

CASELLA'S
LIST OF IMPROVED
Bourdon's Steam, Hydraulic Pressure
AND
Vacuum Gauges, Engine Counters,
&c., &c.

Change of Address:
C. CASELLA & Co.,
11, 13 & 15, Rochester Row,
LONDON, S.W.



L. CASELLA,

SCIENTIFIC INSTRUMENT MAKER

TO THE

ADMIRALTY, ORDNANCE, THE BOARD OF TRADE, THE INDIAN, AMERICAN,
JAPANESE, CHINESE, AND ALL THE LEADING GOVERNMENTS,

147, HOLBORN BARS, LONDON, E.C.

CASELLA'S IMPROVED

BOURDON'S STEAM, HYDRAULIC PRESSURE AND VACUUM GAUGES, ENGINE COUNTERS, &c., &c.



Fig. 1.

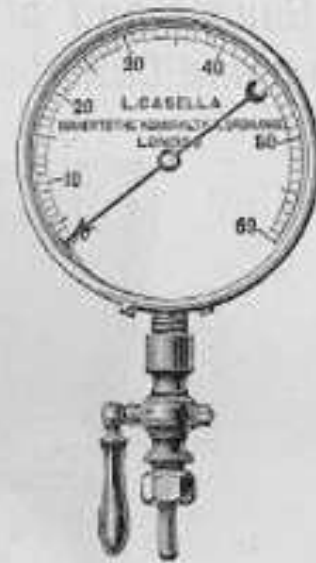


Fig. 2.

1. Improved Bourdon's Steam Pressure Gauges, in polished brass cases, with or without flange, with central hand, to indicate any pressure up to 300 lbs. on the square inch (Figs. 1 & 2).

3	4	5	6	7	8	9	10 inches.
11/9	13/-	15/9	18/3	19/6	26/-	31/6	39/- each.

2. Improved Bourdon's Vacuum Gauges, to correspond in size and style, same prices as above.

3. Stop Cocks, gun-metal, with union, &c., for any of the above gauges. . . extra, 3/6

4. Iron Syphon fitted to Stop-cock 3/6

5. Improved Bourdon's Water Pressure Gauges, graduated to any height up to 700 feet of water only, or with pressure in lbs. added.

5	6	7	8	9	10 inches.
19/6	22/9	24/6	32/6	39/-	48/- each.

6. Standard Pressure Gauges, Improved Duplex, Bourdon's, with two hands and double scale, one being a check on the other, up to 300 lbs. pressure.

6	7 inches.
52/-	58/6

7. Improved Bourdon's Pressure Gauges, with dial back and front, working with one tube, specially adapted for Steam Launches, &c., without flange, up to 300 lbs.

3	4	5	6	7 inches.
18/3	21/-	23/6	27/3	30/- each.

8. Improved Hydraulic Pressure Gauges, steel tube, carefully tested considerably above the maximum indicated pressure, in circular frame highly finished, registering to any pressure up to 4 tons per square inch.

4	6	7	8	9	10 inches.
33/9	39/-	45/6	49/6	55/3	65/-

9. Maximum Hand and Lock and Key for the above extra, 10/-

Extra Sensitive Pressure Gauges, showing pressure from 1 oz. to 1 lb.

AMMONIA PRESSURE GAUGES.

- 10. Ammonia Pressure Gauges, best, with 15 lbs. vacuum, open face, showing works, painted opal dial, mounted in nickel rim and flat iron flange, with connection at back, &c., &c. £3 0 0

Special Gauges and other Apparatus made wholly in steel for Ammonia Chambers, and other refrigerating purposes.

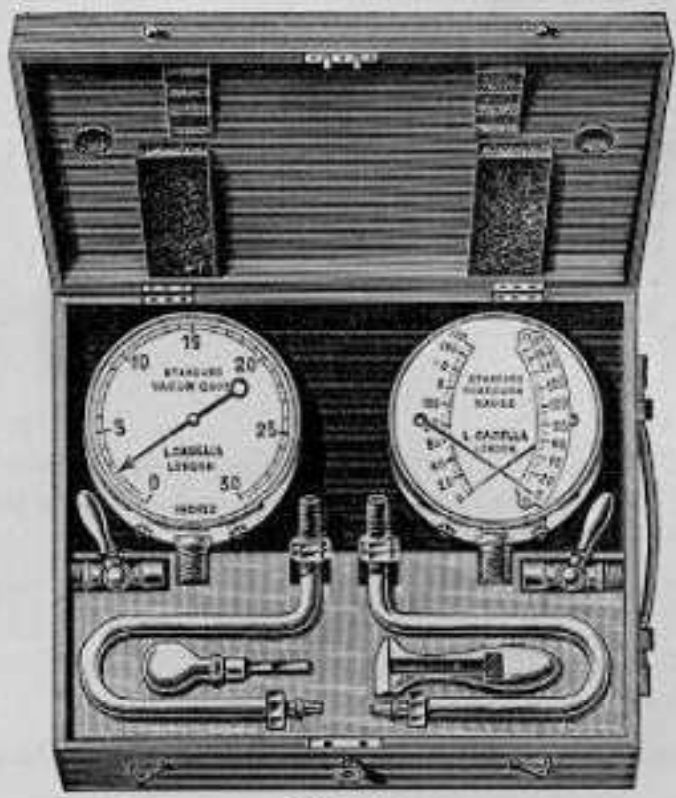


Fig. 11.

- 11. Set of Test Steam Pressure and Vacuum Gauges, consisting of a 6 in. Standard Bourdon's Duplex Steam Guage, with two indices, the one being a check on the other, graduated to any pressure; and a 6 in. Standard Bourdon's Vacuum Gauge, specially made for testing other gauges attached to machinery, &c., each having a gun-metal stop-cock and polished copper syphon, and also a patent spanner and screw-driver, all fitted in a handsome polished mahogany case with lock and key and leather handle. (Fig. 11) £7 17 6
- 12. Standard Duplex Test Gauges, for the use of Inspectors of Marine Departments, including two stop-cocks, syphon, elbow piece and spanner, in solid leather sling case with lock, complete 6 0 0
- 13. Standard Duplex Test Gauges, smaller, for use of Inspectors generally, with stop-cock, elbow, spanner, tap and bent jet, in leather case, complete 5 0 0
- 14. Richards's Steam Engine Indicators, with one spring and one scale, gun-metal stop cock, parallel bars, square, &c., in case, complete 7 10 0
- 15. Steam Engine Indicator, as above, improved 8 0 0
- 16. Steam Engine Indicator, as above, with Patent Check or Detent to Paper Roller 8 10 0

		£	s.	d.
17.	Steam Engine Indicator, as above, special for high pressure ..	9	0	0
18.	Motion for Oscillating Engines extra	0	10	0
19.	Extra Spring and Scale, to any range	0	10	0
20.	Extra Spring and Scale, to any range, to show millimetre per kilogramme per square centimetre	0	10	0
21.	Metallic Diagram Paper, per packet	0	4	0
22.	Portable Speed Tests, 32/- to 52/- each, and others.			

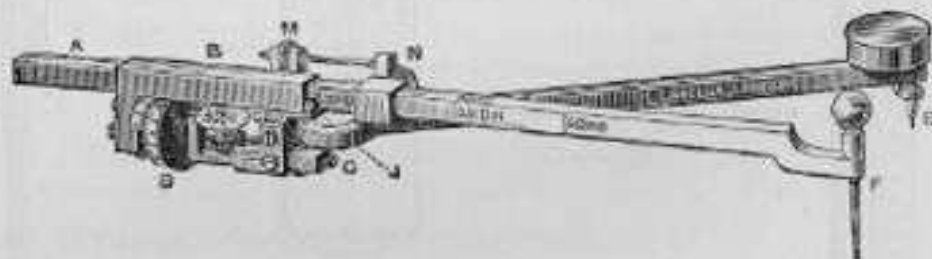


Fig. 23.

23.	Planimeters, Amsler's, for measuring the area of diagrams, in case. (Fig. 23)	£2 15 0 & 3 15 0
24.	Planimeter Diagrammer, Amsler's, for ascertaining the average pressure in lbs. per square inch, from the diagrams	4 5 0
25.	Thermometers, for Steam Pipes, Boilers, &c., with magnified mercury column, in polished brass cases, with revolving cover mounted on opal scale with indelible bold figures, 50 to 350° Fahrenheit, with gun-metal mercury cup	1 10 0
26.	Thermometers, for Superheated Steam, with iron mercury cup	1 5 0
27.	Thermometers, for Hot Water Pipes, with socket	1 2 0

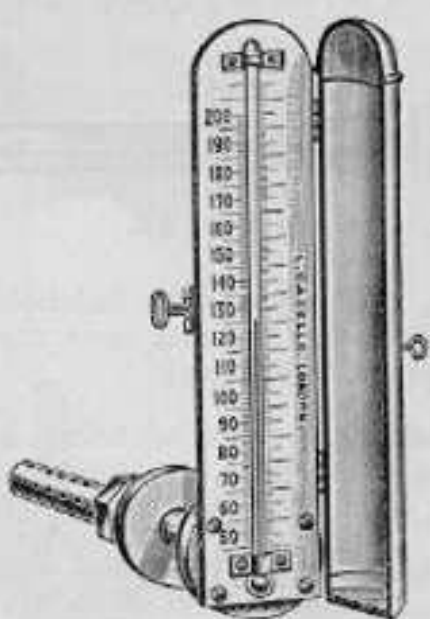


Fig. 28.

28.	Thermometer, with bent tube for insertion into vertical steam, &c., apparatus; white enamelled tube, with bold mercurial column, on silvered metal scale graduated to any range, in half cylindrical brass frame with hinged door and fastening, thus enabling the observer to read the thermometer most readily and with certainty. (Fig. 28)	2 10 0
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Fig. 29.



Fig. 30.



Fig. 33.

- | | £ | s. | d. |
|--|---|----|----|
| 29. Thermometers, bent enamelled tube, bold columns, to any range Fahrenheit or Centigrade, with large brass flange curved to any radius to fix to circular vessels. (Fig. 29) | 2 | 5 | 0 |
| 30. Gas Thermometers, 8 in. scale, in brass cases, straight, for horizontal pipes, with ground socket and screw plug. (Fig. 30) | 1 | 1 | 0 |
| 31. Gas Thermometers, as above, bent, for perpendicular pipes | 1 | 2 | 0 |



Fig. 32.

- | | | | |
|--|----|----|-------------|
| 32. Gas Thermometers, opal scale, with indelible figures, in white metal frame with knob handle, and cone top for insertion into various sized gas pipes. (Fig. 32) | | | |
| 33. Gyle Tun Thermometers, enamelled tubes, bold column, 40° to 120° Fahrenheit, or other range, in strong wood mounting, with protection for tube, from 2 feet to 6 feet long (Fig. 33) | £1 | 10 | 0 to 2 15 0 |
| 34. Vatting Thermometers for Brewers and Sugar Refiners, with hard-wood frames, and metallic or porcelain scales, 30° to 212° Fahrenheit (or as required), 3 feet and 4 feet long | £1 | 10 | 0 to 1 15 0 |
| 35. Mash Tun Thermometers, with porcelain scales, in strong metal mountings, 3 feet and 5 feet long | £2 | 5 | 0 to 2 10 0 |
| 36. Oven Thermometers, on cast iron base, to equalize the temperature 60° to 450° | 0 | 14 | 6 |
| 37. Oven Thermometers as above, but self-registering | 0 | 18 | 6 |

38. **Brewing Thermometers**, enamelled tube with magnified column, showing 30° to 212° (or as required), stout metal scales or porcelain scales, in strong rivetted copper cases as used in large brewing establishments, 10 in. to 14 in. .. £0 11 0 to 0 16 0
39. **Brewing Thermometers**, in every variety and size, metal or porcelain scales, in japanned or copper cases, to any required scale (Fig. 39) .. £0 3 6 to 0 12 6
40. **Sugar Boilers' Thermometers**, made to order.
41. **Economic Standard Thermometers**, verified, for testing or checking other thermometers, £0 7 6 to 0 15 6
42. **Standard Thermometers**, graduated, on stem for delicate investigations in large brewing establishments, &c. £0 15 6 to 2 5 0
43. **Standard Hydrometers** for delicate investigations in large breweries, &c., single or in sets .. £0 6 6 to 0 10 6
44. **Standard Hydrometers** for Torpedo work.
45. **Manufacturing Thermometers** for determining the temperature of oil, tallow, stearine, &c., &c., &c., with white enamelled tube, bold column, metal or porcelain scale, ranging from 212° to 660° (or as required), in copper case. Stem made to any required length £2 10 0 to 5 0 0

Special Thermometers and Hydrometers, for Electrical, Water and other Engineers, made to order.

46. **Pyrometers**, improved, indicating on a 6 in. dial 100° and 1,500° Fahrenheit, with adjustment, for ascertaining the temperature of Flues, Stoves, Ovens for Molten Lead Works. The stem of the Pyrometer varies from 18 in. to 36 in., according to the depth of the Apparatus in which they are used 4 4 0



Fig. 39.

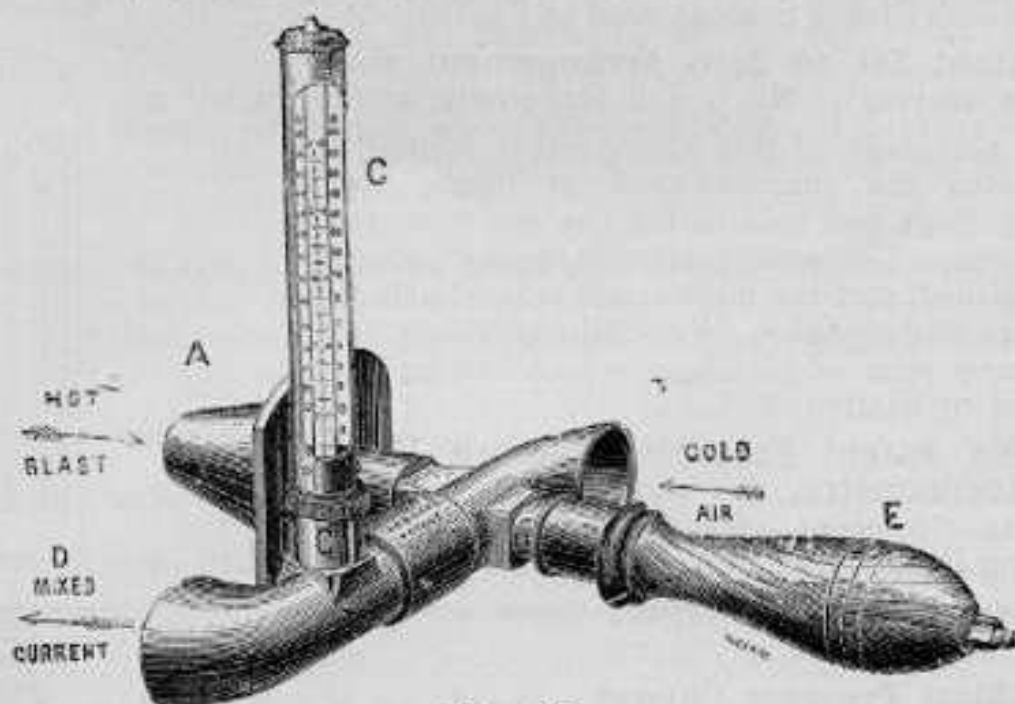


Fig. 47.

47. **Hot-Blast Pyrometer, Hobson's Patent**, complete with one Thermometer. (Fig. 47) 6 6 0
48. **Spare Thermometer** for do. to replace broken one 0 12 6

	£	s.	d.
49. Electrical Pyrometer, Le Chatelier's, without accessories ..	13	10	0
50. Platinum Coupling for do., iridio-platinum	1	5	0
51. Iron Rod, for the Coupling	1	15	0
52. Gas Stove, Leclerc et Forquignon's	2	10	0

The Mètre of Coupling includes 1 mètre of pure and 1 mètre of iridio-platinum.

Full description of the Apparatus may be had on application.



Fig. 53.

53. Air Meter, Casella's, for measuring the velocity of Currents of Air passing through Shafts, Mines, Hospitals, Public Buildings, &c., graduated to 1,000 English feet	No. 1.	2	10	0
54. Air Meter, as above, to 10,000 feet	No. 2.	2	15	0
55. Air Meter, as above, to 10,000,000 feet	No. 3.	3	10	0
If with Metric Scale instead of English	extra	0	5	0

56. A Patent Set to Zero Arrangement may be adapted to No. 1 and No. 2 only, extra £0 10 0

The advantage of this arrangement is that it saves the inconvenience of taking two readings and subtracting the one from the other. The setting is most easily accomplished, and the mechanism is not liable to get out of order. For full particulars see description of Air Meter, which can be had on application.

57. Dines's Patent Portable Pressure Hand Anemometer, for showing Velocity per Hour in Miles. Most useful for ascertaining Draughts in Shafts, Galleries, &c. ..	3	10	0
58. Mercurial Steam Gauges, brass scale, in polished mahogany frame	2	0	0
59. Hot-Blast Pressure Gauges	2	10	0
60. Mercurial Vacuum Gauges, metal scale, in round brass cases, with stop-cock. (Fig. 60)	£1	15	0 & 2 5 0

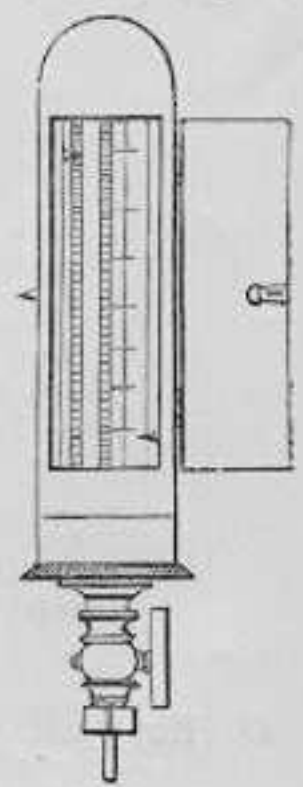


Fig. 60.

61. **Improved Gauge Glasses**, for Steam Boilers, guaranteed to bear any pressure or temperature, of green glass, or with magnified red or white enamelled backs. Any length and diameter cut to order.



Fig. 62.

62. **Pair of Water Test Tubes**, of best clear glass, $23\frac{1}{2} \times 2\frac{1}{2}$ in. diameter, brass mounts, and a glass disc in cell, to unscrew at each end, on carved wood supports on polished mahogany board, with a partitioned box to hold 6 spare glass discs for testing the quality of water, as used by the leading Water Companies, &c., &c., complete. (Fig. 62) 11 0 0



Fig. 63.

63. **Pair of Water Test Tubes**, best clear glass, $36 \times 1\frac{1}{2}$ in. diameter, with brass mounts and a glass disc in its cell, to unscrew at each end, mounted in oak frame with handles, made for suspension, as used by the leading Water Companies, &c. (Fig. 63) 7 15 0
64. **Water Test Tubes**, made of metal tube, and with perfectly clear glass disc for observing, and unscrewing at each end, made to order.
65. **Standard Mercurial Gauge**, with 2 Standard Improved Bourdon's Gauges, complete, with all latest improvements, for testing Pressure Gauges 120 0 0
66. **Mercurial Gauge**, for Water Pressure, for ascertaining the height of water at any distance from the office, with one scale on one side of tube showing feet of water, and the other scale showing capacity in gallons, complete £9 to 12 0 0
67. **Pressure Test Indicator** 4 4 0
68. **Salinometers**, Glass, in metal case 0 3 0
69. **Salinometers**, best gilt metal, in case 0 7 6
70. **Salinometers**, with Thermometer, in mahogany case 0 18 0
71. **Salinometers**, best gilt metal, with Thermometer, in polished mahogany case, complete 0 18 0
72. **Thermometers** for Salinometers, tube well protected on brass scale 0 5 6

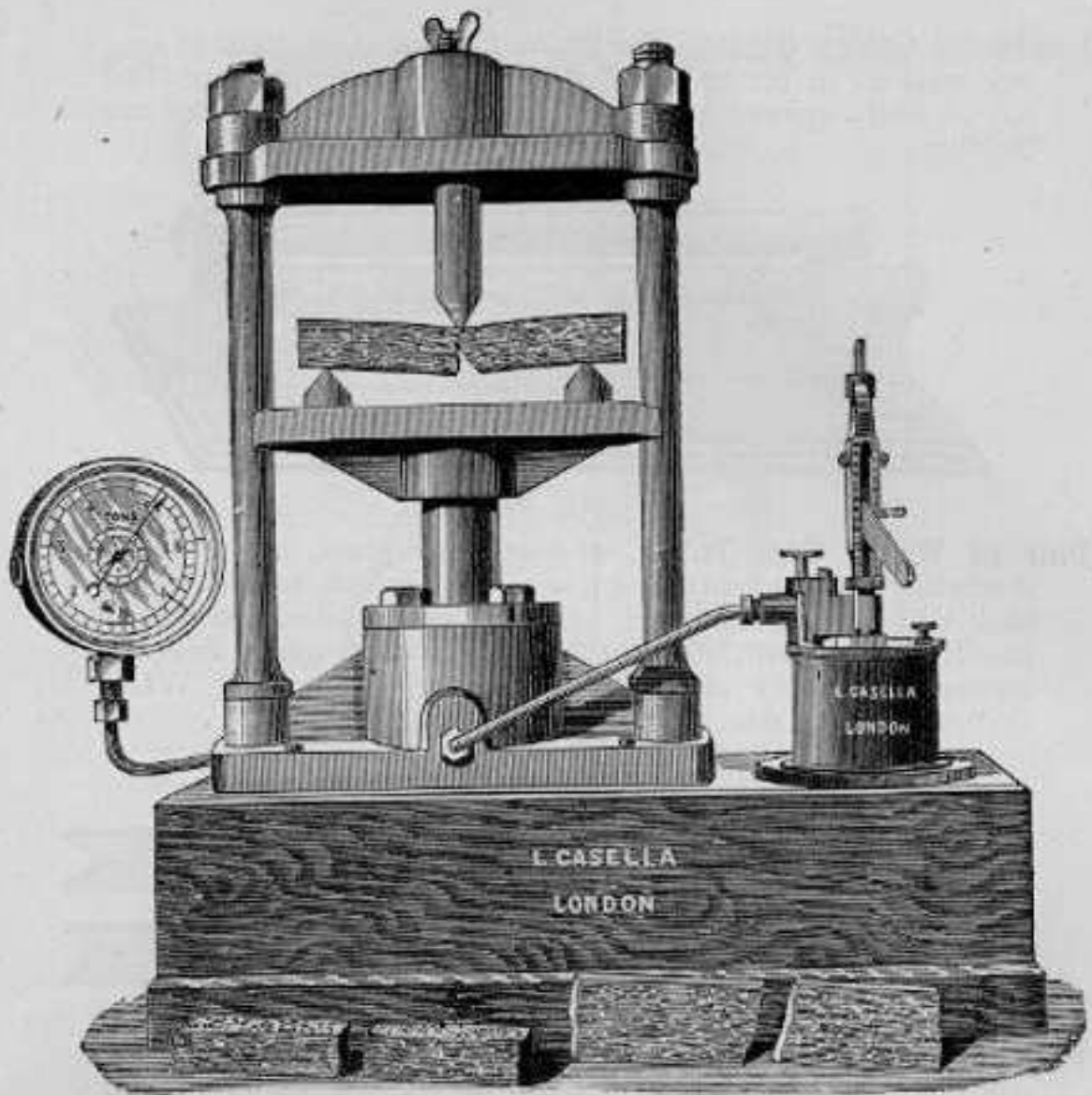


Fig. 73.

- 73. Brahma Presses (Fig. 73), of various sizes to order
- 74. Hydraulic Test Pumps, on Stand, for testing Boilers, &c. .. £14 10 0

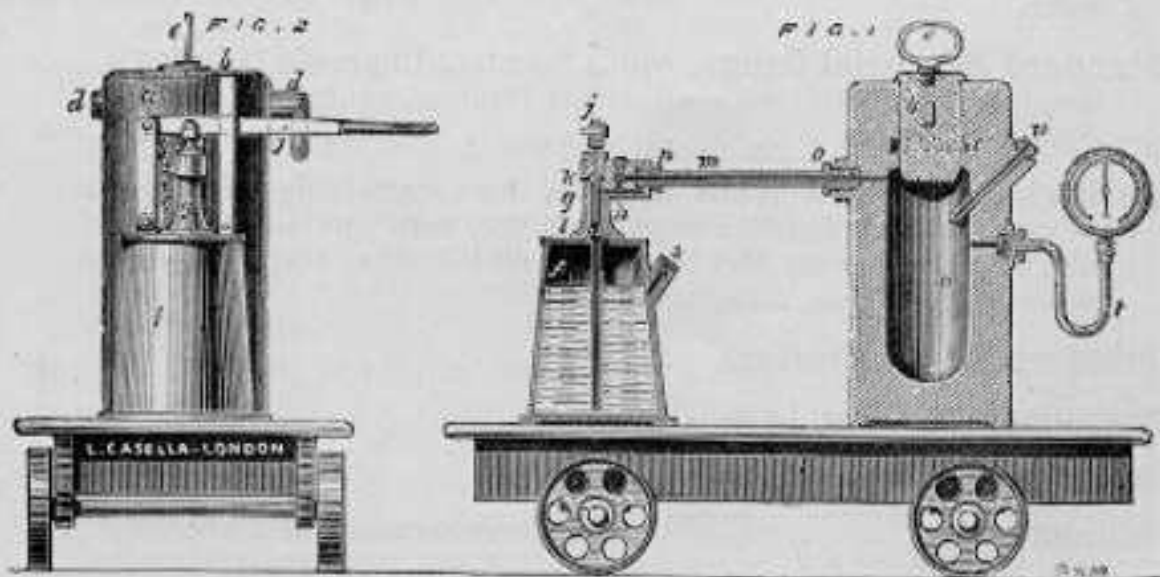


Fig. 75.

- 75. Hydraulic Presses (Fig. 75), for testing, &c., prices on application.
 For Self-Recording Pressure Gauges, &c., &c., see Casella's Catalogue of
 Richard Frères' Self Recording Instruments, and for whom L. Casella
 is Agent in Great Britain, India, the Colonies, and America, &c.

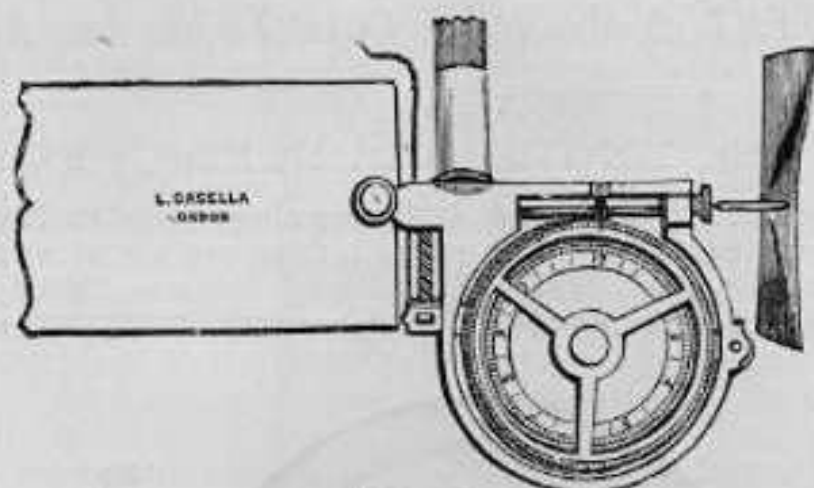


Fig. 76.

	£	s.	d.
76. Current Meter , for showing the rate of flow of tide in any stream or river, and the amount in gallons per hour flowing off (Fig. 76), in polished mahogany case	5	10	0
77. Current Meter , as above, much improved.. .. .	6	10	0
78. Current Meter , as above, but graduated metrically Rods and appliances for the above, for sounding at various depths, extra.	7	0	0
79. Current Meter , large size, as constructed for the Severn Commission, complete in case	17	12	6



Fig. 80.

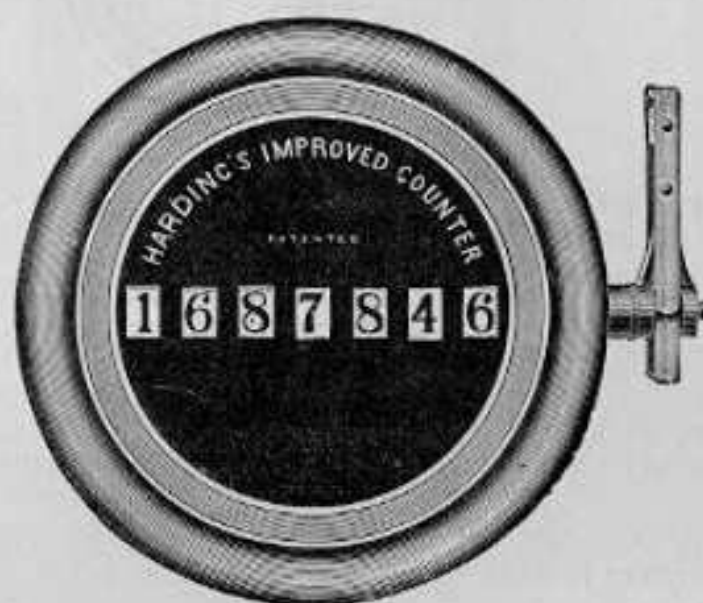
80. Perambulator . An instrument of great utility for measuring the distance of places from each other, the length of roads, &c. It consists of a large wheel of known circumference, having its axis attached to a frame and handle; a system of wheels connected with the axis of the large wheel registers the number of its revolutions upon a dial in English measure. Specially adapted for tropical climates (Fig. 80)	12	12	0
81. Perambulator , as above, but graduated metrically.. .. .	13	0	0
82. Perambulator , small size	6	0	0

HARDING'S IMPROVED ENGINE COUNTERS, TACHEOMETERS, PATENTED MACHINE COUNTERS, &c., &c.

No. 1 Size, ENGINE COUNTERS, $\frac{5}{8}$ Figures.

The No. 1 Size, with $\frac{5}{8}$ in. Figures, is the one always used for Engines of all kinds. Thousands of Harding's No. 1 Counters are at work on Stationary, Marine Engines, Mill and Pumping Engines, Newspaper Printing Machines, and on engines employed for many other purposes.

8



Quarter
Natural Size.

Fig. 83.

83. Round Engine Counter, 9 in. diameter, $\frac{5}{8}$ Figures .. Price £5 5 0

They are made in round and rectangular cases (as shewn in quarter size annexed), of a bold and handsome pattern, which will be found worthy of any engine house. The mechanism in this size is very solid and durable.



Quarter
Natural Size.

Fig. 84.

84. Square Engine Counter, 10 in. long, $\frac{5}{8}$ Figures (Fig. 84). Price £5 5 0

For Engines the reciprocating motion is almost always selected, on account of the ease with which the counter lever is connected with some part of the valve gear.

For Machines where the Counter is required to work at high speed, the rotary action is the most suitable. The Counter in these cases can be connected by a driving band or by wheels, the latter being, of course, more reliable.

The Square Counter is also made in combination with a superior lever clock, for use in marine engine rooms.

No. 1 Size, ENGINE COUNTERS, $\frac{1}{2}$ Figures (continued).

85. **Square Counter and Engine Room Clock Combined.** Price £10 10 0
The Patent Porcelain Number Wheels, which shew indelible black figures on a pure white ground, will be found of great value, especially for marine engine rooms, where the Counter is often placed in unavoidably dark positions.

86. **No. 1c, Special Counter and Gear for Pumps and Machines, with varying Strokes.**

Where a varying stroke has to be recorded there is an arrangement of a No. 1 size round Counter and Patent Clutch Gear which registers, in yards or feet, the working stroke of the machine to which it is applied, the figures showing the actual added length of the strokes made. These Counters will work correctly with any possible stroke, registering equally well the merest trembling or strokes many feet in length. They have been applied to heavy pumping and other machinery with great success, and in some cases have registered many hundreds of miles of varying strokes without any appreciable error.

Many Special Patterns of No. 1 size have been made for machines where large size figures are required—among others a pattern with five figures (without case) for turnstiles.

Price £2 0 0

When required these Engine Counters can be had with shaft right through, so that the lever can be worked from either hand. For Counters made in this way a small additional charge is made.

All these Counters are made with arrangements for setting the wheels back to zero readily.

Prices of No. 1 Counter ($\frac{1}{2}$ Figures).

87.	No. 1 Round Engine Counter	£5 5 0
88.	No. 1A Square " "	£5 5 0
89.	No. 1B " " " and Clock combined ..	£10 10 0
90.	No. 1c Special Counter and Gear for Pumps and Machines with varying Strokes. Price on Application.	
91.	No. 1D Turnstile Counter (no case)	£2 0 0

No. 2 Size, MACHINE COUNTERS.

The No. 2 size is a very convenient one for application to general machinery for which the No. 1 size might be found too large or too expensive. The No. 2 Counters have been applied to a great variety of machines where it is required to keep a record of the work performed, as for instance in Spinning, Paper Making and Printing Machines, Grinding Mills, Tipping, Hoisting, and Loading Apparatus, the larger sizes of Gas and Water Meters, &c., &c.,

The following is full size of the figures. **8**

This size is made with 6 wheels fitted with rotary or reciprocating motion as required.

They are made of bold design in well finished brass cases, of round and rectangular patterns, and with 6 figures.

No. 2 size Machine Counter may be had with rotary or reciprocating motion as may be required, and in round or square patterns.

The following woodcut represents the No. 2A size Square Counter (half natural size).

No. 2 Size, MACHINE COUNTERS (continued).

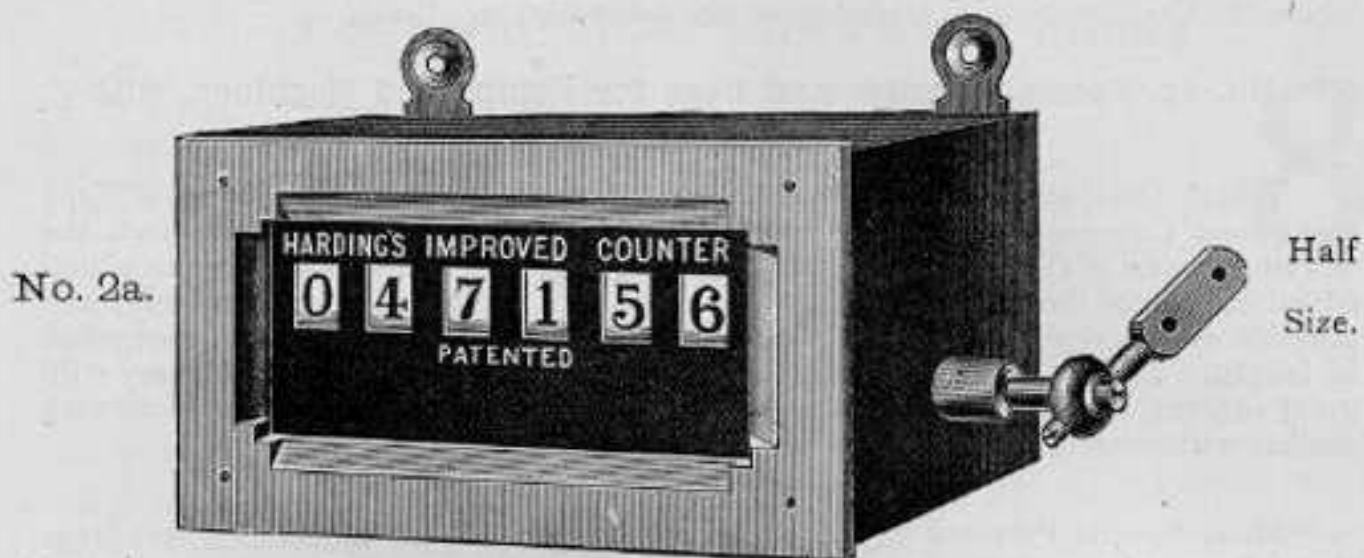


Fig. 92.

92. Price of above, round or square, with reciprocal motion (Fig. 92). £3 0 0
 93. " " with rotary motion £2 10 0

The reciprocating Counter is fitted with a lever which can be readily connected with any suitable stroke.

The rotary Counters can be connected to machinery either by pulley or belt, or by the greatly preferable means of wheels.

94. A Special No. 2 Size Counter is made for Roving Frames, as shown below.

Price £2 10 0

For special purposes where a sufficient quantity can be ordered, special patterns will be made.

When a suitable pattern is not found on the list, customers are requested to explain their special requirements as fully as possible.

Prices of No. 2 Size Counters.

95. No. 2 Counter, round or square, 6 figures, rotary action £2 10 0
 96. No. 2A " " " reciprocating motion .. £3 0 0
 97. No. 2B Roving Frame Counter, improved pattern £2 10 0

These Counters can also be made with zero arrangements. Prices on application.

No. 3 Size, SMALL MACHINE & POCKET COUNTERS.

This size, which is the smallest and cheapest of HARDING'S COUNTERS, is capable of numerous applications. No. 3 is a Woodcut (half size) of the Speedometer or Pocket Counter, now so generally and favourably known.

No. 3.



Half

Natural Size.

Fig. 98.

98. Price £1 16 0

This little instrument is not intended like the other patterns of HARDING'S Counters to be permanently attached to machinery, but it is designed for the purpose of ascertaining (watch in hand) the speed per minute of rapidly revolving machinery, by simply applying the steel bit, with which the instrument is provided, to the centre hole of a shaft, a very slight pressure of the hand being sufficient to transmit the motion of the shaft to the mechanism of the Counter. For use on Spindles a hollow steel bit is provided. It is largely used for testing the speed of Dynamos.

It is manufactured with great care, and all the chief working parts are of hardened steel, so that it may be used with accuracy at speeds over 5,000 per minute.

No Engineer or Manager should be without one.

99. No. 3A a small rotary Counter with 4 figures, which is one of the most useful sizes made. It is constructed with steel working parts, and is suitable for use with high speeds £1 12 0

100. **Pressure Test Indicator**, for testing the pressure of Steam Boilers, as a check upon the ordinary Steam Gauges. Complete with 2 springs, $\frac{1}{4}$ and $\frac{1}{30}$, as supplied to The Boiler Insurance Companies £4 4 0

Mahogany or Leather Case for above, extra.

101. There is no size of HARDING'S Counters capable of more numerous applications. Of this size, and of the following, 3B, thousands are at work on Spinning, Weaving, Grinding, Printing, Sewing, Hoisting, and Loading Machinery, &c., &c.

Price £1 5 0

The reciprocating movement is exterior to the Counter so as to facilitate oiling and cleaning.

102. **No. 3c.** A number of special patterns of **No. 3** size are in use for Gas and Water Meters, where they possess over the old indices the great advantages of being readily legible.

Price 7s. 6d.

These patterns of which one, **No. 3c**, is shewn (half size), doubtless are applicable to many other purposes.

They can be had from 7/6 upwards. Particulars on application.

No. 3 Size, SMALL MACHINE & POCKET COUNTERS (continued).

103. A pattern of the No. 3 Counter is made for driving at a distance by electricity or pneumatic connection. Price 30s.

A No. 3 size Counter is likewise made with three wheels to work by pressure of the thumb or finger, which is very useful for counting cargo, checking the number of passengers on board a boat, counting number of persons entering or leaving a room, and billiard marking, &c., &c. Price for same, complete, in leather case, 30s.

Many types of No. 3 size Counters have been made for Telephones, Automatic Machines, &c., and for special purposes where a sufficient quantity can be ordered, special patterns will be made.

When a suitable pattern is not found on the list, customers are requested to explain their special requirements as fully as possible.

	£	s.	d.
104. Pattern No. 3 Pocket Counter (or Speedometer) nickel plated and fitted in Leather Case, with Steel Bits	1	16	0
105. No. 3A, 4 figures, rotary motion	1	12	0
106. No. 3B, 5 ,, reciprocating motion	1	5	0
107. No. 3C, 5 ,, rotary motion	0	7	6
108. No. 3 size, Counter to work by electricity	1	10	0
109. No. 3 ,, Hand Counter in leather case complete	1	10	0
110. No. 3 ,, Counter, 5 wheels, square case, reciprocating motion	1	15	0

HARDING'S PATENT SPEED INDICATOR.

IMPORTANT TO ELECTRICIANS.

111. *This Instrument has been designed for showing at a glance, without counting or the use of a watch, by the position of a needle on a dial, the actual speed at which an Engine or Machine is at any moment revolving.*

The want of a really practical instrument of this kind has long been felt, and the present one will at once commend itself by its simplicity, accuracy, sensitiveness, and moderate price.

In most manufactories it is of importance that the speed of the motive power should be regular, and this regularity can be tested only by the use of a good Speed Indicator. In many cases considerable variations of speed occur, which are not ordinarily detected, but which are at once revealed when the Indicator is attached. The Instrument permits the engineer to notice at a glance the variations in the speed of the engine, and he is thus able to detect and remove many causes of irregularity, and to run his engine at her normal speed.

In cases, where, in differing circumstances, it is necessary to run engines at varying speeds, the Indicator will be found very valuable.

No one, indeed, who has had one of them in use, would again wish to be without, and wherever they have been introduced they have given great satisfaction.

Price £5 5 0

The Indicator is about 9 in. diameter and 4 in. deep, very solidly constructed, chiefly of brass, with the working parts of hardened steel. The only bearing requiring oil is exterior to the case and therefore easily got at.

For Stationary Engines where the range required is not large, only half the

dial is divided, and the divisions are wide apart, so as to enable very small variations to be noted. Where larger ranges are required, special dials are prepared.

The Indicator is very easily fixed, and the iron bracket that carries it can be attached either below the instrument, as shown in woodcuts, or above it, or at either side—screw holes being provided for these various positions.

It is important that the diameter of the pulley from which the instrument is driven should be a correct multiple of the diameter of the small pulley on the indicator. In each case, the size of the driving pulley is given, and suitable turned pulleys can be supplied if desired.

IMPORTANT NOTE.—In ordering, please to give:—

- (1) The working speed of the Engine or Machine to be indicated.
- (2) The diameter and correct speed of the shaft from which the Indicator is to be driven.

112. Price £5 5 0

113. **Speedometer and Stop Watch combined.** The watch runs 3 or 4 hours.
In Leather Case, complete £8 15 0

HARDING'S PATENT TACHOMETER OR SPEED INDICATOR.

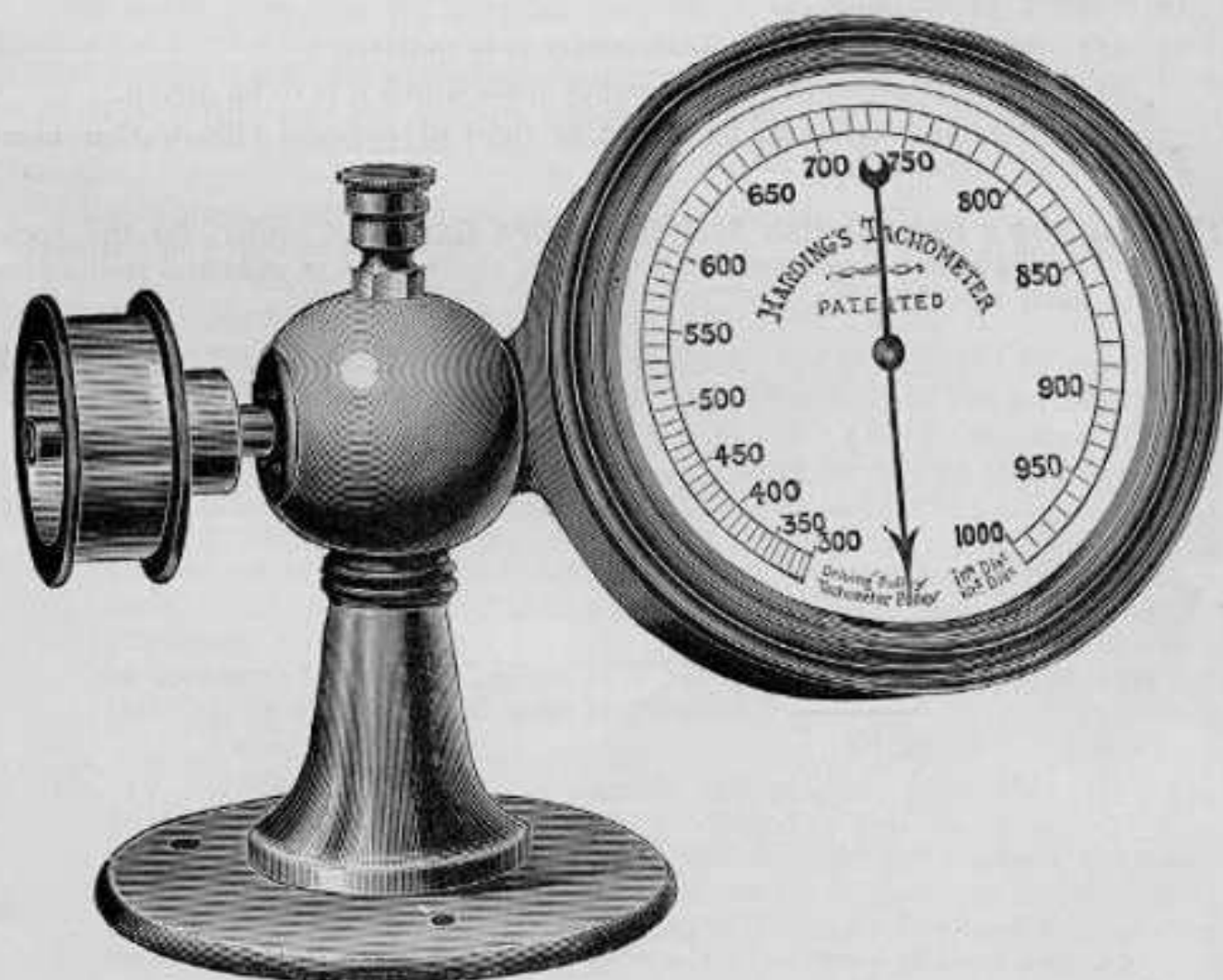


Fig. 114.

114. RANGES OF SPEED. Dynamis and Electric-Lighting Engines—600-1800, 500-1500, 400-1200, 300-900, 200-600, 150-450, 120-360; Marine and Stationary

Engines—100-300, 80-240, 60-180, 50-150, 40-120, 30-90, 20-60; Special purposes—ANY required range.

For Steam Trams, Traction Engines, Locomotives, &c., &c., the dial of Tachometer is made to show miles per hour.

This Instrument has a dial 8 in. diameter and weighs 25 lbs.

The base of Pedestal is $7\frac{1}{2}$ in. diameter, and is provided with 3 holes for $\frac{3}{8}$ in. bolts.

Price £7 10 0 subject to discount

This Instrument, which shows at a glance, without calculation, the exact speed at which an Engine or shaft is running, is a new adaptation of the Patent Speed Indicator, thousands of which have been supplied to the leading Electrical Engineers, Shipbuilders, Engine Builders, &c. It possesses several important advantages over the old pattern, and is far superior to all other instruments of its kind. Some of its important advantages are:—

Absolutely accurate at all speeds; reliable and durable.

Can be driven from any direction, and from any size of pulley or shaft.

Made with any range or scale of speeds.

Dial can be either at right or left of pedestal, and swivelled to any angle.

Handsome in appearance, and made by English workpeople in England.

Is the cheapest Tachometer in the market.

In ordering please state:—

- (1) Average speed which Tachometer is to indicate.
- (2) Exact diameter of shaft or pulley from which it is to be driven.
- (3) Whether dial is to be at left or right of pedestal (Illustration shows right hand).

115. **Harding's New British Standard Wire Gauge**, Circular, for the pocket or workshop, Legalised, with tables of equivalents in mils and millimètres, each 10/-

YOUNG'S PATENT SPEED INDICATORS.



Fig. 116.

116. **No. I.** (Fig. 116.) Size—Dial, $2\frac{1}{2}$ inches diameter; Case, 3 inches deep.

This is a Portable Instrument which, on being applied by hand to the centre hole of a rotating shaft (in the same manner as an ordinary counter), will instantaneously and correctly indicate the speed of rotation of the said shaft, without the necessity for using a watch or clock. It therefore meets a want that has long been felt by Engineers.

Two spindles are generally supplied with which to place the centre bit. These Spindles are fitted with suitable Gear so that High or Low Speeds can be indicated, the Dial having two circles graduated accordingly, usually for speeds varying from 100 to 2000 revolutions per minute, one circle being marked 100 to 500, and the other from 4000 to 2000, but the Instrument can be made for lower or higher speeds if required.

N.B.—This Instrument can be adapted for taking the speed of Vertical Spindles of Spinning and similar Machines.

Price	..	..	..	..	..	£4 14 0
Case for do.	..	..	..	..	..	0 4 0

117. **No. II.** This Instrument is similar to No. I., but is arranged for permanent attachment. It can be driven either by a Pulley, or by suitable Gearing.

Price	£6 6 0
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118. **No. III.** Is an Instrument specially constructed for use on locomotives and and steam or electric tram cars, &c. The Dial is 4 inches diameter, being made to show speed in miles per hour or revolutions per minute. This Instrument is usually fitted with an extra Pointer, for registering the maximum speed attained, and the case is fitted with a padlock, so that the Maximum Pointer cannot be tampered with. This Instrument can also be arranged to be driven either by a Pulley and Band, or by a Spindle and Gearing, as may be found most convenient.

Price	£6 15 0
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119. **No. IV.** A larger form and of heavier construction than No. III. The Dial is 6 inches diameter; it can be graduated to suit steam engines running at, say, 30 to 150 revolutions per minute, or to suit engines, dynamos, or other machines running at 300 to 1,500 revolutions per minute, or in any other suitable manner. This form of Indicator has been applied very successfully to torpedo boats for indicating the speed of their engines.

Price	£8 10 0
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120. **No. V.** This Instrument is internally the same as No. IV.; the Dial also is of the same size, and can be graduated in the same manner. The Gearing

is somewhat differently arranged, and the whole Instrument is fixed on a strong iron base for bolting to a supporting bracket. This form of instrument is especially adapted for application to large marine engines.

Price £9 0 0

Maximum Pointer fitted to the above Instruments, and Padlock to Case, 12/6

YOUNG'S PATENT SPEED RECORDER AND INDICATOR.

121. No. VI. This Apparatus is designed to give a continuous record of the speed of an engine or machine by a diagram traced on a slip of paper.

It consists essentially of a centrifugal arrangement in connection with levers giving motion to a pencil, the position of which varies according to the speed of the engine or machine by which it is driven. There are two cylinders, one holding a supply of paper sufficient for about two weeks; the other cylinder carries the paper forward by means of clockwork at a uniform speed of four inches per hour, this rate giving a diagram on a sufficiently large scale to note clearly any changes that take place in the speed, or the number or duration of stoppages. The paper is divided into hours and half-hours, and a scale is given corresponding to the indications on the Dial, the Instrument having also a Dial and Pointer showing at a glance the actual speed at any time.

Price £22 0 0

YOUNG & RICHARDSON'S COMBINED SPEED INDICATOR & REVOLUTION COUNTER.

122. No. VII. This Instrument is specially advantageous where it is desired to register the number of revolutions of a machine in addition to indicating its speed at any moment, for example, on the engines of steamships.

Price £14 0 0

In all the Instruments above described, the indications are effected by means of a small high-speed centrifugal governor acting on the dial pointer. (*Vide "Engineer," August 18th, 1882.*)

Owing to its construction, each Instrument can be minutely adjusted during final testing, and the indications are so correct and rapid, that it will show all the variations in the speed of a machine, even those caused by the slipping of a belt.

Special care is taken with the parts likely to wear.



Fig. 123.



Fig. 123A.

123. Lowne's Patent Crank-Log, for Safety and Ordinary Bicycles and Tricycles, with one dial to 70 miles. (Figs. 123 & 123A) .. £1 10 0

124. Do. Do. as above, with extra continuous Record Dials to 700 miles £1 17 6

Size 2½ ins.; weight 9 ounces. When ordering, state gearing or number of cogs on upper or lower axles, and diameter of driving wheel.

BOUCHER'S CALCULATING CIRCLE.

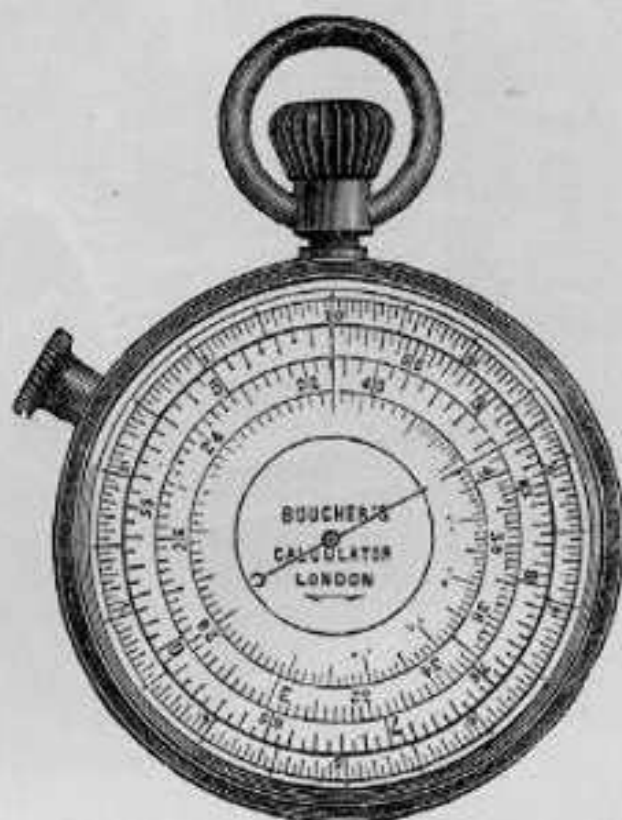


Fig. 125.

125. This is an Instrument by means of which arithmetical operations may be performed, and numerical formulæ resolved with great ease and rapidity, and at the same time with sufficient accuracy for ordinary practice. It is sometimes described as a "Circular Slide Rule."

The Calculating Circle resembles a keyless watch in shape and size, and is furnished with two dials, protected by glass; one of these dials is movable the other fixed. The movable dial is turned around its centre by the button within the guard-ring, which would correspond with the winder of a keyless watch.

Two pointers or hands, which move—the one over the face of the movable dial, and the other over the face of the fixed dial—are turned by another and smaller button placed upon the side of the Calculating Circle. These pointers are rivetted upon the same axis, so that they always turn together.

A third and smaller pointer, called the "index," is fixed to the case close to the guard-ring.

Each of the dials has engraved upon it several concentric circles, divided in a special way, and by means of the winding button any desired division of the movable dial can be brought under the pointer or under the index; and in the same way, by means of the smaller button on the side of the case, the pointer of either dial may be moved so as to correspond with any division upon that dial.

The method of dividing the circles is based on the properties of logarithms, but no knowledge of logarithms is required by the person using the instrument.

A very large number of these Calculating Circles have been sold to Engineers, Electricians, and others, who find them extremely useful in connection with their ordinary calculations.

Price £1 11 6 each.

Postage extra.

A Book of Instructions accompanies each Calculator.

RANSOM'S "CYCLOMETER" OR SPEED RECORDER.

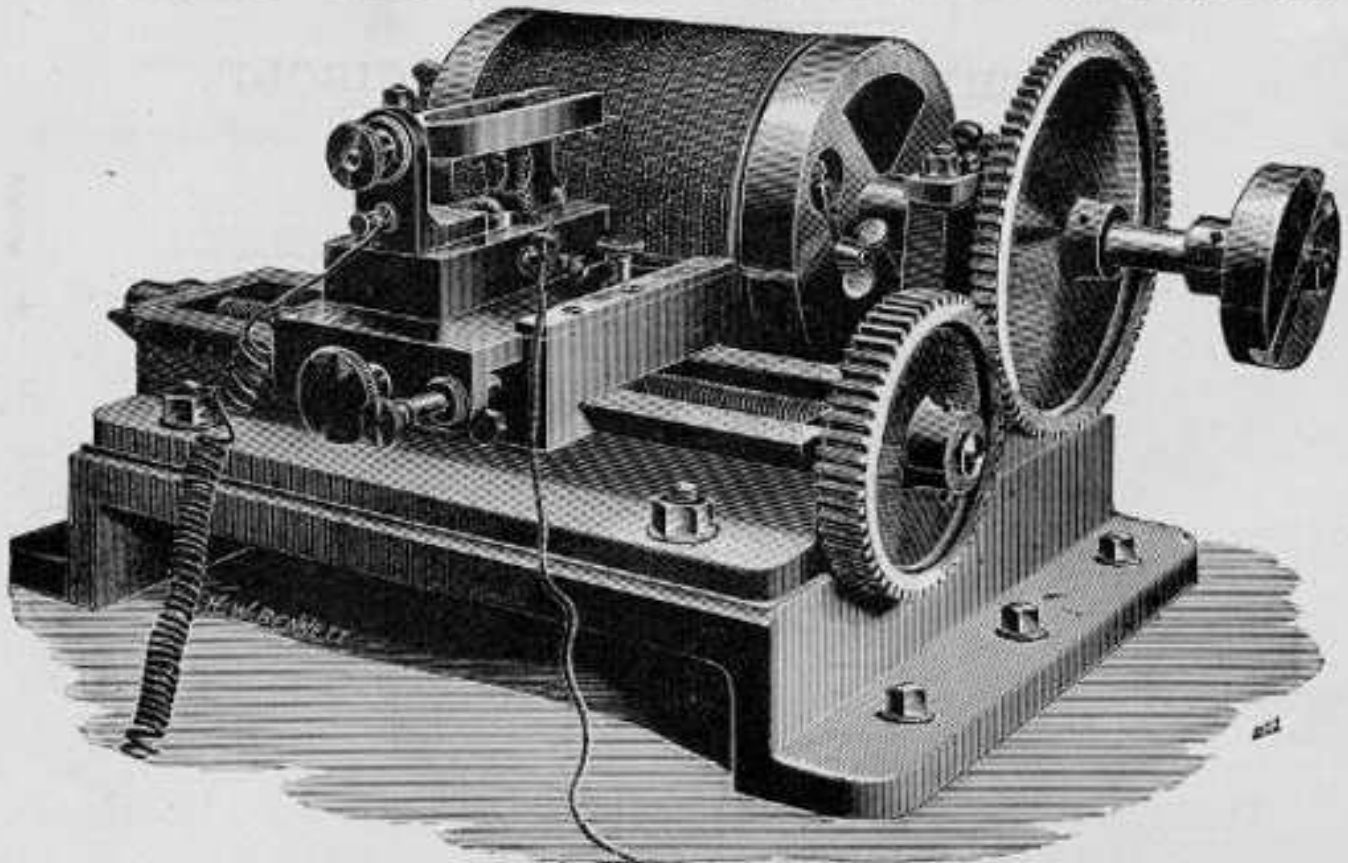


Fig. 126.

126. A very ingenious instrument for measuring to the $\frac{1}{5000}$ part of a second the time of rotation of any shaft; and not only is the total time of each revolution recorded, but the time taken in turning through any minute angle or portion of a revolution also may be obtained with equal accuracy.

Particulars on application.

127. Bristol's Patent Nickel Plated Steam Pressure Recording Gauges, with 100 charts and supply of ink, 0 to 200 lbs. pressure per square inch £7 10 0
Spare Diagrams for the above $\frac{3}{5}$ per 100.

MOSCROP'S CONTINUOUS RECORDER OF SPEED OF MOTORS AND PRESSURE OF BOILERS.

128. Patent Continuous Engine Speed Recorder 24 0 0
129. Patent Continuous Engine Speed Recorder combined, with continuous Steam Pressure Recorder 34 0 0
130. Analyser for use with the above 3 0 0

A permanent record of every momentary variation in speed, and the time of every start and stop is obtained. Gives a permanent record of steam pressure at every moment; both speed and pressure are recorded simultaneously and on the same paper, and are filed in a book for reference. The paper roll is replaced in the machine once in three months.

Special Apparatus, Gauges, Pyrometers, Thermometers, &c., &c., made to order.

Callipers, Slide Rules, Scales, &c., &c. Prices on application.

L. CASELLA,

Scientific Instrument Maker to the Admiralty, Ordnance, The Board of Trade, the Indian, American, Japanese, Chinese, and all the Leading Governments.

147, HOLBORN BARS, LONDON, E.C.

