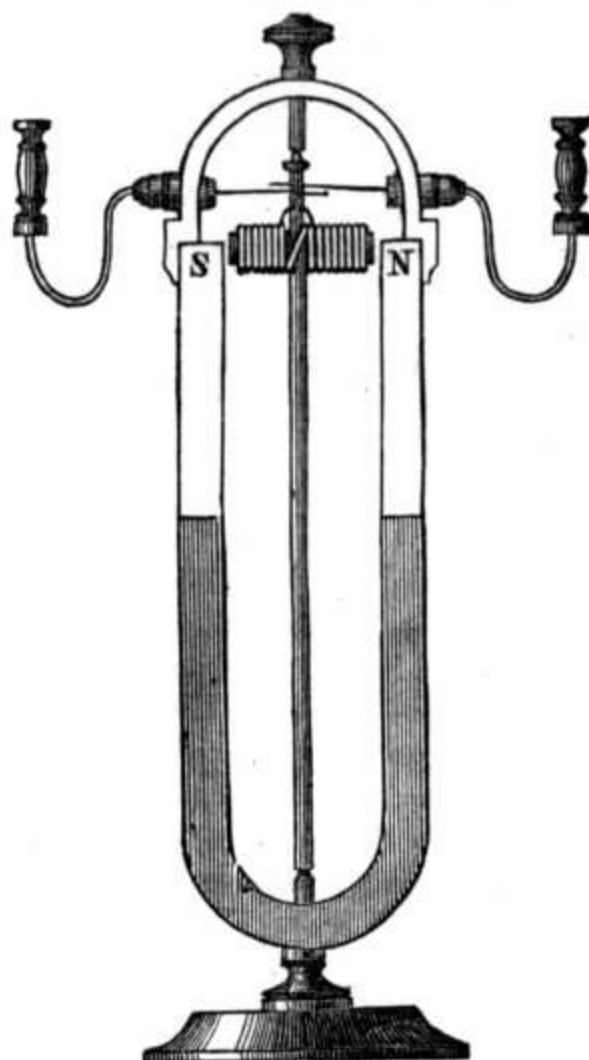
No. 26



No. 13.



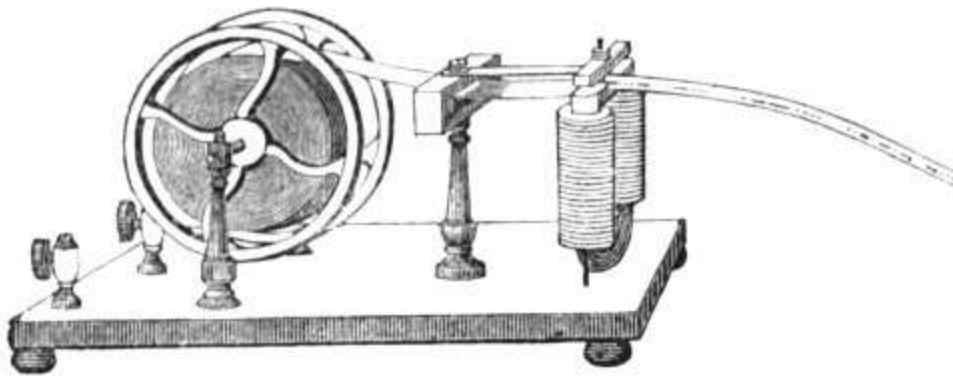
No. 28.



No. 29.

NUMBER	PRICE
26. Contracting Helix, 3.00 and .....	3.50
27. Vibrating Armature Engine, with bell, .....	10.00
28. Horizontal Revolving Armature Bell Engine, .....	10.00
29. Revolving Electro Magnet; Page's, .....	5.00
30. Lever Beam Electro-Magnetic Engine, 10.00 and .....	15.00
31. Double Beam Axial Engine, 10.00 and .....	15.00
32. Thermo-Electro Arch; between poles of U magnet, 4.00 and .....	5.00
33. Thermo-Revolving Frames; on poles of U magnet, .....	6.00
34. Thermo-Electric Battery; 60 pairs, .....	25.00

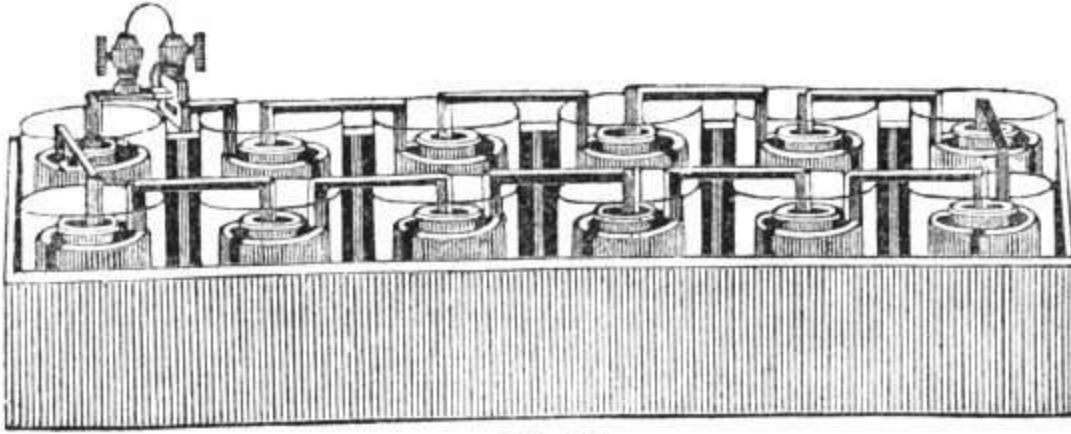




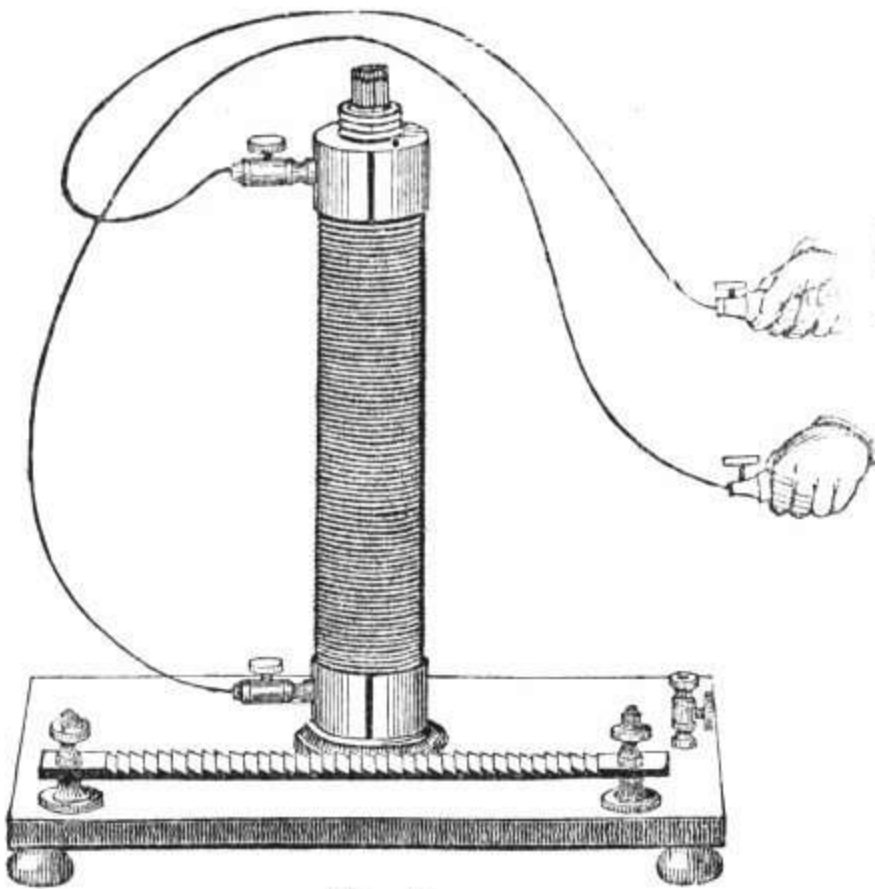
No. 38.



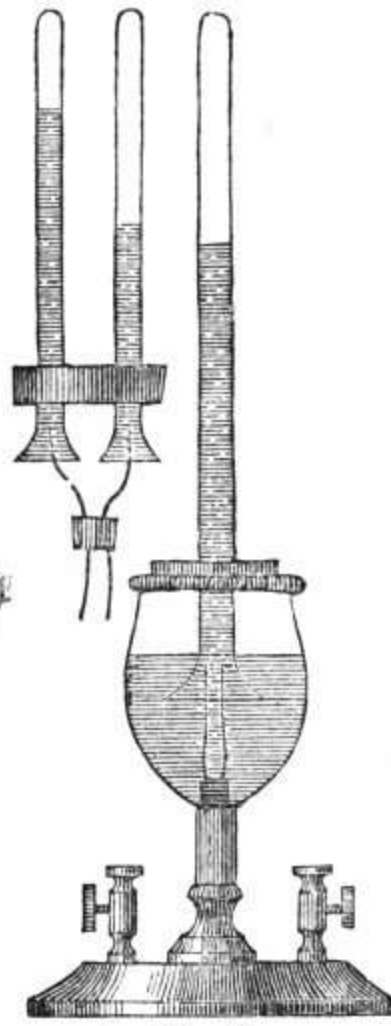
No. 35.



No. 36.

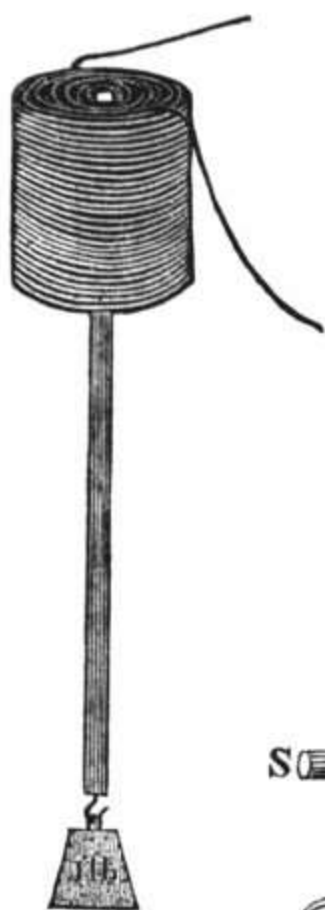


No. 41.

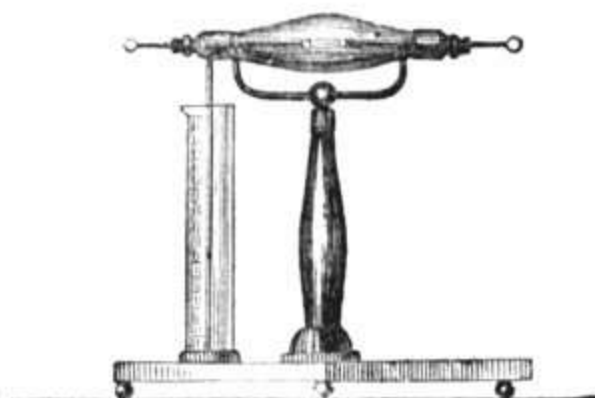


No. 42.

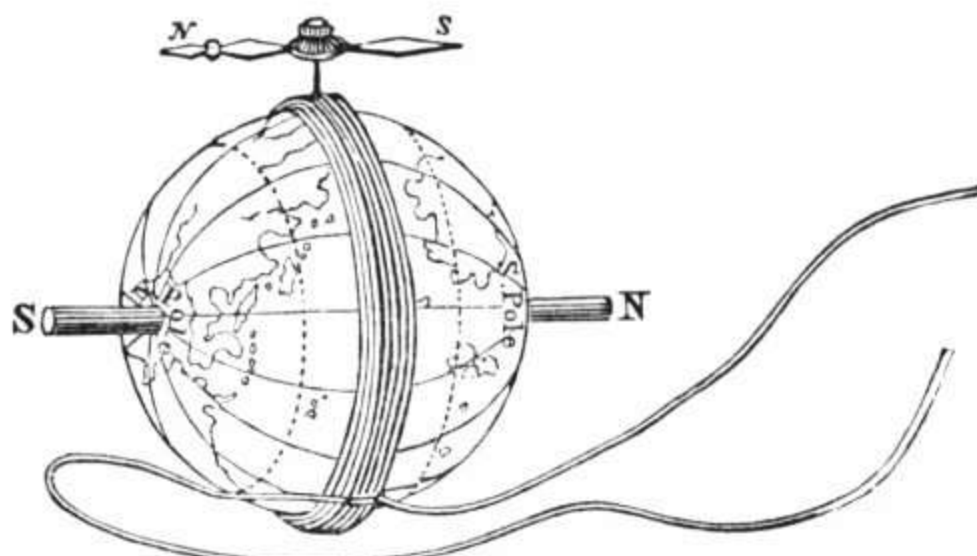
NUMBER	PRICE
35. Grove's Battery ; single pair, 1.50 and.....	2.00
36. Grove's Battery ; in box, per pair, 1.50 and.....	2.00
37. Working Model of Telegraph ; with clock work, .....	15.00
38. Model of Telegraph ; with spool and paper,.....	5.00
39. Decomposing Cell ; one and two tubes, 2.50 and .....	3.00
40. Double Helix and Vibrating Electrotome, or Vibrating Shocker, .....	5.00
41. Separable Helices ; for analysis of shocks with vibrating electrotome, and breakpiece,.....	12.00



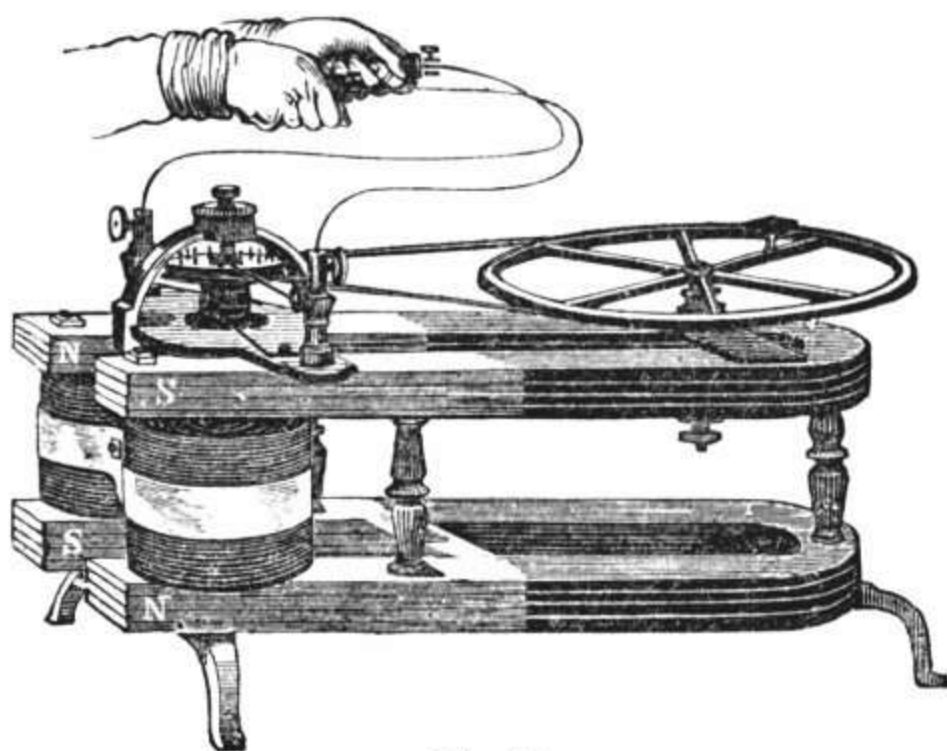
No. 42.



No. 43.

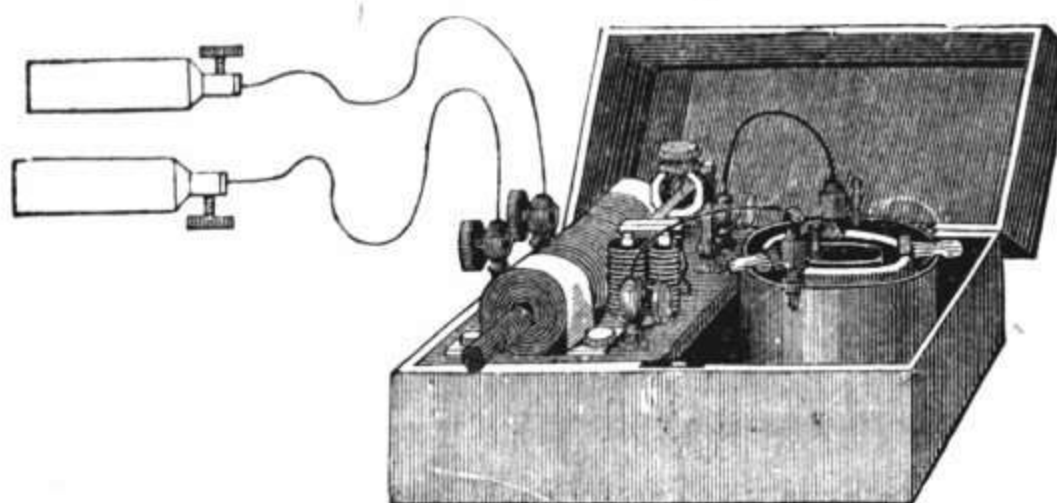


No. 45.

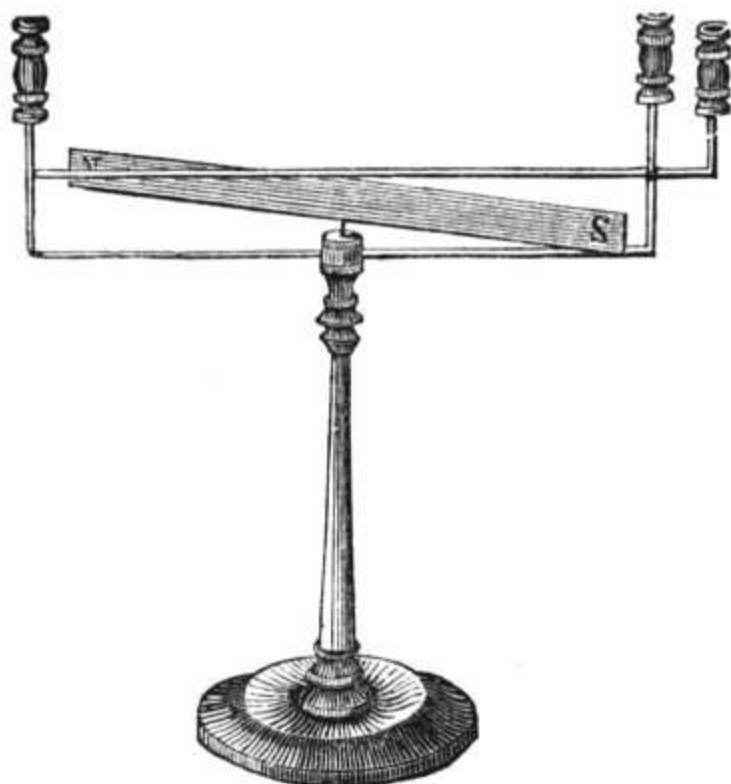


No. 47.

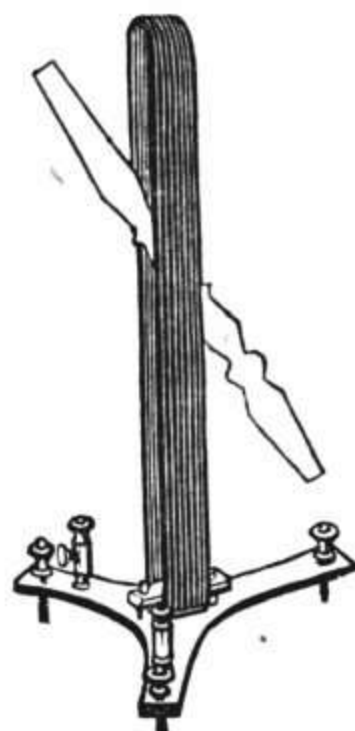
NUMBER	PRICE
42. Lifting Coil; and rods for suspension, 1.50 and .....	2.50
43. Apparatus for Decomposing and Recomposing Water, by galvanism. See description, No. 95, Electricity, .....	8.00
44. Terrestrial Helix; 7 inches diameter, .....	1.50
45. Globe and coil, with magnets and dipping needle, .....	4.00
46. Magneto-Electric Machine; five 18 inch U magnets and large compound wire armatures, revolving opposite the poles of magnets; substan- tially mounted, brass geared wheels, mahogany basement, .....	40.00
47. Magneto-Electric Machine; large armatures, revolving between two large compound magnets, .....	40.00
48. Magneto-Electric Machine; smaller size, 25.00 and .....	30.00



No. 60.



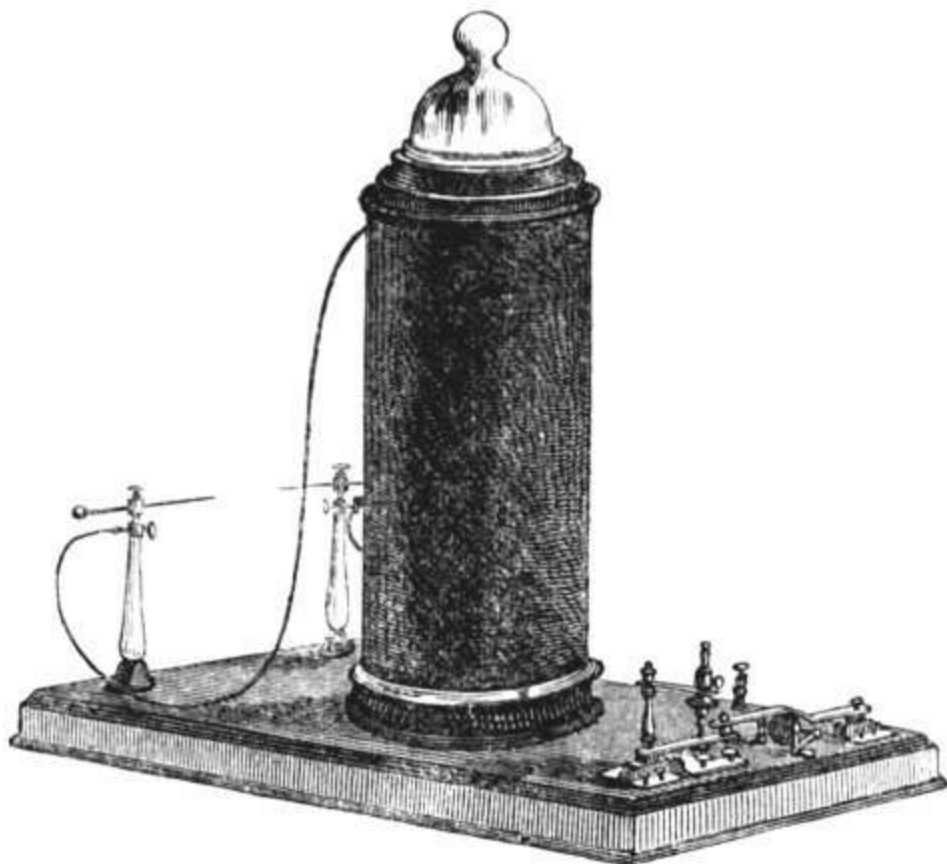
No. 50.



No. 52.

NUMBER	PRICE
49. Magneto-Electric Machine; for medical use, and shocks, in box, 12.00,	18.00
50. Oersted's Galvanometer; 3.00 and.....	3.50
51. Galvanometer; compass form, 2.50 and.....	3.00
52. Upright Galvanometer; on tripod, with levelling screws, .....	5.00
53. Galvanometer, with Astatic Needle, 5.00 and .....	6.00
54. Attracting and repelling wires, .....	3.50
55. Flat Spiral; per pound, .....	1.00
56. Bar Magnets; for breaking, each 12 cents and .....	.17
57. Signal Key; for connecting the circuit,.....	2.50
58. Apparatus for showing the rotation of mercury, .....	4.00
59. Thermo-Electric Plates, pair 25 cents; series .....	2.00
60. Apparatus for Medical Use; battery, shocker, handles, and wires, complete in box, 10.00 and.....	12.00
61. Illustration of the Magnetic Clock; attachment to Atwood's Machine,.	7.00
62. Sponge Handle; insulated, 75 cents and.....	1.00
63. Shocking Handles; with binding screws, pair, .....	1.50
64. Set of Connecting Wires; coarse and fine,.....	.50
65. Galvanic Slippers, each, .....	.75
66. Magnetic Ship, Swan, Fish, &c., each 25 cents to .....	.50





No. 67-70.

## RITCHIE'S IMPROVED RUHKORFF APPARATUS.

ONE of the most important instruments which have been brought out for many years is the Ruhmkorff Induction Apparatus, by which almost all the effects of static or frictional electricity are produced from the galvanic battery. I have improved the construction of the instrument, and have made it capable of throwing the spark more than double the length yet obtained in Europe, and by the use of a much smaller battery.

The power of the instrument is immensely greater than that of the largest electrical machine; one sufficient to throw the spark three inches has been found to evolve a quantity of electricity equal to that which could be produced by *eight hundred* machines of twenty-four inches diameter. It is not affected by the state of the atmosphere. The battery used is a Grove's or Bunsen's battery, of one to four cells.

The instrument, as constructed by me, consists of a primary coil of large copper wire, surrounding a bundle of iron wires, mounted upon a basement. A secondary coil or helix, of fine silk-covered wire, from one to ten miles in length, is wound upon a cylinder of thick gutta percha, (each layer of which is insulated,) which surrounds a glass bell or cylinder, closed at the top. The glass bell, with the coil, is placed over the primary coil, the terminals of the wire, enclosed in rubber tubes, lead to insulated pillars, and the discharges pass between platina points; or the current is conducted by wires to other apparatus to show its effects.

The current from the battery is received through wires by pole cups in connection with the primary helix, and passes through an interrupter or break-piece; within the basement, and connected with the interrupter, is placed a condenser of alternate strata of oiled silk and tin foil.

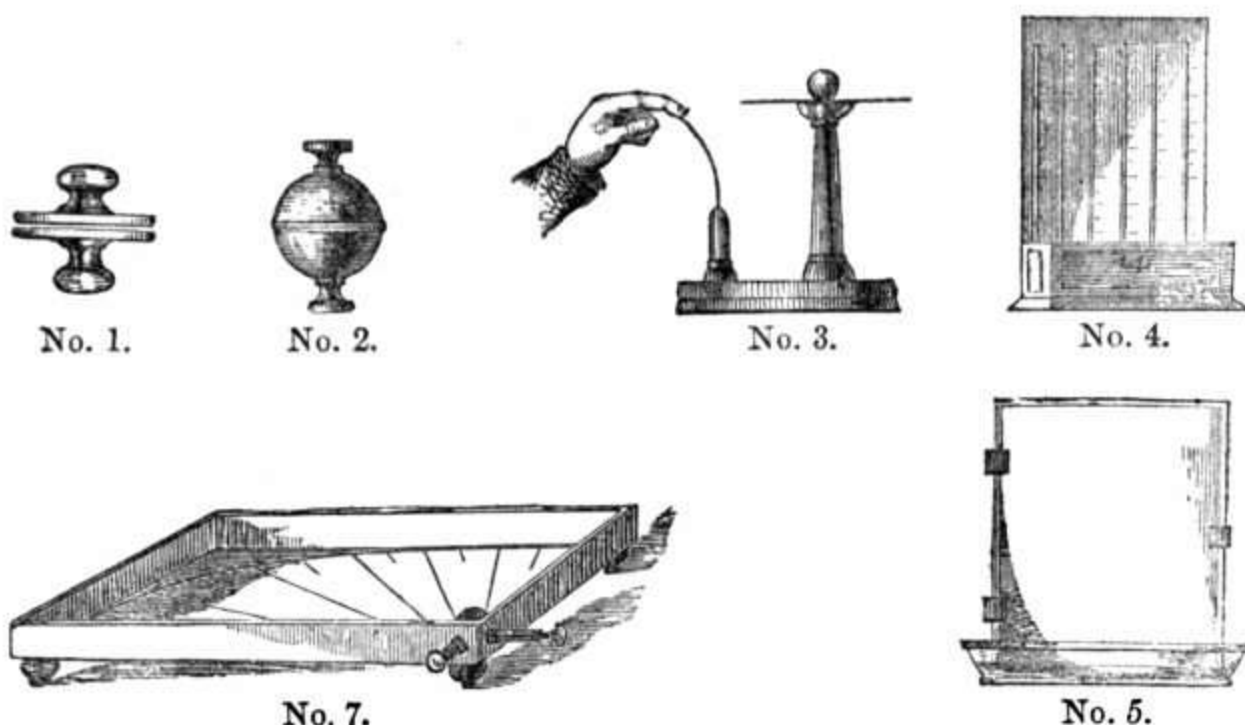
The instrument is mounted upon a mahogany or marble basement; the helix is covered with silk velvet, and rests upon a mahogany pedestal, and is finely finished.

NUMBER	PRICE
67. Induction Apparatus; basement of verd antique marble, 24 by 17 inches; helix 10 inches diameter; height of instrument 25 inches; capable of throwing the spark from ten to twelve inches,.....	300.00
68. Induction Apparatus; basement of mahogany, polished, 22 by 12 inches; helix 8 inches diameter; capable of throwing the spark six inches,.....	175.00
69. Induction Apparatus; mahogany basement, 20 by 11 inches; capable of throwing the spark four inches,.....	125.00
70. Induction Apparatus; mahogany basement, 20 by 9 inches; capable of throwing the spark two and one half inches, .....	75.00

## ACOUSTICS.

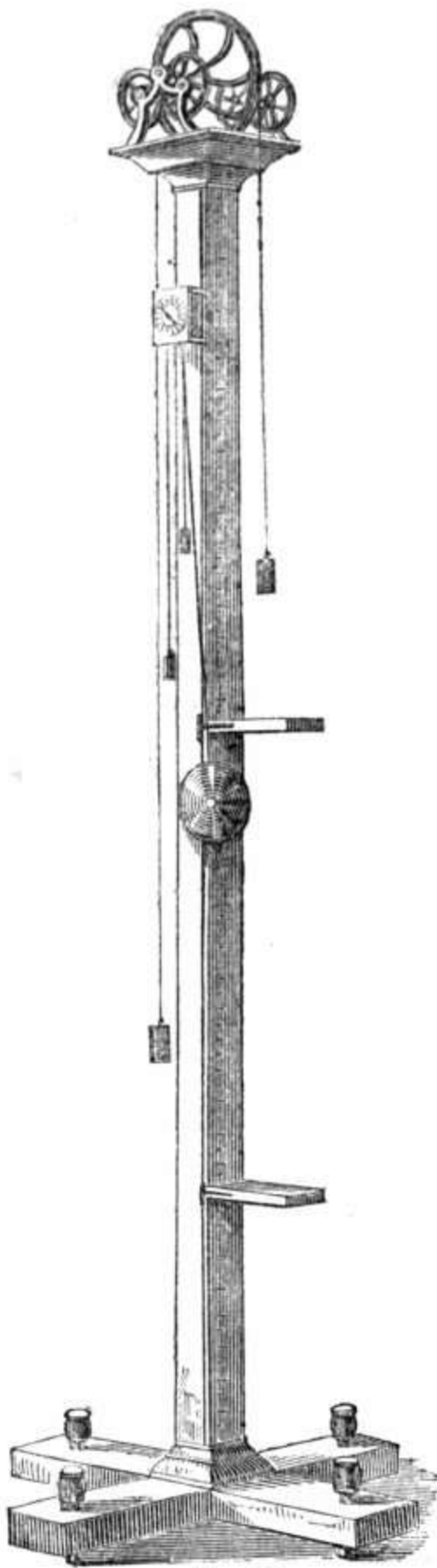
NUMBER	PRICE
16. Apparatus to illustrate Undulations of Light and Sound; frame of mahogany, 4 feet,.....	25.00
17. Tuning Fork and Glass Flask, for showing Polarization of Sound,.....	2.00
18. Apparatus to Increase the Sound of a Bell, and the Theory of Interference of Waves of Sound; bell mounted on pedestal, with tube closed at one end by movable piston; movable on basement, .....	10.00
19. Organ Pipes, of metal, .....	1.00
20. Apparatus for showing the Nodes of a Bell; a large glass bell, around the rim of which is suspended a row of cork balls; mahogany basement; the vibration is produced by a violin bow,.....	7.00
21. Trevyllian's Experiment; copper bar, with lead basement, .....	2.50
22. Iron Screw Press for confining a plate of glass for vibration, with table clamp screw, .....	5.00
Plates of Glass for do., 16 inches square, or circular 16 inches in diameter, .....	2.00

## LAWS OF MATTER AND MECHANICS

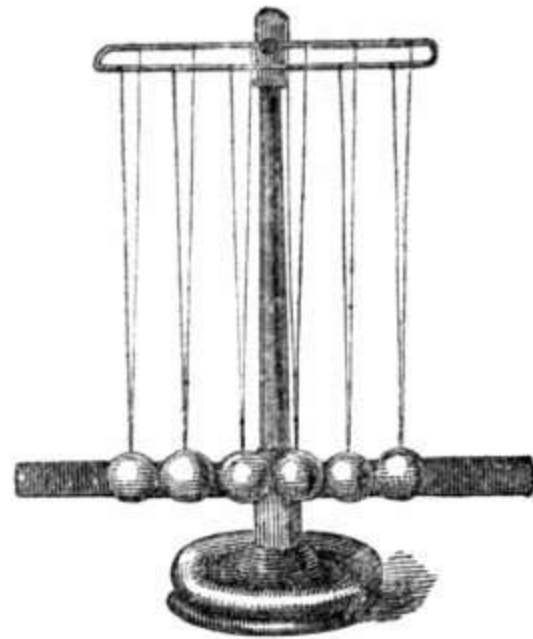


NUMBER	PRICE
1. Pair Glass Plates and handles, for cohesive attraction, .....	1.00
2. Pair of Lead Hemispheres and handles, for cohesion, .....	.75
3. Inertia Apparatus, stand with spring and balls, .....	1.00
4. Capillary Tubes, set of six, with stand and water pan, .75 and .....	1.50
5. Capillary Plates, of plate glass, showing the parabolic curve, .....	.50
6. Glass Plate, with hook and cord for liquid cohesion, .....	.75
7. Table, with spring pistols and ball, illustrating compound forces, 6.00,	8.00
8. A set of eight illustrations for centre of gravity, .....	7.00
9. Set of Illustrations of the Lever; mahogany basements, brass pillars and frame; brass levers; balanced, twelve to eighteen inches, with flat brass weights turned, two each; one, two, four, and eight ounces, four of sixteen ounces, with brass pulleys; illustrating the three kind of levers; the whole highly finished and complete, .....	50.00
10. Hunter's Screw; in frame, brass screws, .....	6.00
11. Collision Balls, frame with six ivory balls, suspended by two cords, with graduated arc, one and a half inch, .....	7.00
12. Collision Balls, the same, with six $1\frac{1}{2}$ inch lignum vitæ balls, .....	4.00
13. Collision Balls, mahogany stand, six $1\frac{1}{2}$ inch balls, single cord, .....	3.00
14. Collision Balls; sets like Nos. 7, 8, and 9, with different size balls, from $\frac{3}{4}$ to $1\frac{3}{4}$ inch, same prices.	
15. Extra set of five balls of different sizes to attach to same frame; ivory, 4.50; wood, .....	2.00
16. Whirling Machine, mahogany frame, with brass geared wheels, with eight illustrations of central and centrifugal forces, of the cause of bodies revolving on their smallest diameter, of the flattening of the poles, &c., .....	8.00
17. Plate, twelve inches in diameter, painted with the prismatic colors, for recomposing white light to use with No. 12, .....	1.50

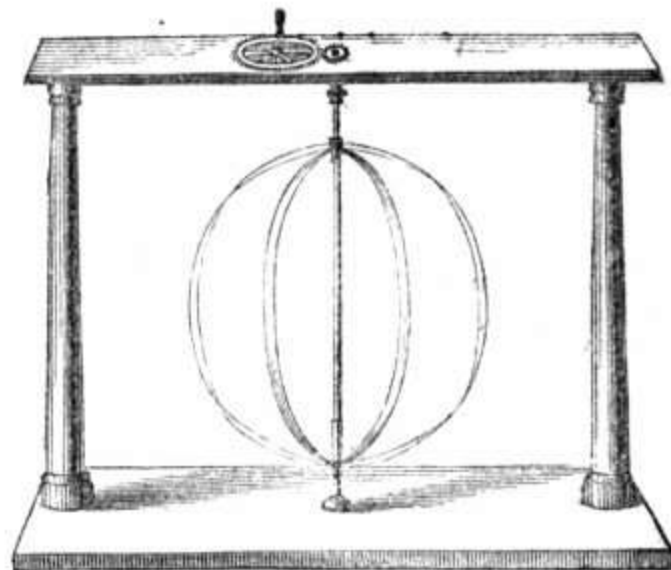




No. 18.



No. 11-13.

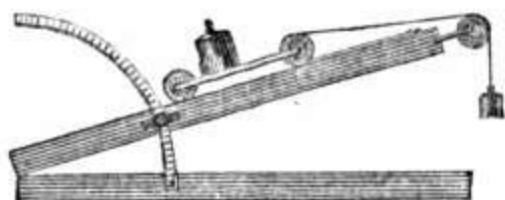
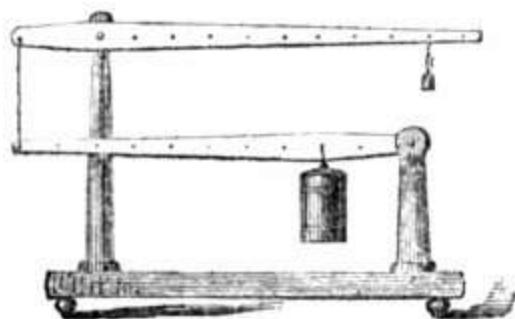
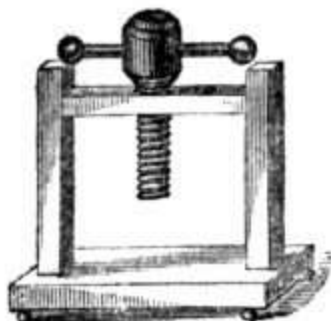
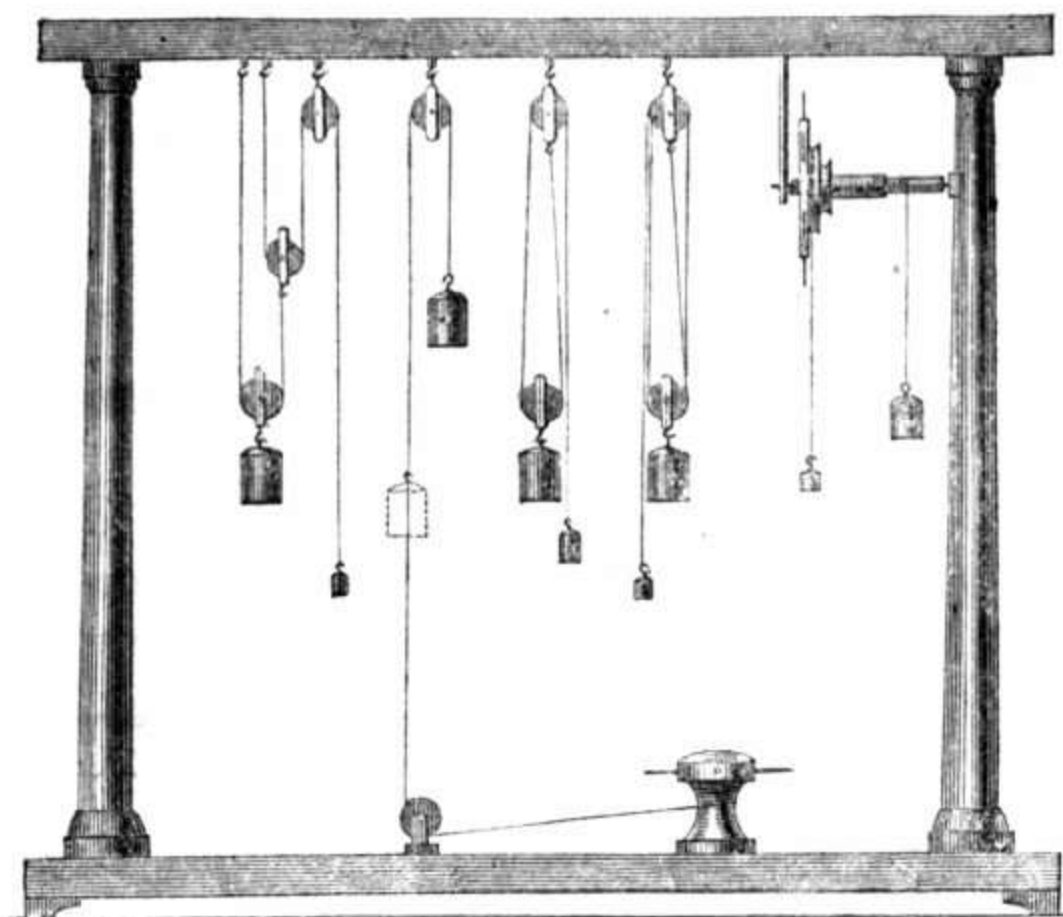


No. 16.

NUMBER

PRICE

18. Ritchie's Improved Atwood Machine, with Electro-Magnetic Movement; mahogany pillar, with basement and levelling screws; brass friction wheels; balanced weights made in three sections; sliding platforms. A point upon a pendulum, which is supported upon the side of the pillar, passes at the centre of each oscillation through a drop of mercury, completing the circuit of a battery, which gives an instantaneous motion to the armature of an electro-magnet. The *first* connection drops the table upon which one of the balance weights (with the additional weight) rests, and each *subsequent* connection strikes a bell, marking the seconds of time during the experiment with the greatest precision. A sliding breakpiece cuts off the current from the battery, until the experiment is ready to be performed, .....100.00



No. 24.

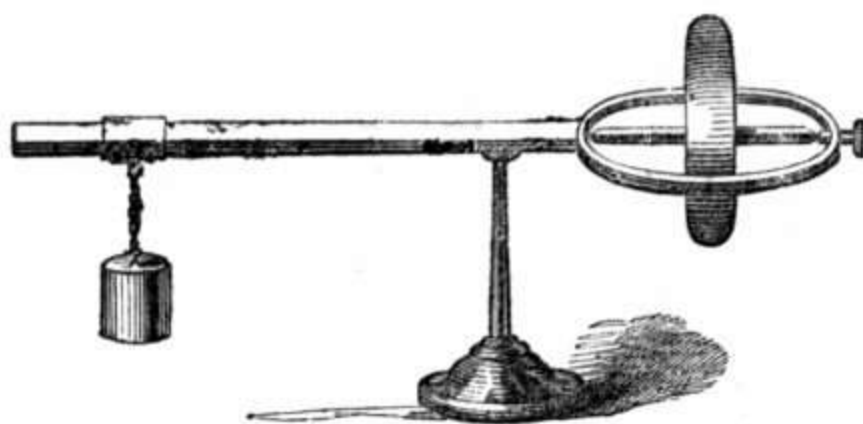
## NUMBER

## PRICE

19. Ritchie's Improved Atwood Machine; similar in every respect to No. 18, except that the large pulley is supported upon pivots, but in such manner as to run with as little friction as with rollers. Every experiment illustrating the laws of falling bodies is performed with this instrument as perfectly as with the most elaborately constructed machine, ..... 75.00
20. Atwood's Machine; graduated mahogany pillar, with basement and levelling screws, with clock, sliding platforms and weights, ..... 35.00
21. Mechanical Powers, mahogany frame, with four sets brass pulleys, with silk cord, and balanced; two sets brass weights, simple and compound levers, wheel and axle, screw and lever with nut, screw as an inclined plane, wedge in sections, inclined plane with arc and binding screw, carriage, ship's capstan, &c.; complete, ..... 25.00
22. Mechanical Powers, arranged in large frame of mahogany, three and a half feet long and three feet high, with large pulleys, two sets of weights, one to forty-eight ounces; the whole handsomely mounted and finished, ..... 35.00



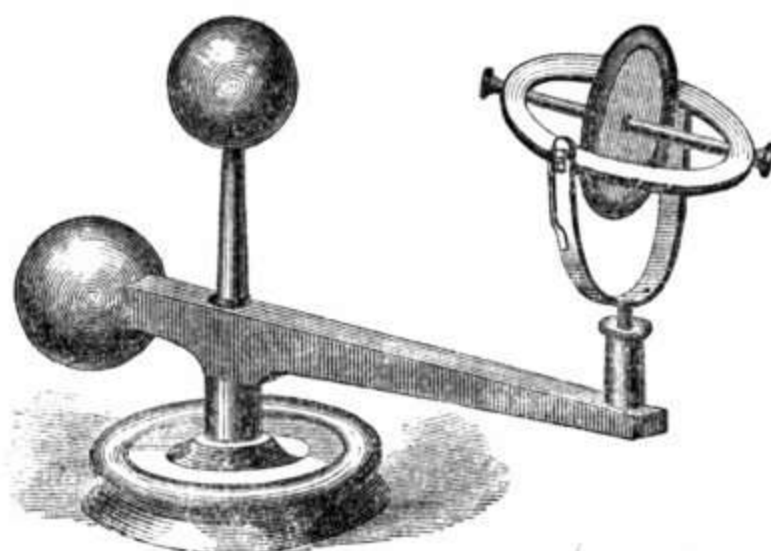
No. 25.



No. 26.



No. 28.



No. 29.

NUMBER	PRICE
23. Mechanical Powers; frame four feet by three and a half; six sets large pulleys, extra weights, wheel and axle with friction rollers, simple and compound levers of first, second, and third kinds; the whole highly finished, .....	50.00
24. Mechanical Powers; mahogany frame, four sets brass pulleys, with silk cord, wheel and axle and capstan, inclined plane and car, levers and screw on separate frames, wedge and weights,.....	35.00
25. Plateau's Apparatus; glass globe ten inches diameter, with cap; stop-cock and stand; a shaft and crank, with movable metal disc,.....	6.00
26. Gyroscope; brass wheel, accurately balanced; brass frame and stand; sliding weight confined by a screw,.....	5.00
27. Gyroscope; same as No. 26, with a gimbal for the centre point of frame, 6.00; with brass stand,.....	7.00
28. Gyroscope; supported on gimbals, with wheel from three to five inches diameter, accurately balanced, mahogany stand, from 8.00 to.....	15.00
29. Gyroscope; mounted on gimbals, and supported upon a balanced frame; the persistency of the wheel to revolve in the same plane as it rotates around the centre, beautifully shows the motions of the earth around the sun; a small weight attached to one of the axes illustrates the <i>precession of the equinoxes</i> ; brass wheel four inches diameter,.....	15.00

This instrument will be made to order, of any form and size.

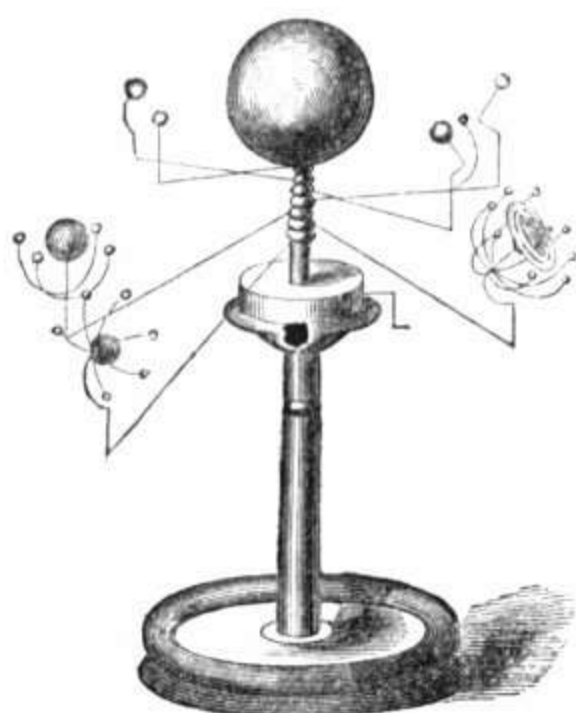


## ASTRONOMY



No. 7.

NUMBER	PRICE
1. Orrery, mahogany stand; motion by crank, brass tubes, gears, and cap, thoroughly made,.....	7.00
2. Orrery; with brass stand, and motion given to moon around earth,....	10.00
3. Spring Orrery; gold gilt planets, brass arms, 5 inch sun, stands two feet high, spreads 3½ feet from Herschel to Saturn; motion to moon round the earth,.....	30.00
If motion is given to Jupiter's moons, .....	35.00
4. Spring Orrery; brass mounted; extra finish, motion as above,.....	45.00
5. Seasons Machine; with five inch sun and three inch earth; giving the motions of the earth on its axis around the sun, inclination to the north parallelism of the axis; aphelion and perihelion position, moon around the earth, moon's nodes, sun on his axis, &c., mahogany stand, .....	7.00
6. Seasons Machine; brass mounted, extra finish,.....	10.00
7. Improved high mounted Globes; 13 inch diameter, stands 48 inches high, on iron legs, neatly bronzed, with casters, the pedestal or pillar is of mahogany, and receives the hub and shaft on which the globe is mounted. This arrangement admits of a horizontal rotary motion to the whole globe, meridian and horizon. Price per pair,.....	45.00
8. High mounted Globes, with bronzed Pedestal, giving great stability,	45.00



No. 1.



No. 9.

NUMBER	PRICE
9. Thirteen inch Globes ; low mounted, pair,.....	30.00
10. Ten inch Globes ; high mounted, pair,.....	30.00
11. Ten inch Globes ; low mounted, pair, .....	18.00
12. Six inch Globes ; low mounted, pair, .....	10.00
13. Six inch Globes ; semi-stand, pair, .....	5.00
14. Two inch Terrestrial, .....	2.00

## MISCELLANEOUS.

1. Set of eight mahogany Solids ; illustrating cube root, plane and solid measure, &c.,.....	1.25
2. Set of twelve Solids ; viz., cylinder, oblique cylinder, prism, six sided prism, cone, pyramid, frustum of cone, frustum of pyramid, sphere, hemisphere, oblate spheroid, prolate spheroid,.....	1.00
3. Set of ten Parallelopipeds ; papered, .....	1.00
4. Set of five Geometrical Transposing Frames, .....	1.00
5. Numeral Frame ; with 120 balls,.....	1.25
6. Dissected Cone ; showing conic sections, 2.00 and,.....	3.00
7. Polyorama ; with views, 4.00 and .....	6.00
8. Surveyors' Compasses ; I keep a variety of much approved makers, from 20.00 to .....	45.00
9. Theodolites, Levelling Instruments, I can furnish at from 75.00 to.....	150.00
10. Barometers ; with Thermometer, Ivory Scale, and Vernier, rosewood frame ; plain, 12.00, ornamented, .....	18.00
Plotting Instruments ; English and French, in cases, from 1.50 to.....	15.00
11. Wet and Dry Bulb Hygrometer ; neatly mounted,.....	5.00
12. Daniel's Hygrometer ; complete in mahogany box, .....	12.00
13. Rain Gauge ; copper, most approved form, 7.00 and .....	12.00
14. Self-registering Thermometer, for day and night,.....	3.50
15. Aneroid Barometer ; very valuable for estimating elevations, &c., very accurate, .....	20.00
16. Thermometers for Schools ; a variety of mounting, 75 cts. to .....	2.00
17. Surveyors' Chains and Pins ; 50 and 100 links, 1.50 and.....	2.75

# PHILOSOPHICAL APPARATUS,

SELECTED FROM

E. S. RITCHIE'S

## CATALOGUE,

AND ARRANGED IN SETS.

The following selections have been made with care, with a view to combine such instruments as will perform as many and varied experiments, and to make each set as complete as possible, within the limits of the amount of each. The purchaser can, of course, make such alterations as he desires.

### SET OF APPARATUS—NO. I.

Capillary Tubes, .....	1.00	Electrical Machine, .....	20.00
Inertia Apparatus, .....	.75	Leyden Jar, .....	1.50
Collision Balls, .....	3.00	Discharger, .....	2.00
Prism, .....	.75	Set of Bells, .....	3.00
Mechanical Powers, .....	25.00	Electrometer, .....	.50
		S. and Point, .....	.50
Air Pump, .....	10.00	Long Haired Man, .....	.50
Bell Glass, 6 inch, .....	2.00	Images and Plates, .....	2.00
Hand Glass, .....	.75	Amalgam, .....	.25
Expansion Apparatus, .....	.75		
Revolving Jet, .....	.75	U Magnet, .....	.75
Hemispherical Cups, .....	3.50	Magnetic Needle and Stand, .....	1.00
Guinea and Feather Tube, .....	4.00	Cylindrical Battery, .....	3.00
Fountain, .....	3.00	Electro Magnet, .....	1.00
Condensing Chamber, .....	2.50	Vibrating Shocker, .....	5.00
Air Gun, .....	.75	Handles and Wires, .....	1.50

\$100.00



## SET OF APPARATUS.—NO. II.

Capillary Tubes, .....	1.00	Electrical Machine, .....	25.00
Collision Balls, .....	3.00	Improved set Leyden Jars, .....	4.50
Inertia Apparatus, .....	.75	Discharger, .....	2.50
Prism, .....	.75	Spiral Tube, .....	2.50
Convex and Concave Lenses, .....	1.50	Set of Bells, .....	3.00
Compound Microscope, .....	5.00	Obelisk, .....	3.00
Seasons Machine, .....	7.00	S. and point, .....	.50
Mechanical Powers, .....	25.00	Electrometer, .....	.50
		Insulating Stool, .....	5.00
Air Pump, .....	25.00	Pair of Plates and Images, .....	2.50
Bell Glass, 8 inch, capped, .....	3.50	Sportsman and Birds, .....	.75
Straight Jar, .....	.75	Long-Haired Man, .....	.50
Expansion Apparatus, Quart Bell, .....	1.00	Ether Spoon, .....	.75
Hand Glass, .....	.75	Miser's Plate, .....	1.00
Mercury Tunnel, .....	.75	Amalgam, .....	.25
Glass Cup for do., .....	.25		
Sliding Rod, .....	1.25	Pair of Water Pumps, .....	12.00
Upward Pressure Apparatus, ....	5.00		
Rubber Hose, 3 feet, .....	1.50	U Magnet, .....	1.00
Bell for Vacuum, .....	1.25	Magnetic Needle and Stand, .....	1.00
Guinea and Feather Tube, .....	4.00	Cylindrical Battery, .....	3.00
Barometer Apparatus, .....	3.00	Electro Coil and Armatures, .....	2.50
Hemispherical Cups, .....	5.00	Revolving Magnet, .....	5.00
Fountain, .....	4.00	Vibrating Shocker, .....	5.00
Rubber Bag and Hook, .....	1.25	Pair Handles and Wires, .....	1.50
Set four Couplers, .....	2.00		
Condenser, .....	5.00	Mechanics, &c., .....	44.00
Condensing Chamber and Cock, ..	3.50	Pneumatics, .....	72.75
Air Gun, .....	1.00	Electrics, .....	52.25
Revolving Jet, .....	1.25	Hydraulics, .....	12.00
Exploding Cup and Cock, .....	1.50	Magnetics, .....	19.00
Stop Cock Washers, .....	.25		
			200.00

## SET OF APPARATUS.—NO. III.

Capillary Tubes, .....	1.00	Air Pump, .....	25.00
Lead Hemispheres, .....	.75	Bell Glass, 8 inch, capped, .....	3.50
Collision Balls, .....	4.00	Straight Jar, for do., .....	1.00
Inertia Apparatus, .....	.75	Tall Bell and Jar, .....	3.00
Prism, .....	1.00	Expansion Apparatus, .....	1.00
Set four Lenses, .....	4.00	Hand Glass, .....	.75
Seasons Machine, .....	7.00	Mercury Tunnel and Cup, .....	1.00
Orrery, .....	7.00	Freezing Apparatus, .....	4.00
Compound Microscope, .....	7.00	Sliding Rod, .....	1.25
Mechanical Powers, .....	35.00	Upward Pressure Apparatus, ....	5.00

Rubber Hose, 4 feet, .....	2.00	Pair Water Pumps, .....	12.00
Bell for Vacuum, .....	1.25	Hydrostatic Bellows, .....	10.00
Guinea and Feather Apparatus, ..	6.00		
Barometer Apparatus, .....	3.00	U Magnet, .....	1.00
Hemispherical Cups, .....	5.00	Bar Magnet, .....	1.00
Artificial Fountain, .....	4.00	Magnetic Needle and Stand, .....	1.00
Rubber Bag and Cock, .....	2.00	Cylindrical Battery, .....	3.00
Set five Couplers, .....	2.50	Electro Coil and Armature, .....	2.50
Bacchus Illustration, .....	1.50	Powder Cup, .....	.50
Weight and Buoyancy of Air, ....	6.00	Revolving Magnet, .....	5.00
Condenser, .....	5.00	Vibrating Shocker, .....	5.00
Condensing Chamber and Cock, ..	3.50	Telegraph Model, .....	6.00
Air Gun and Balls, .....	1.00	Handles and Wires, .....	2.00
Revolving Jet, .....	1.25		
Plate Paradox and Disks, .....	1.00	Pair Rubber Bags and Cocks, ....	8.00
Exploding Cup and Cock, .....	1.50	Oxygen Flask, copper, .....	2.50
Washers for Stop Cocks, .....	.25	Hydrogen Generator, .....	3.00
		Pyrometer and Rods, .....	3.00
Electrical Machine, .....	25.00	Conductometer, .....	1.50
Improved set Leyden Jars, .....	4.50	Fire Syringe and Tinder, .....	1.00
Diamond Jar, .....	3.00	Set Wire of Gauze, .....	.50
Movable Coating Jar, .....	3.00	Lamp Stand, .....	2.00
Discharger, jointed, .....	3.50	Spirit Lamp, .....	1.00
Spiral Tube, .....	2.50	Test Tubes, 6, .....	.50
Set of Bells, .....	3.00	Flasks, 3, .....	.75
Thunder House, .....	5.00	Funnel, .....	.25
S and Point, .....	.50	Retorts, 3, .....	1.00
Electrometer, .....	.50	Rupert's Drops, 12, .....	.50
Insulating Stool, .....	6.00	Candle Bombs, 12, .....	.50
Plates and Images, .....	2.50		
Sportsman and Birds, .....	.75	Mechanics, .....	67.50
Long-Haired Man, .....	.75	Pneumatics, .....	92.25
Powder Bomb, .....	1.25	Electrics, .....	65.25
Seasons Machine, .....	1.50	Hydrostatics, .....	22.00
Ether Spoon, .....	.75	Magnetics, .....	27.00
Miser's Plate, .....	1.00	Chemicals, .....	26.00
Amalgam, .....	.25		
			300.00

## SET OF APPARATUS.—NO. IV.

Attraction Plates, .....	1.00	Seasons Machine, .....	7.00
Collision Balls, .....	4.00		
Lead Hemispheres, .....	.75	Air Pump, .....	85.00
Centre of Gravity Apparatus, ....	7.00	Open top Bell Glass, .....	4.50
Mechanical Powers, .....	35.00	Bell Glass, 8 inch, capped, .....	3.50
Whirling Machine, .....	8.00	Tall Bell and Jar, .....	3.00
Gyrascope, .....	6.00	Straight Jar, .....	1.00
Prism, .....	1.25	Hand Glass, swelled, .....	1.00
Compound Microscope, .....	7.00	Freezing Apparatus, .....	4.00
Set 6 Lenses, .....	6.00	Expansion do., .....	1.00
Orrery, .....	7.00	Mercury Tunnel and Cup, .....	1.00

Sliding Rod, .....	1.25	Gasometers, .....	25.00
Upward Pressure Apparatus, ....	5.00	Copper Oxygen Flask, .....	2.50
Rubber Hose, 4 feet, .....	2.00	Gallows Connector, .....	1.25
Hemispheric Cups, .....	5.00	Hydrogen Generator, .....	3.00
Bell for Vacuum, .....	1.25	Pair Reflectors and Ball, .....	6.00
Set 6 Couplers, .....	3.00	Spirit Boiler, .....	2.00
Guinea and Feather Tube, .....	6.00	Pyrometer, .....	3.00
Rubber Bag and Cock, .....	2.00	Conductometer, .....	1.50
Fountain, .....	4.00	Fire Syringe, .....	1.50
Weight and Buoyancy of Air, ...	6.00	Spirit Lamp, .....	1.00
Bacchus Illustration, .....	1.50	Lamp Stand, .....	2.00
Treble Globe, .....	3.00	Set Wire Gauze, .....	.50
Barometer Apparatus, .....	3.00	Ounce Measure, .....	.75
Condenser, .....	5.00	Ten Cubic Inch do., .....	1.00
Condensing Chamber and Cock, ..	3.50	Tubulated Retorts, four, .....	1.25
Revolving Jet, .....	1.25	Flasks, three, .....	1.00
Air Gun, .....	1.00	Funnel, .....	.25
Plate Paradox, .....	1.00	Test Tubes, twelve, .....	1.00
Pipe Paradox, .....	1.00	Eolopile, .....	1.50
Exploding Cup, .....	1.50	Candle Bombs, 1 doz., .....	.50
Washers, .....	.50	Rupert's Drops, .....	.50
Electrical Machine, .....	50.00	U Magnet, .....	1.00
Battery of four 2 quart jars, ....	10.00	Bar Magnet, .....	1.00
Improved set of Leyden Jars, ....	4.50	Star Armature, .....	.50
Movable Coating Jar, .....	3.00	Needle and Stand, .....	1.00
Diamond Jar, .....	3.00	Cylindrical Battery, .....	6.00
Jointed Discharger, .....	3.50	Groves' Battery, 4 cups, .....	8.00
Universal Discharger, .....	8.00	Voltaic Pistol, .....	3.00
Directing Rod, .....	2.00	Electro Magnet, .....	1.50
Spiral Tube, .....	2.50	Electro Coil and Armature, .....	2.50
Set of Bells, .....	3.00	Helix and Bar, on stand, .....	2.50
Electrometer, .....	.50	Decomposing Cell, .....	2.50
Gold Leaf Electrometer, .....	3.00	Orsted's Galvanometer, .....	3.00
Thunder House, .....	5.00	De la Rive's Ring, .....	1.25
S and Point, .....	.50	Vibrating Shocker, .....	5.00
Pair Plates and Images, .....	2.50	Revolving Magnet, .....	5.00
Sportsman and Birds, .....	.75	Model of Telegraph, .....	5.00
Insulating Stool, .....	6.00	Powder Cup, .....	.50
Powder Bomb, .....	1.25	Handles and Wires, .....	2.00
Long-Haired Man, .....	.75		
Ether Spoon, .....	.75	Mechanics, .....	61.75
Miser's Plate, .....	1.50	Optics and Astronomy, .....	28.25
Seasons Machine, .....	1.50	Pneumatics, .....	161.75
Amalgam, .....	.50	Electrics, .....	114.00
Pair Water Pumps, .....	12.00	Hydrostatics, .....	26.00
Hydrostatic Bellows, .....	10.00	Chemicals, .....	57.75
Equilibrium Tubes, .....	4.00	Magnetics, .....	50.50
			<hr/>
			500.00



## SET OF APPARATUS.—NO. V.

Pair Lead Hemispheres,.....	.75	Glass Condensing Chamber,.....	10.00
Capillary Tubes, .....	1.50	Pressure Gauge for do., .....	1.50
Capillary Plates,.....	1.50	Crushing Squares, .....	1.00
Collision Balls, .....	4.00	Bell for Condensed Air, .....	1.50
Centre Gravity Apparatus, .....	7.00	Hydrostatic Paradox, complete,..	4.50
Whirling Machine, complete, ....	8.00	Air Gun Barrel, .....	1.00
Mechanical Powers,.....	35.00	Plate Paradox, .....	1.00
Gyrascope, .....	7.00	Condensation Gauge, .....	2.50
Prism, .....	1.50	Leather Washers, .....	.50
Set of six Lenses,.....	6.00		
Achromatic Microscope, .....	20.00	Electrical Machine, .....	85.00
Magic Lantern, .....	25.00	Battery six 2 quart Jars, .....	14.00
Astronomical Sliders, .....	18.00	Improved set Leyden Jars, .....	4.50
Stereoscope, .....	6.00	Movable Coating Jar, .....	3.00
Diagrams and Pictures for do., ..	10.00	Diamond Jar,.....	3.00
Orrery, .....	7.00	Directing Rod,.....	3.50
Seasons Machine, .....	7.00	Spiral Tube, .....	3.00
		Illuminating Egg Stand, .....	1.50
Air Pump,.....	85.00	Luminous Letters, .....	2.50
Swelled Bell Glass,.....	4.50	Jointed Discharger, .....	3.50
Capped Bell Glass,.....	3.50	Universal Discharger, .....	8.00
Tall Bell and Jar, .....	3.00	Revolving Bell, .....	2.00
Straight Jar,.....	1.25	Electrometer, .....	.50
Hand Glass,.....	1.00	Gold Leaf Electrometer, .....	5.00
Bladder Cup, .....	1.50	Insulating Stool,.....	6.00
Freezing Apparatus, .....	4.00	Plate for Dancing Balls, .....	1.00
Expansion do, .....	1.00	Set of Electrical Bells, .....	3.00
Hemispherical Cups, .....	7.00	Dancing Image Plates,.....	3.00
Upward Pressure Apparatus, ....	7.00	Pair of Images, .....	.50
Rubber Hose,.....	2.00	Box Pith Balls, .....	.50
Water Hammer, .....	3.00	Sportsman and Birds, .....	.75
Bell for Vacuum, .....	1.25	Wax Cylinder,.....	1.00
Guinea and Feather Tube, .....	7.00	Glass Cylinder, .....	1.00
Artificial Fountain, .....	4.00	Powder Bomb, .....	1.25
Bacchus Illustration,.....	1.50	Ivory Mortar, .....	3.00
Treble Globe,.....	3.00	Thunder House,.....	5.00
Barometer Apparatus, .....	5.00	Long-Haired Man, .....	.75
Weight and Buoyancy of Air, ....	6.00	Abbe Nolet's Globe, .....	5.00
Siphon in Vacuum, .....	2.50	Luminous Bell Points, .....	1.00
Revolving Jet, .....	1.25	S. and Point, .....	.75
Mercury Tunnel and Cup, .....	1.00	Bucket and Siphon, .....	1.00
Bursting Squares, .....	1.50	Electric Tellurian, .....	1.50
Wire Guard and Valve Cap, ....	1.00	Ether Spoon, .....	.75
Rubber Bag and Cock, .....	2.00	Miser's Plate,.....	2.00
Set Couplers, .....	2.50	Amalgam,.....	.50
Condenser, .....	5.00		
Condensing Chamber and Cock,..	3.50	Equilibrium Tubes, .....	4.00
Sliding Rod,.....	2.00	Hydrostatic Bellows,.....	10.00

## SETS OF APPARATUS.

61

Pair Water Pumps, .....	12.00	Cryophorus, .....	2.00
Siphon, .....	1.50	Chemical Thermometer, .....	2.50
Hiero's Fountain, .....	6.00	Set Substances, .....	15.00
Tantalus Cup, .....	1.50		
Gasometers, .....	35.00	Bar Magnet, .....	1.00
Copper Oxygen Flask, .....	3.50	U Magnet, .....	1.50
Lead Tube, .....	1.50	Wheel Armature, .....	.50
Hydrogen Generator, .....	4.00	Star Armature, .....	.50
Reflectors and Ball, .....	6.00	Needle and Stand, .....	1.00
Spirit Boiler, .....	2.00	Cylindrical Battery, .....	6.00
Radiating Cubes, .....	2.00	Groves Battery, 4 cups, .....	8.00
Pyrometer, .....	3.00	Voltaic and Electric Pistol, .....	4.00
Lamp Stand, .....	2.00	Hem. Coil and Armature, .....	2.50
Spirit Lamp, .....	1.00	Helix and Bar, .....	2.50
Conductometer, .....	1.50	Decomposing Cell, .....	2.50
Pair Pendant Spoons, .....	.50	Galvanometer, .....	3.00
Fire Syringe, .....	1.50	De la Rives Battery, .....	1.25
Set Wire Gauze, .....	.50	Revolving Bell Engine, .....	10.00
Blowpipe, .....	.50	Revolving Magnet, .....	5.00
Gas Bag and Cock, .....	5.00	Vibrating Shocker, .....	5.00
Aphlogistic Lamp, .....	1.50	Powder Cup, .....	.50
Dropping Tube, .....	.25	Terrestrial Helix, .....	1.50
Graduated oz. Measure, .....	.75	Thermo Arch, .....	5.00
do. Test Tubes and Stand, .....	2.00	Handles and Wires, .....	2.00
Tubulated Retorts, six, .....	2.25	Model of Telegraph, .....	5.00
Glass Flasks, six, .....	2.00		
Funnel, .....	.25	Mechanics, .....	64.75
Cubic inch Tube, .....	.50	Optics and Astronomy, .....	100.50
Evaporating Dishes, three, .....	.75	Pneumatics, .....	198.25
Mortar and Pestle, wedgewood, ..	1.00	Electrics, .....	178.25
Hydrogen Balloon, .....	3.00	Hydrostatics, .....	35.00
Bologna Vials, dozen, .....	1.00	Chemical, .....	105.00
Rupert's Drops, dozen, .....	.50	Magnetics, .....	68.25
			<hr/>
			\$750.00

## SET OF APPARATUS. — NO. VI.

Attraction Plates, .....	1.00	Plateau's Apparatus, .....	6.00
Lead Hemispheres, .....	.75	Gyrascope on Balanced Frame, ....	15.00
Inertia Apparatus, .....	.75	Glass Plate and Press for Vibration, ..	7.00
Capillary Tubes, .....	1.50		
Capillary Plates, .....	1.50	Microscope, Oberhauser's, .....	40.00
Set of Cube Solids, .....	1.25	Botanical Microscope, .....	1.50
Set of Geometric Solids, .....	1.00	Set of Microscopic Objects, .....	3.00
Collision Balls, Ivory, .....	7.00	Set of Six Lenses, .....	8.00
Centre of Gravity Apparatus, .....	7.00	Set of Three Mirrors, .....	2.75
Dissected Cone, .....	3.00	Eye Models, .....	12.00
Whirling Machine, .....	8.00	Stereoscope, .....	5.00
Improved Atwood Machine, .....	75.00	Pictures and Diagrams for do., ....	15.00
Mechanical Powers, .....	35.00	Tourmaline Polariscopes, .....	5.00



Mounted Prism,.....	3.00	Washers, .....	.50
Kaleidoscope,.....	.75	Prepared Oil, .....	.50
Multiplying Lens, .....	.50		
Magic Lantern, .....	25.00	Electrical Machine,.....	85.00
Astronomical Sliders,.....	18.00	Battery of Six Jars,.....	14.00
Selected Sliders, .....	20.00	Improved Set of Jars,.....	4.50
Orrery, Brass Stand,.....	10.00	Diamond Jar,.....	3.00
Tellurian,.....	7.00	Movable Coating Jar,.....	3.00
Pair of high mounted Globes, .....	45.00	Sportsman and Birds,.....	1.00
		Insulating Stand, .....	4.00
Air Pump,.....	85.00	Jar covered with filings, .....	2.00
Swelled Bell Glass, six gallons,....	4.00	Spotted Tube, .....	3.00
Cylindrical open Bell Glass,.....	2.00	Ether Spoon, .....	.75
Clapped Bell Glass, .....	3.50	Discharger, .....	3.50
Fall Bell and Jar,.....	3.00	Universal Discharger, .....	8.00
Plain Bell Glass, two quart,.....	1.00	Balance Electrometer,.....	4.00
Bladder Cup, .....	1.50	Set of Five Bells on Stand,.....	7.00
Air Gun, .....	1.00	Bells and Stand for Leyden Jar, ...	3.00
Hand Glass,.....	1.00	Dancing Image Plates, .....	3.00
Straight Jar,.....	1.00	Pair of Images, .....	.50
Freezing Apparatus,.....	4.00	Illuminating Egg Stand,.....	1.50
Expansion do.,.....	1.00	Electrometer,.....	.50
Hemispherical Cups, .....	7.00	Gold Leaf Electrometer,.....	5.00
Revolving Jet,.....	1.25	Plate for Dancing Balls, .....	.50
Bell for Vacuum,.....	1.25	Box of Pith Balls,.....	.50
Upward Pressure Apparatus,.....	7.00	Flier, .....	.75
Rubber Hose,.....	2.00	Tellurian, .....	1.50
Barometer Apparatus, .....	3.00	Insulating Stool,.....	6.00
Fountain,.....	4.00	Long Haired Man, .....	.75
Guinea and Feather Tube, .....	7.00	Revolving Globe,.....	2.00
Weight and Buoyancy of Air,.....	6.00	Miser's Plate,.....	2.00
Treble Globe, .....	3.00	Luminous Bell Points,.....	1.50
Mercury Tunnel and Cup,.....	1.00	Electrophorus, .....	6.00
Plate and Wood Cylinder, .....	1.00	Ivory Mortar, .....	2.00
Bursting Squares,.....	1.50	Powder Bomb, .....	1.25
Guard and Cap Valve,.....	1.00	Inclined Plane and Wheel,.....	2.00
Bacchus Illustration, .....	1.50	Directing Rod,.....	3.00
Water Hammer, .....	3.00	Luminous Letters on Stand,.....	4.00
Sliding Rod,.....	2.00	Thunder House,.....	5.00
Rubber Bag and Cock, .....	2.00	Abbé Nollet's Globe, .....	3.00
Condenser, .....	5.00	Gassiot's Cascade,.....	1.50
Condensing Chamber and Cock,...	3.50	Coulomb's Sphere and Needle, ....	4.50
Glass Condensing Chamber,.....	10.00	Amalgam, .....	.50
Pressure Gauge, .....	2.50		
Crushing Squares,.....	1.00	Improved Induction Apparatus, ...	175.00
Bell for Condensed Air,.....	1.00	Bunsen's Battery, 4 cells, .....	14.00
Hydrostatic Paradox, complete, ...	4.50	Sulphate of Copper Battery,.....	6.00
Plate Paradox,.....	1.00	Pair Bar Magnets, .....	3.00
Pipe Paradox, .....	1.00	U Magnet, .....	1.00
Set of Six Couplers, .....	3.00	Wheel and Star Armatures,.....	1.00
Gallows Connecters, two,.....	2.50	Needle and Stand,.....	1.00
Hydrostatic Balloon, .....	1.00	Electro Magnet, .....	1.50

PB-6346-2-SB  
723-36  
5-c  
BT



Coil and Semi-circular Magnets, ...	2.50	Woolfe's Bottles, two,.....	2.50
Helix and Bar,.....	2.50	Test Tubes and Stand,.....	2.00
Powder Cup,.....	.50	Dropping Tube,.....	.25
Voltaic and Electric Pistol, .....	4.00	Hydrogen Generator,.....	4.00
De La Rives' Battery, .....	1.25	Flasks, six,.....	2.00
Contracting Helix, .....	3.00	Funnel, .....	.30
Revolving Magnet,.....	5.00	Digesters, three, .....	1.00
Thermo Arch, .....	5.00	Globe Receiver,.....	.45
Telegraph Model, .....	5.00	Retorts, six, .....	2.25
Decomposing Cell, .....	3.00	Evaporating Dishes, four,.....	1.25
Analysis of Shocks, .....	12.00	Bologna Vials,.....	1.00
Lifting Coil, .....	1.50	Rupert's Drops,.....	1.00
Globe and Coil, .....	4.00	Cork Borers,.....	1.50
Galvanometer, .....	3.00	Compound Bar, .....	.75
Magnets for breaking, eight, .....	1.00	Blow Pipe, .....	.50
Signal Key,.....	2.50		
Handles and Wires, .....	2.00	Equilibrium Tubes,.....	4.00
		Upward Pressure of Fluids, .....	2.50
Gasometers, .....	45.00	Brass Cup and Cylinder,.....	2.00
Rubber Tube, .....	2.00	Pair of Water Pumps, .....	12.00
Radiating Cubes, .....	2.00	Hiero's Fountain, .....	6.00
Conductometer, .....	1.50	Hydrostatic Bellows, .....	10.00
Platina and Copper Spoons,.....	1.25	Hydraulic Press, .....	25.00
Set of Wire Gauze, .....	.50	Screw Pump, .....	6.00
Hydrogen Balloon, .....	3.00	Tantalus' Cup,.....	1.50
Cryophorus, .....	2.00	Siphon, .....	1.50
Lamp Stand,.....	2.00	Hydrometer and Jar, .....	2.50
Spirit Lamp,.....	1.00	Glass Balloon and Car, .....	4.00
Pyrometer, .....	3.00	Eolipile,.....	1.50
Rubber Gas Bag, .....	5.00	Wollaston's Globe, .....	3.00
Chemical Thermometer, .....	4.00	Candle Bombs,.....	.50
Aphlogistic Lamp and Coil, .....	2.00		
Oxygen Retort, .....	2.50	Laws of Matter and Mechanics,...	170.75
Crucibles, .....	.20	Optics and Astronomy, .....	221.50
Mortar and Pestle, .....	1.50	Pneumatics, .....	199.50
Reflectors and Ball, .....	6.00	Electrics, .....	204.50
Spirit Boiler,.....	2.00	Electro-Magnetics and Magnetics, .....	260.25
Ounce Measure,.....	1.00	Chemical, .....	111.50
Fire Syringe,.....	1.50	Hydrostatics, .....	82.00
Stirring Rods,.....	.30		
Ring and Ball,.....	1.50		
			\$1250.00

## TERMS.

Prices uniform and definite; no deviation from Catalogue prices.  
Boxes, Packing, and Shipping,  $2\frac{1}{2}$  per cent. on the amount of bill.  
Insurance against breakage by transportation, 1 to  $2\frac{1}{2}$  per cent.  
Marine Insurance, at current rates of underwriters.  
Sight Drafts on New York or Philadelphia received at par.