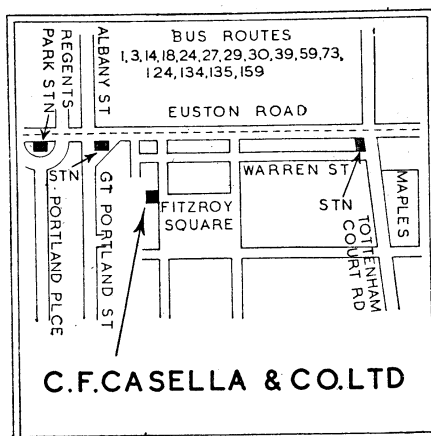




Catalogue No. 684

METEOROLOGICAL AND SCIENTIFIC INSTRUMENTS



C. F. CASELLA & CO. LTD.
Regent House, Fitzroy Square
LONDON, W.1

Established in London in 1810

Telegrams: "Escutcheon, Rath-London."

Cables: "Escutcheon, London."

Telephone: Euston 3750.

Usual Codes.



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WE would draw the attention of our customers new and old in various parts of the world to the fact that we have agents in the following countries :—

Argentine, Brazil, Burma, Canada, Ceylon, China, France,
India, Malaya, Peru, Singapore and South Africa.

Our agents are always willing to help and advise on problems of instrumentation, service and supply. In many cases they may be able to supply the more popular of our instruments from their stock.

As we select and approve new agents more countries are added to the above list so that it is continually expanding. Our instruments, therefore, are becoming more and more widely known and appreciated.

We have supplied instruments to the British, Dominion and Colonial Governments for nearly 140 years, and make instruments to their specifications as well as to our own designs.

Many Governments of Foreign Powers are also users of our instruments, besides industries, research laboratories and observatories situated in both hemispheres.

As well as the instruments shown in this catalogue we make other types, including many for industry, astronomy, special investigations and research generally.

We shall be very pleased to receive your inquiries.



THIS catalogue cancels previous issues, and is subject to alteration without notice. As the design of instruments is constantly being improved, the illustrations and descriptions should not be taken as correct in every detail.

Carriage is paid in Great Britain on all orders of the value of £5 and upwards.

Insurance. Goods despatched by post or rail to addresses in Great Britain are insured under a floating policy against loss $\frac{\text{or}}{\text{and}}$ breakage. We make a trifling charge for this insurance (about 3d. in the £ for small amounts), and make good without further expense to the customer any loss or damage sustained.

Foreign consignments are insured against loss $\frac{\text{or}}{\text{and}}$ breakage, unless instructions are sent to the contrary, and the cost is charged to the customer ; the rates vary greatly, according to the destination and the nature of the consignment.

Packing Cases are charged extra, but are allowed for in full when returned carriage paid and in good condition.

New Customers are requested to send remittance with order, or to furnish the usual references.

Foreign shipments. Arrangements should be made for payment in London against shipping documents.

C. F. CASSELLA & CO. LTD.



CONVERSION TABLE

ft./sec.	ft./min.	miles/hour	cm./sec.	metres/min.	kilos/hour
0.25	15	0.17	7.62	4.57	0.27
0.30	18	0.20	9.14	5.49	0.32
0.35	21	0.24	10.67	6.40	0.39
0.40	24	0.27	12.19	7.32	0.43
0.45	27	0.31	13.72	8.23	0.50
0.50	30	0.34	15.24	9.14	0.55
0.75	45	0.51	22.86	13.72	0.82
1.00	60	0.68	30.48	18.29	1.09
1.25	75	0.85	38.10	22.86	1.37
1.47	88	1.00	44.81	26.82	1.61
1.50	90	1.02	45.72	27.43	1.64
1.75	105	1.19	53.34	32.00	1.92
2.00	120	1.36	60.96	36.58	2.19
2.25	135	1.53	68.58	41.15	2.46
2.50	150	1.70	76.20	45.72	2.74
2.75	165	1.87	83.82	50.29	3.01
3.00	180	2.04	91.44	54.86	3.28
3.50	210	2.38	106.68	64.01	3.83
4.00	240	2.72	121.92	73.15	4.38
4.50	270	3.06	137.16	82.30	4.92
5	300	3.40	152.40	91.44	5.47
10	600	6.80	304.80	182.88	10.94
15	900	10.20	457.20	274.32	16.41
20	1200	13.60	609.60	365.76	21.88
30	1800	20.40	914.40	548.64	32.83
40	2400	27.20	1219.2	731.52	43.77
50	3000	34.00	1524.0	914.40	54.72
60	3600	40.80	1828.8	1097.28	66.66
70	4200	47.60	2133.6	1280.20	76.60



EQUIPMENT OF A METEOROLOGICAL STATION

We give below the usual instruments required for a normal station employing in general non-recording instruments which are sufficient for telegraphic or postal reporting. For fuller readings, more instruments are used with many of them self-recording. We shall be pleased to quote for any size or complexity of station from the amateur taking readings for his own interest up to first order Observatories.

Mercury Barometer reading to 0.1 mb. or 0.002 in. See page 33.

Dry and wet bulb thermometers.

Maximum and minimum thermometers.

(The above in a Stevenson screen can be either sheathed pattern or opal scale on mahogany mount). See page 66.

Rain gauge. See page 113.

Sunshine recorder. See page 129.

Grass minimum thermometer. See page 76.

Earth thermometers at 1 ft. and 4 ft. depth. See page 77.

Wind vane on at least a 20-ft. mast. See page 28.

Other instruments which can be installed are :—

Nephoscope either Finemann or Besson. See pages 135 and 136.

Rainfall recorder. See page 120.

Anemometer or Anemograph. See pages 18 and 24.

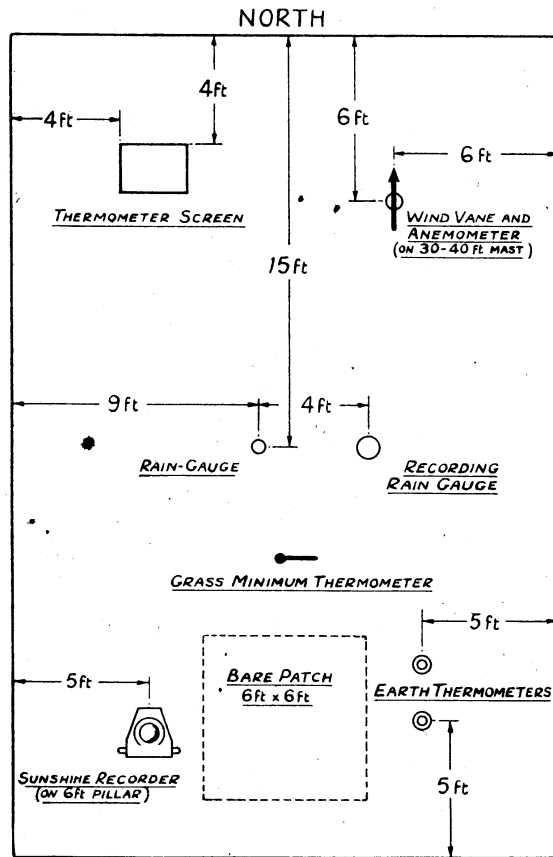
Assmann Hygrometer. See page 104.

Recorders of various kinds.

The instruments should be laid out on a plot, with a suitable exposure in all directions, if possible generally representative of the surrounding country. It should be securely fenced to prevent unauthorised access and should be of grass wherever climatic conditions permit. We give

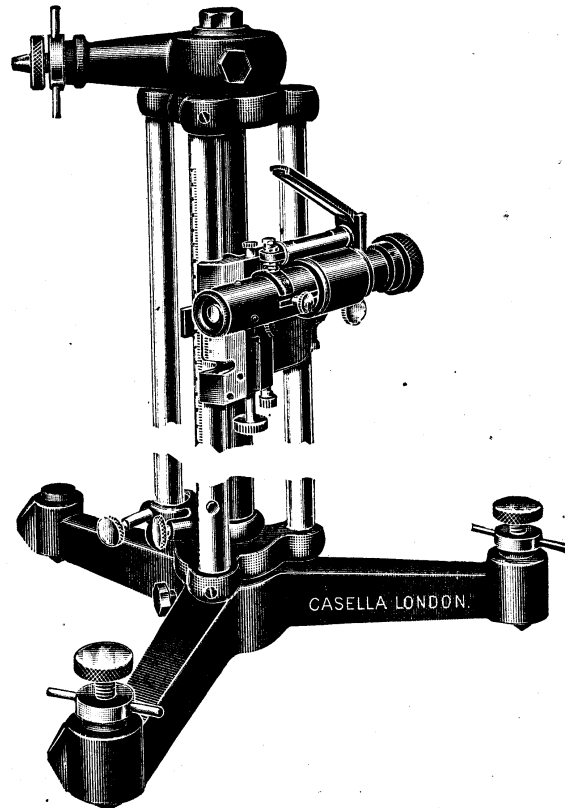


a plan showing the positions of the instruments with respect to each other designed to reduce interference as far as possible, without having to provide too large a plot. The minimum size should be 30 ft. by 20 ft., this will require to be larger if a Nephoscope or large screen for recording instruments are installed. Where grass is grown a bare patch is usually left to enable entries relating to the state of the ground to be recorded, *i.e.* wet, snow, frozen, etc.





CATHETOMETER



This instrument is being put to a wide variety of uses in all kinds of industries, and is an almost indispensable piece of apparatus for a research laboratory. It is robust, well made and accurate and will give many years' trouble-free use.

The substantial tripod base with levelling screws carries a fixed steel column fitted with ball bearings top and bottom, which in turn carry two triangular shaped castings. The latter are connected by three rods forming a cage which thus revolves round the central column. This cage can be clamped to the column and a fine motion given to it by a tangent screw and spring of the orthodox type.

The telescope carriage slides up and down two of the cage rods on a 3-point bearing and can be clamped to it in any position. A fine motion screw gives a range of movement of 12 mm. to this carriage to



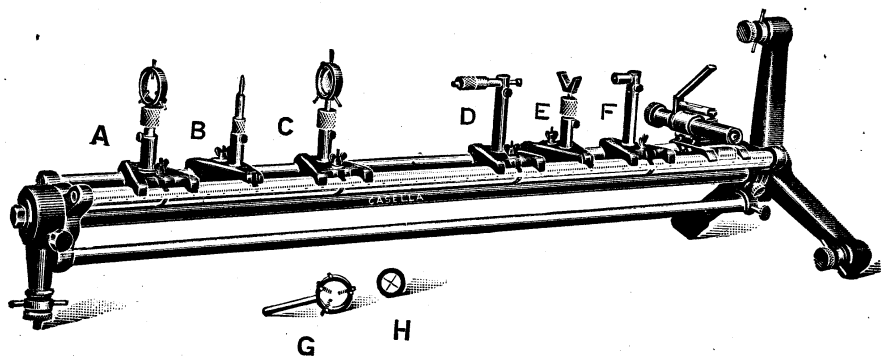
which is attached the vernier, reading to 0.05 mm. A millimetre scale is divided on one of the two rods used for the carriage, which are either $\frac{1}{2}$ or 1 metre long, depending on the model.

The telescope is supported from a tapered centre on this carriage and can be tilted with another fine motion screw for levelling the telescope bubble which is viewed from the eye end in a mirror. Focusing is by means of an internal lens and has a range from infinity to 1 metre. Supplementary lenses can be supplied to enable objects to be focused closer than this if desired, while the objective cell can be removed and replaced by a microscope objective.

A further useful feature is that the whole instrument can be turned over and used in the horizontal position, additional feet and a levelling screw being provided for this purpose. When in this position the telescope can be used in either the vertical or horizontal plane.

A number of accessories can be supplied, such as 3-point slides, lens holders, mirrors, etc., converting the cathetometer into an optical bench, comparator, etc. These parts can be seen in the illustration.

As a post-war improvement, the three rods are hard chromium plated giving a tarnish-free surface and increased contrast of the scale divisions.



The accessories shown as A, B and C make an optical bench ; as D, E and F, a comparator.

In each case M 8 and M 28 are used.

A comprises	M 10 and M 20	E comprises	M 10 and M 16
B „	M 12 and M 26	F „	M 12 and M 18
C „	M 10, M 20 and M 24	G „	M 20
D „	M 12 and M 14	H „	M 22



M 2.	Cathetometer, half metre, reading by vernier to 0.05 mm. supplied with extractor for removing diaphragm for cleaning	...	...	...	...	MABAC
M 4.	Ditto, 1 metre	...	...	...	...	MABED
M 6.	Micro-objective Adaptor for Telescope	...	...	...	...	MABIF
M 8.	Three-point Slide (3 required as a minimum)	...	...	...	...	MABOG
M 10.	Pillar for the above, screwed adjustment	...	...	...	...	MABUK
M 12.	Ditto, plain	...	...	...	...	MACAN
M 14.	Screw Micrometer	...	...	...	...	MACEP
M 16.	V. Block	...	...	...	...	MACIR
M 18.	End Piece	...	...	...	...	MACOT
M 20.	Lens Holder	...	...	...	...	MACUV
M 22.	Diaphragm	...	...	...	...	MADAW
M 24.	Mirror	...	...	...	...	MADEZ
M 26.	Pin for Optical Bench Measurements	...	...	...	...	MADIC
M 28.	Clamp for Securing Slide to Bench	...	...	...	...	MADOF

Half Metre Cathetometer M 2.

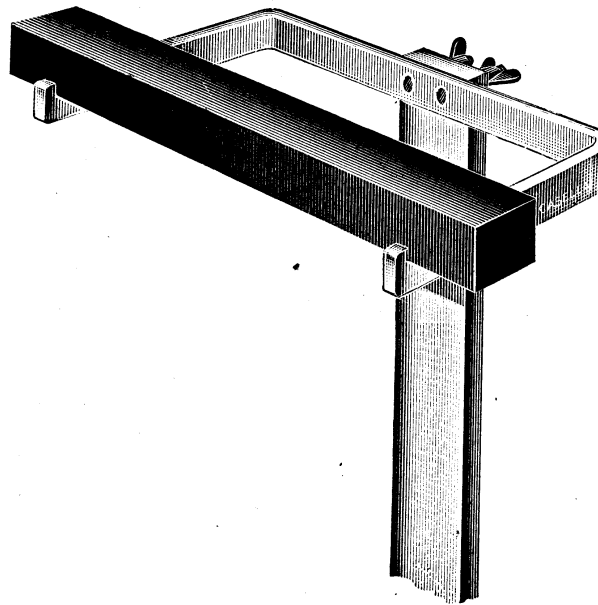
34 × 18 × 15 in. 86 × 46 × 38 cm. 90 lb. 41 k.
 Gross packed—116 lb. 51 k. Volume in 2 cases, 3.7 cu. ft. 0.1 cu. m.

1 Metre Cathetomer M 4.

52 × 18 × 15 in. 152 × 46 × 38 cm. 104 lb. 47 k.
 Gross packed, 140 lb. 63 k. Volume in 2 cases, 6 cu. ft.
 0.17 cu. m.



THE DUVDEVANI DEW GAUGE



In spite of the fact that dew is as old as any other meteorological phenomenon it has never been measured and recorded on any proper scale. The reason is that up to now there has existed no method of measurement which has not suffered from either a practical or a theoretical defect. At last, however, a method has been evolved which overcomes all previous difficulties. Beginning in 1936 Dr S. Duvdevani, Plant Ecologist, at the Agricultural College, Pardess Hanna, Palestine, worked on an optical method of dew measurement which in 1943 was adopted by the Palestine Meteorological Service at a series of stations covering the country, which at the present moment amount to nearly 100.

To S. Duvdevani, therefore, goes the credit of having patiently devised and perfected the method and gauge, and to the Palestine Meteorological Service of having taken this opportunity of setting up the first countrywide network of dew stations in the world, with an eminently suitable system of easy application.



THE DUVDEVANI DEW GAUGE

The method consists in exposing at about sunset a special dew gauge. At sunrise, or later in humid types of climate, the formation of dew drops, whose form, size and distribution are always characteristic of the same amounts of dew, is compared with a special set of calibrated full-sized photographs of dew formed on a standard dew gauge. The subsequent conversion from the photograph number most nearly corresponding to the dew appearance, gives the equivalent of dew in mm. per sq. dcm.

Owing to the deterioration of the surface of the gauge with exposure it must be replaced every four months.

A complete dew station comprises the following :—

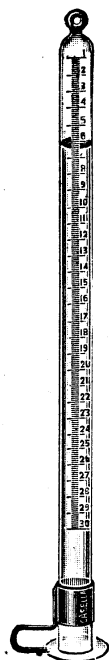
- (1) One or more dew gauges.
- (2) A dew gauge stand for exposing gauges at various heights.
- (3) The album of photographs, called the dew-scale standards.
- (4) A daytime protecting stand.
- (5) Hourly, three-hourly, daily and annual dew registers.

With each original equipment ordered we supply a full set of instructions, giving guidance as to exposure, care, etc. If sufficient details are sent we shall be pleased to answer any queries arising out of the proposed use, special purposes, etc., for any type of climate.

M 30.	Dew Gauge.	$12\frac{1}{2} \times 2 \times 1$ in.	$32 \times 5 \times 2.5$ cm.	...	MTKAB
M 32.	Dew gauge stand for various exposure heights	...	...	...	MTKEN
M 33.	Daytime protecting stand	...	...	...	MTKIC
M 34.	Album of dew scale standards	...	...	...	MTKOW
M 35.	One-hourly dew register	...	...	...	MTKUF
M 36.	Three-hourly dew register	...	...	...	MTLAC
M 37.	Daily dew register to last one month	...	...	...	MTLEP
M 38.	Annual register with summary and equivalents table	...	...	...	MTLID



EVAPORIMETERS



Piche's evaporimeter was designed about 1890, in order to indicate, in a simple and convenient manner, the amount of evaporation at any place.

It consists of a graduated cylindrical tube of glass, closed at one end. The other end is covered by a disc of porous paper. This is kept in position by a metal clip, provided with a disc of the same diameter as the tube.

The instrument is filled with water and hung vertical with the closed end upwards, so that as the water evaporates from the wet paper, small bubbles of air rise to the upper portion of the tube, and the amount evaporated is indicated on the scale of millilitres graduated on the tube.

- M 40. **Piche's Evaporimeter**, with graduated glass tube
0 to 30 ml., metal clip and box of papers ... MAFAK
12½ in. 32 cm. 2 oz. 50 grams.
- M 42. **Extra Papers**, per 100 ... MAFEN
- M 44. **Stand for suspending tube** ... MAFIP



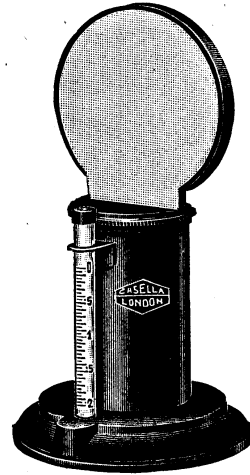
EVAPORIMETERS

M 46. Pickering's Standard Evaporimeter

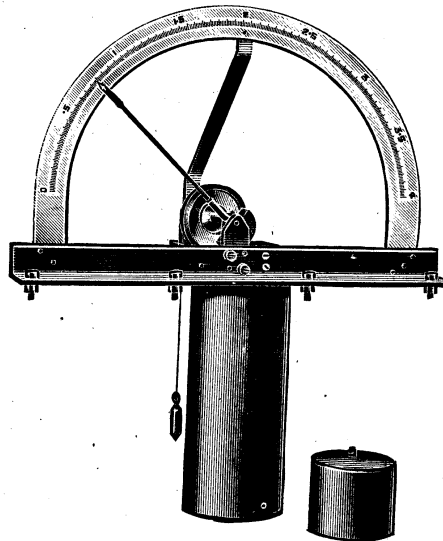
A simple means of measuring directly the volume of water evaporated from a moist surface of known area, is afforded by this instrument.

The moist surface consists of a piece of linen 50 sq. cm. in area, held vertically over a copper water reservoir fitted with a graduated glass side tube, as shown in the figure. The sheet of linen ends in a tongue, which dips into the water, and is thus kept damp. The graduations are such that they give the number of units of volume evaporated per unit area exposed. Thus a fall of 0.24 shows that 0.24 cubic inch, or cubic centimetre, has evaporated from each square inch or square centimetre, of the surface exposed.

Code Word MAFOR



8×4×4 in. 20×10×10 cm. 2 lb. 12 oz. 1.2 k.

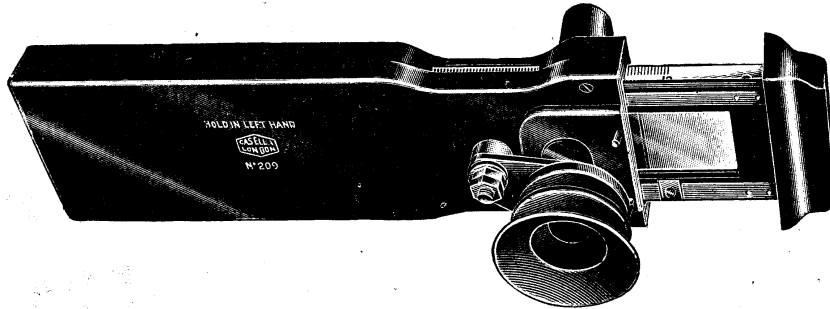


M 48. **Evaporation Indicator**, for fixing to the top of a tank 6×6 ft., reading in hundredths of an inch up to 4 inches (or metric) ; complete with float and still pool

... .. MAFUT



GOLD VISIBILITY METER



This meter is designed for use at night and employs as reference objects a series of fixed lights of known candlepower. The principle is that of obscuring the lights and noting the amount of obscuration required by the observer to achieve this. The means employed is a neutral density wedge which with a small compensating wedge produces a field of view of uniform density at any position of the wedge. Thus, the main wedge in its holder is moved until the selected light is just obscured and a scale carried on the holder read against an index.

This scale, which has been devised for the instrument, is in nebules (1 nebule equals density of 0.03).

The instrument has two compensating wedges, giving two ranges, the lower from about 10 to 120 nebules, the higher from 110 to 220 nebules.

This meter was designed by E. Gold, Esq., F.R.S., and is to the specification of the British Meteorological Office.

M 54. **Gold Visibility Meter, Mk. II** (M.O. pattern), in case MAGAV

Size of case, 11 x 4 x 3½ in. Net 1½ lb. ; gross, 3½ lb.
,, ,, 28 x 10 x 9 cm. ,, 0.7 k. ,, 2 k.



ANEMOMETERS AND WIND DIRECTION INSTRUMENTS

Precautions to be observed in the fixing and care of Anemometers and Wind Direction Instruments

The most important consideration in the fixing of an anemometer is a good exposure, and a situation must be chosen which is free from eddies or sheltering. It is not sufficient, for instance, merely to place the instrument, be it anemometer or wind direction instrument, directly on the roof of a building. It must be mounted so that it is 30 to 40 feet above the roof, and is unaffected by any projecting parts such as chimneys and ventilators. It is often not appreciated that obstructions have a very considerable influence both in the vertical and horizontal plane. In an open situation, 30 to 40 feet above the mean ground level is recommended, but higher if the site is obstructed.

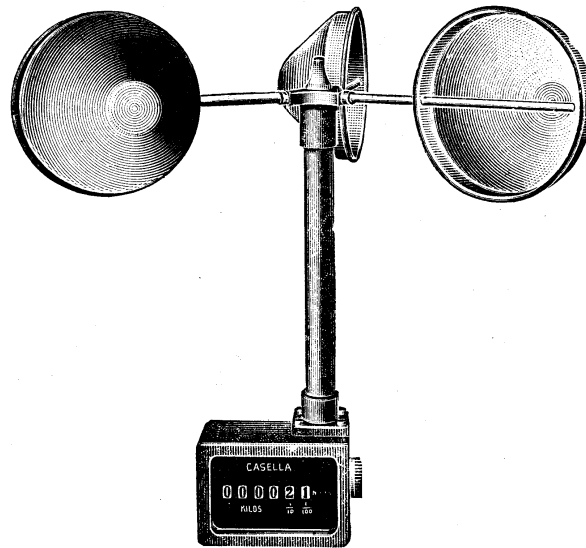
In the case of setting up a wind vane or direction indicator it is necessary to fix either the north point by means of the pole star or by a magnetic compass, making due allowance for the annual change in the deviation of magnetic from due north, or the south point which can be found with a good local sun dial or by a watch set at "local apparent time." The position the vane takes up with respect to the wind direction should be tested by attaching a long streamer and noting whether its direction agrees with that of the vane. This should be repeated from time to time in case the vane gets a bias one way or another.

After the instrument has been finally placed in position it only requires to be examined and oiled periodically. In the case of electrical instruments it should be noted that all connections are sound, and that the insulation of the wires is in good condition.



CUP ANEMOMETERS

The three cups of these anemometers are now 5 inches diameter, conical shape with a beaded edge making the factor of wind run to cup centre travel 2.98. This cup head assembly is standardised on all our anemometers whether totalizing, electrical contact or direct reading.



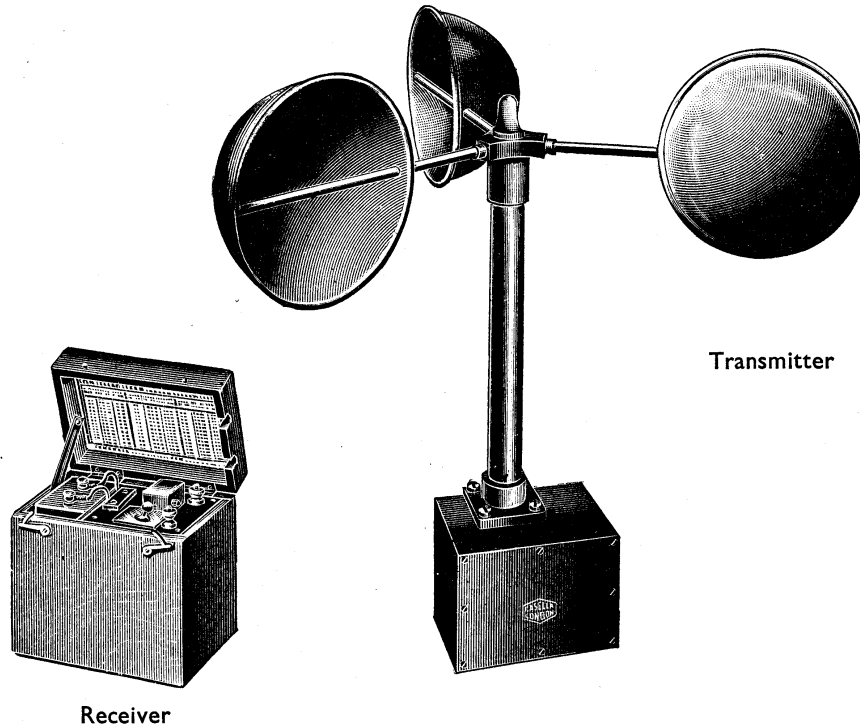
The counters of this instrument indicate hundredths, and tenths of a mile or kilometre and up to 9999.99 miles or kilometres.

It has been adopted as a standard instrument by the British, Canadian and American Meteorological Services, as well as many others all over the world.

M 60.	Robinson Anemometer , English reading, height 16 in.	...	...	...	...	...	MAGEW
M 62.	Ditto , Metric reading, height 41 cm.	...	...	...	...	...	MAGIZ
M 64.	Ditto, short stem , English reading, height 10 in.	...	...	...	...	...	MAGOC
M 66.	Ditto, short stem , Metric ,, ,, 25 cm.	...	...	...	...	...	MAGUD
M 68.	N.P.L. Certificate ... ..	...	...	...	...	...	MAKAF
	7½ lb. 3.5 k.						



ELECTRICAL ANEMOMETER



This instrument is designed for remote reading of wind velocity by the simplest means. A contact maker attached to the cup spindle makes a circuit every 1/20th mile or 80 metres run of wind. This circuit is connected to a self-contained battery and buzzer box and gives buzzes whose intervals can be timed to give the average wind velocity over the stated interval.

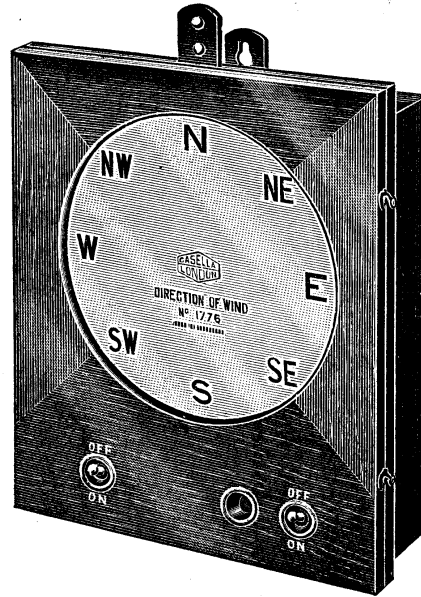
A table of wind speeds is fitted into the lid of the box and is given in m.p.h. and ft./sec. or k.p.h. and m./sec., whichever is desired.

The Anemometers M 70 and M 72 have a simple mechanical make and break mechanism, while M 74 and M 76 have a mercury switch arrangement which is tilted by a device attached to the cup spindle.

M 70.	Electric Contact with battery, etc. (M.O. Pattern)			
	English reading, height, 16½ in.	...	...	MAKEG
M 72.	Ditto, Metric reading, height, 21 cm.	...	...	MAKIN
M 74.	Ditto, English	..	.. 16½ in.	MAKOP
M 76.	Ditto, Metric	..	.. 21 cm.	MAKUR
M 78.	Extra 50-ft. lengths of wire, 13 lb.	5.9 k.	...	MALAT



ELECTRICAL ANEMOMETER WITH DIRECTION INDICATOR



In this instrument the wind velocity is obtained as in the electric anemometer M 70 *i.e.* by timing the interval between buzzes actuated every 1/20th mile run of wind by the rotation of the cups. The direction is indicated, also electrically, by one of the windows against the cardinal points being illuminated by a small lamp. This is operated from a contact maker attached to the wind vane shown in M 134.

Thus the transmitters can be fixed with any suitable exposure, whether in an accessible place or not, and the indicator indoors to suit the observer.

Batteries, or transformer for A.C. Mains supply together with 50 feet of ten core cable, are included in the prices.

- | | | | | | | |
|-------|--|---|-----|-----|-----|-------|
| M 80. | With English Scale | ... | ... | ... | ... | MALEV |
| M 82. | With Metric Scale | ... | ... | ... | ... | MALIW |
| | | Size of panel 12×10×3 in. 30×25×7.5 cm. | | | | |
| M 84. | Extra 50-ft. lengths of ten core cable | ... | ... | ... | ... | MALoz |



DIAL TYPE DIRECTION INDICATOR

In this instrument the Wind Vane shown in M 134 has attached to the spindle a special type of electric transmitter which, when supplied with 12 volts D.C. will cause a similar type of receiver, provided with a pointer, to rotate in synchronism with it.

The pointer, which rotates over a dial marked with compass points, thus indicates instantaneously the wind direction at the selected exposure point. This can be any suitable position where the wind direction is desired, or where the exposure is favourable, the indicator being in some convenient place, say in an office, hall or public room. Size of dial, 3 in. (7.5 cm.).

Supplied with 50 feet of wire.

M 86.	Dial Type Direction Indicator	...	...	...	MALUC
M 88.	Extra 50-ft. lengths of wire	...	...	...	MANUD

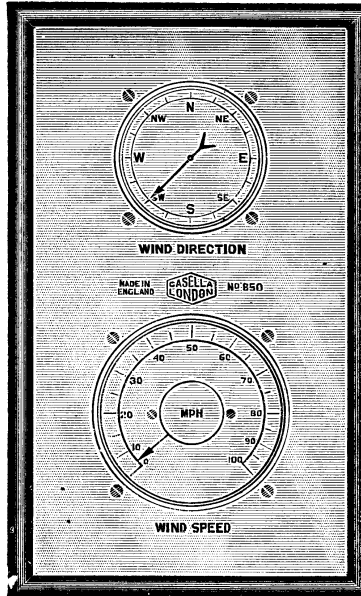
DIAL TYPE DIRECT-READING ANEMOMETER

In this instrument the rotation of the standard cup head is converted to electrical impulses, and fed to a receiving mechanism situated as far from the head as convenient. Thus the dial indicates instantaneously the velocity of the wind at some desirable point indoors, say, away from the head.

M 90.	Dial Type Direct Reading Anemometer, miles per hour	...	...	...	...	...	MANEF
M 92.	Ditto, kilos per hour	...	...	...	...	...	MANIG
	Height 11 in. 28 cm. 12 lb. 5.4 k.						
M 94.	Extra 50-ft. lengths of wire	...	...	...	...	...	MANOK



ANEMOMETER WITH DIRECTION INDICATOR—DIAL TYPE



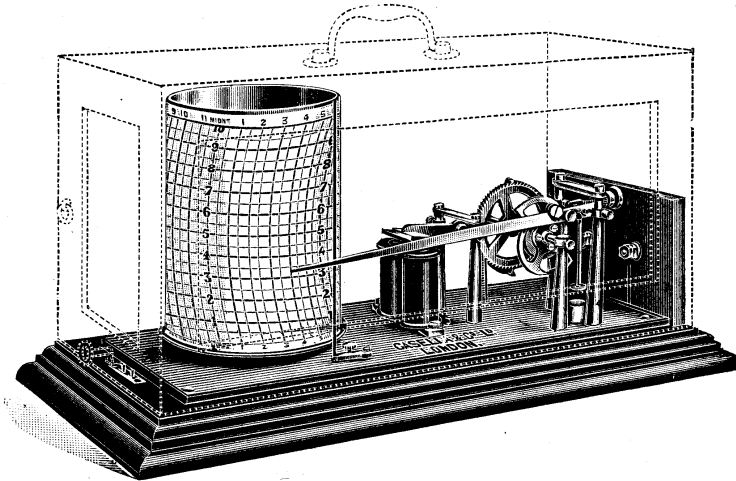
The last two instruments are here combined in one handsome panel suitable for inseting into the wall. It forms an attractive and interesting feature in any country club, golf club house, hotel or other place where many people congregate. It shows the wind velocity and direction directly, without the necessity of venturing out into the perhaps inclement weather to ascertain these two very vital pieces of information.

This is supplied with 50 feet run of wire and full instructions for fitting and maintenance. It can be installed by any intelligent handy man or small builder.

- | | | | | | | | |
|--|--------------------------------|-----|-----|-----|-----|-----|-------|
| M 96. | English reading | ... | ... | ... | ... | ... | MANUP |
| M 98. | Metric | „ | ... | ... | ... | ... | MAPAT |
| Size of panel 12×10×6 in. 30×25×15 cm. | | | | | | | |
| M 100. | Extra Wire, per 50 feet | ... | ... | ... | ... | ... | MAPOB |



RECORDING ELECTRICAL ANEMOMETER



The transmitter of this electrical anemometer consists of a set of Robinson cups similar to those illustrated on page 19.

The total amount of wind in miles or kilometres is recorded on the chart, so that, using the time scale, the mean velocity can be measured over any period. The steepness of the curve also provides a means of determining the velocity by inspection at any time.

The pen arm is raised by means of a helical cam, counterpoised so as to have a constant and small friction; the pen makes one step at each tenth of a mile or kilometre until it reaches the top of the chart at 10, when it falls to zero and begins rising again. The clock rotates once in 24 hours or once in a week, as desired.

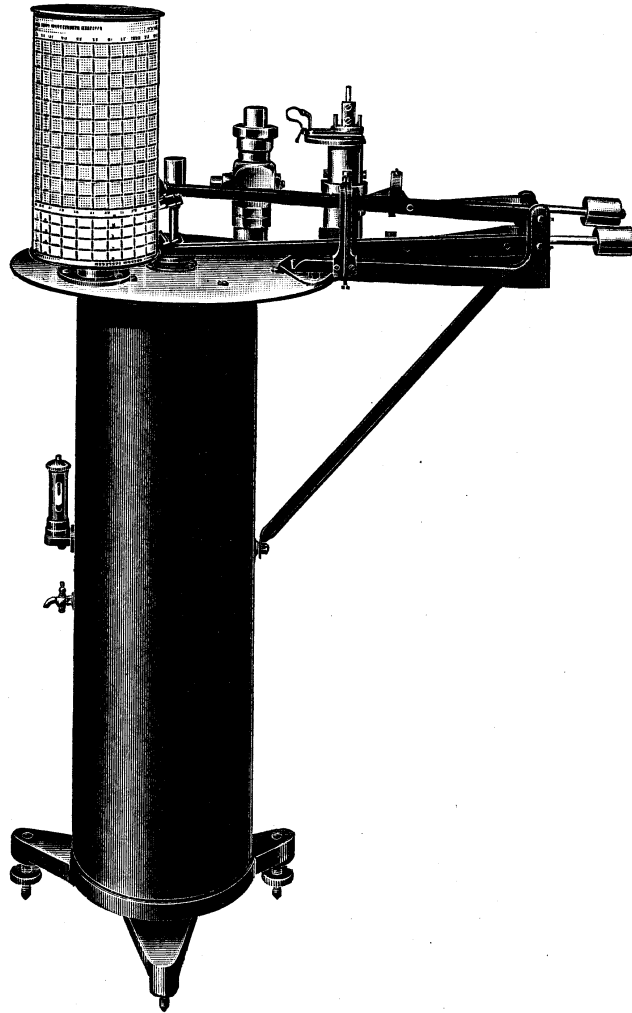
It will be seen that provision has been made for a very open range, so that accurate readings can be taken with great ease.

The good points of this anemometer may be summed up as follows :
 Simple construction, few moving parts. Open range of chart. Pen not liable to stick when near the top of the chart, as in many instruments of this kind. No mercury contacts.

- | | | |
|--------|---|-------|
| M 102. | Transmitter and Recorder , scale in miles, complete with batteries, 50 ft. of insulated wire, pen, ink, 55 charts, etc. | MARAB |
| M 104. | Ditto , metric | MARIK |
| M 106. | Extra 50 ft. length of wire | MARON |
| | Transmitter, height, 16 in. 40 cm. 7½ lb. 3.5 k. | |
| | Recorder, 15×10×9 in. 38×25×23 cm. 12 lb. 5.4 k. | |



DINES PRESSURE-TUBE ANEMOMETER





PRESSURE-TUBE ANEMOMETER

This recording anemometer has been adopted as a standard instrument, not only by the British Meteorological Office, but by many observatories and meteorological stations throughout the world.

The head is a type of pitot tube kept facing into the wind by the vane, the pressure and static connections being led through 1 inch iron tubing to the recorder.

This is a copper cylinder, part filled with water which supports a copper float. The pressure connection is made to the underside of the float and the static connection to the space above the float. Thus increased pressure due to increased velocity of the wind causes the float to rise. A rod attached to the top of the float carries a pen which records the vertical rise and fall of the float on a chart rotated in the usual way by a clock. The float is shaped so that in spite of the non-linear equation relating wind velocity to pressure the rise of the float is made linear to the scale 0.6 inches = 10 miles per hour (or corresponding kilometres).

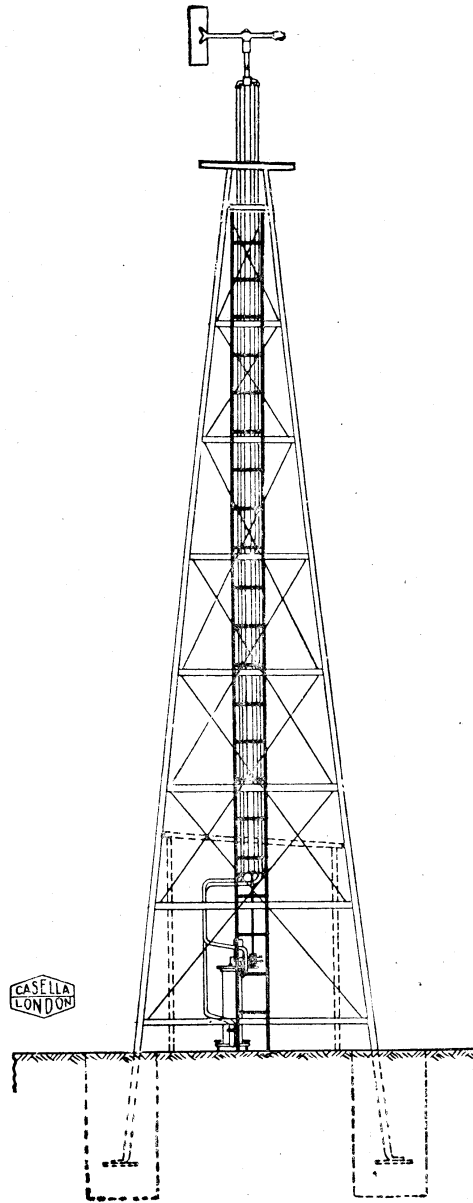
The wind direction is recorded by two pens one above the other on the lower portion of the velocity chart. The upper pen leaves the chart when the vane passes through North having passed through West. The lower pen comes into action when the vane passes on towards East. Changes of direction can thus be readily related to accompanying changes in velocity.

The connection from the vane to the recorder is made by lengths of rod joined together every ten feet. The recorder must, therefore, be situated vertically below the head within fairly small limits, since, although universal joints are fitted, they do not allow a very great degree of misalignment.



DINES PRESSURE-TUBE ANEMOMETER

- M 108. **Dines Anemometer, with Twin Pen Direction Recorder** for velocity up to 110 miles per hour (design of the British Meteorological Office) with combined velocity and direction head, 100 feet of 1 inch iron tubing, 50 feet direction rod, couplings, 55 charts, pens, ink, etc. MASAV
- M 110. **Ditto**, for velocity up to 180 kilometres per hour... MATAG
- M 112. **Additional Charts**, English reading MATEK
- M 114. **Ditto**, Metric reading MATOR
- M 116. **Metal Cover** MAVAZ
 44×27×16 in. 112×68×41 cm.
 Net weight, 200 lb. 90 kilos.
 Gross „ 450 lb. 200 kilos.
 36 cu. feet 1 cu. metre
- M 118. **Dines Anemometer** as M 108 but recording up to 200 miles per hour. Up to 50 miles an hour the chart scale is 0.6 in.=10 miles per hour ; from 50 to 200 miles the scale is 0.3 in.=10 miles per hour MAVEC
- M 120. **Ditto**, but recording up to 320 kilometres per hour MAVID
- M 122. **Additional Charts,** English reading MAVOL
- M 124. **Ditto**, Metric reading MAVUN
- M 126. **Dines Anemometer for Distant Reading of Velocity and Direction.** The motion of the float and vane are transmitted by Selsyn and Autosyn Motors to corresponding receivers which record on a similar chart to the standard instrument. The only connection required is a cable, its size depending on whether alternating current is or is not available at each end and whether telephonic communication is desired between exposure point and recorder position. The transmitting end may be separated by up to 1,000 yards from the receiving end MAWAP



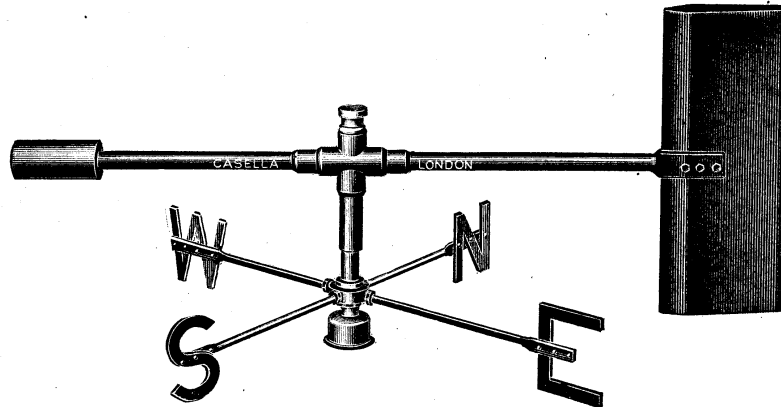
Steel Mast for Dines Anemometer ; angle steel corner posts, angle steel girts every 5 feet, platform anchors, earth plates, etc. ; all steel work hot galvanized after manufacture, galvanized bolts.

M 130.	40 feet	...	...	...	...	...	...	...	MAWER
M 132.	30 feet	...	...	...	...	...	...	...	MAWIT

Approx. shipping specification for M 130 :—Net weight, 7 cwt. 3 qrs. (394 kilos.) ; gross weight, 8 cwt. 2 qrs. (422 kilos.). Dimensions, packed 15 ft. 6 in. × 1 ft. × 8 in. (4.7 × 0.3 × 0.2 m.).



WIND VANE



This new direction indicator is an improved type over the previous models, as it is more sensitive in light winds. The vane rotates on a ball bearing spindle which is extended below the base. By means of connecting sleeves this spindle can carry a compass card indicating the direction some distance below it.

The base of the wind vane has a 1½ in. B.S.P. Socket for screwing to a steel pipe or mast.

Bold Cardinal points are now provided in place of the plain arms, the look of the whole vane is quite pleasing and can form part of an estate, club, etc., without detracting from its appearance.

This vane forms the basis for our remote indicators shown in M 80, M 82, M 86, M 96 and M 98.

M 134. **Wind Vane**, British Meteorological Pattern,
Mark II MAWOV

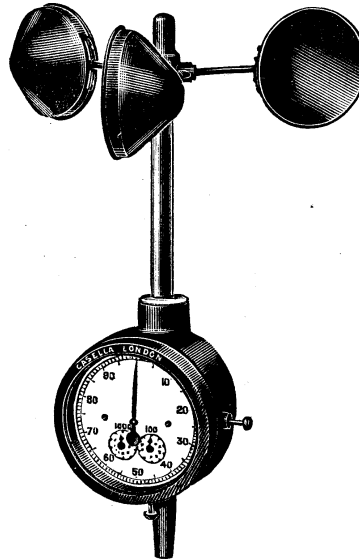
36×18 in. net 14 lb. 6·3 k.
92×46 cm. gross 30 lb. 13·6 k.



SENSITIVE ANEMOMETERS

Professor P. A. Sheppard in the "Journal of Scientific Instruments," described a new sensitive anemometer with several novel features designed to give freedom from over estimation in gusty winds, low starting speed, and a linear calibration. Since then we have introduced various modifications which have further improved its performance particularly at low speeds.

The main features are small light aluminium cups of a conical shape $2\frac{1}{8}$ in. diameter carried on a vertical spindle, running on a jewel bearing and gearing into a light counting mechanism.



$\frac{1}{4}$ size, cups 64 mm.

The instrument reads down to 25 feet per min. but in spite of this sensitivity will safely withstand a velocity of 5,280 feet per min.

The cup revolutions are timed from the counter readings by means of a stop watch over a period of say 3 mins. The number of units is then found for 1 minute and the corresponding velocity in feet or metres per second taken from the individually calibrated chart supplied.

Its sensitivity and small size make it very useful for many purposes, such as wind velocities at athletic meetings, for gliding and yachting as well as investigations into local irregularities of wind velocity and many special applications.

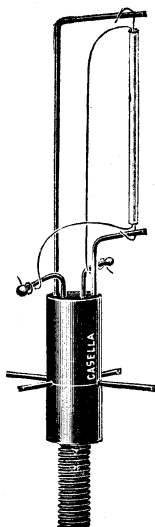
The anemometer is supplied in a case with the calibration chart and an adaptor for fixing to a post, mast, etc.

M 140.	English reading	...	...	...	...	MAWUZ
M 142.	Metric	„	...	...	...	MAXAK
Anemometer, $7 \times 10\frac{1}{4}$ in. 18×26 cm. 1 lb. 0.45 k.						
Case $12 \times 9 \times 4$ in. $30 \times 23 \times 10$ cm. $4\frac{1}{2}$ lb. 2 k.						



N.P.L. LOW SPEED HOT WIRE ANEMOMETER

In the past hot wire anemometers have not proved satisfactory for large scale use as the calibration would not remain constant for very long. The cause of this instability has now been discovered during research at the Aerodynamics Division of the National Physical Laboratory, and an instrument has been produced which shows no change at all in calibration over periods as long as six months. We have made arrangements with the National Physical Laboratory to manufacture this anemometer which should prove of great value in many ways.



This stability has been achieved by enclosing the hot wire and the thermocouple inside fine twin-bore silica tube and by welding all joints in place of soldering.

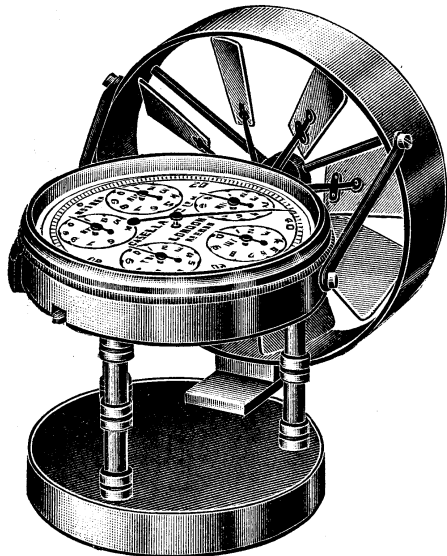
This instrument is intended as a very low speed anemometer, and in one form is supplied with a control box and galvanometer, giving ranges of about 0-0.5, 0.4-2.0 and 1.8-5.0 ft. per second, at the maximum speed the accuracy being about 0.8%. Since the galvanometer has a scale length of about 6 in. it will be seen that the instrument has an extremely open scale enabling full advantage to be taken of its accuracy.

Since the hot wire is of a low temperature it is suitable for use in an explosive atmosphere and can be calibrated for use in any gas whose flow it is desired to measure. Its small bulk enables it to be used in confined spaces, while it can be built into a material of cellular structure the air flow through which it is desired to measure. It is suitable for ventilation problems of all kinds where the usual anemometer will not read at all. A further great advantage is that it can be made to record continuously merely by substituting a recorder for the galvanometer.

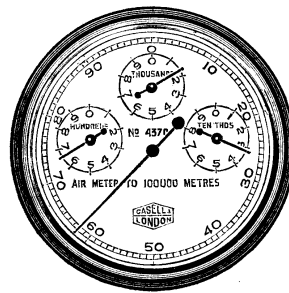
M 144. MAXEL



AIR METERS



M 148



M 150

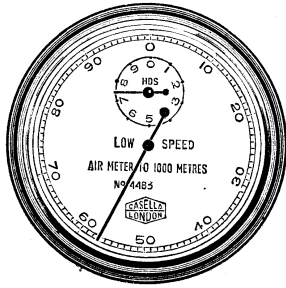
The following Air Meters are made for a Minimum velocity of about 150 ft. per minute (or 50 metres), and a maximum velocity of about 3,000 ft. per minute (about 900 metres). In use, the fan should face the current, with the dial behind.

Portable Air Meter, best quality, dial $2\frac{3}{8}$ in. diam. (6 cm.) in case, about $4 \times 4 \times 4$ in. ($10 \times 10 \times 10$ cm.) with set-to zero attachment.

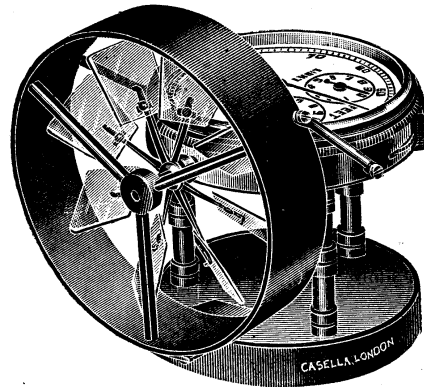
M 148.	Registering to 100,000 feet ...	...	...	...	MAXOW
M 150.	„ „ metres ...	...	...	...	MAXUB
M 152.	N.P.L. Certificate ...	...	...	...	MAYAL
	$1\frac{1}{2}$ lb.	0.7 k.			



AIR METERS



M 156



M 154

Portable Air Meter, extra sensitive, with set-to-zero attachment.

This will register speeds as low as 50 feet per minute, but is not very accurate below 100 feet per minute. It must not be exposed to currents of more than 800 feet per minute (say, 250 metres). The fan is made of mica, and weighs only about a third of a gram. The instrument is fitted with a set-to-zero attachment.

Best quality, silvered metal dial $2\frac{3}{8}$ in. diam. (6 cm.), in case $4 \times 4 \times 4$ in. ($10 \times 10 \times 10$ cm.)

M 154.	Registering to 1,000 feet	...	...	...	...	MAYET
M 156.	,, ,, metres	...	...	...	...	MAYOD
M 158.	N.P.L. Certificate	...	...	...	...	MAYUF

$1\frac{1}{2}$ lb. 0.7 k.



BAROMETERS

Instructions for Transport and Handling

When sent from our works a mercury barometer is packed in a small case with a glass window, and a handle is fixed in such a position that the barometer is carried with the cistern uppermost. If sent by passenger train it is given in charge of the guard of a through train and the customer is asked to send someone to meet the train, take the barometer into his personal charge and see it through the parcels office himself.

Overseas orders are shipped by "special stowage," the carrying case is placed in the safest part of the boat ; and the customer arranges to have the boat met at the port of arrival.

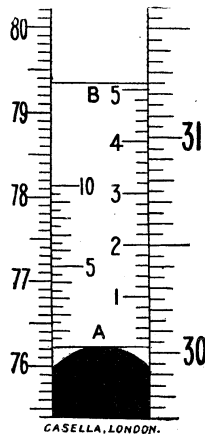
The barometer should be kept with its cistern uppermost until a position has been selected for it. It may be placed in any convenient room where it is not exposed to the sun ; it should be in a good light with the scale about 5 feet from the ground, and the board should be as nearly vertical as possible. The height of the cistern above mean sea level should be known to one foot since a difference of one foot equals 0.001 in. (0.03 mb.) The room should not be subject to extremes of temperature and should not contain any corrosive chemicals.

To test whether air has entered the tube the barometer should be inclined gently till the mercury reaches the top of the tube ; if air is present there will be a dull thud or no sound, but if there is no air a sharp click will be heard.

The bottom screw should be turned very slowly when the barometer is being made portable, otherwise the surging of the mercury may break the top of the tube.



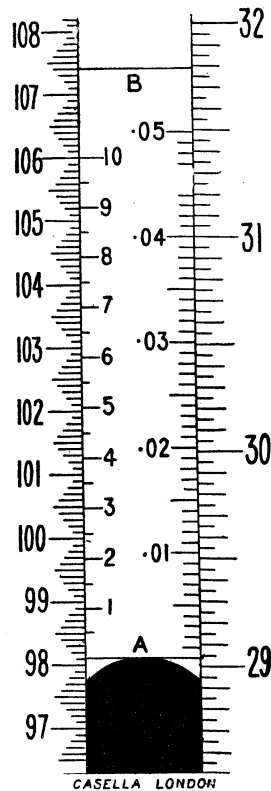
Examples of Verniers of Mercury Barometer



Barometer reading in inches and millimetres.

On the right hand scale, the height of the mercury is shown as 30.022 inches.

On the left hand scale the height is 762.25 millimetres.



Vernier of an Observatory Barometer reading to 0.001 inch and 0.05 millibar.

On the inch side the reading is 29.040, and on the millibar side, 981.10 millibars.



CONVERSION TABLES

INCH, MILLIMETRE AND MILLIBAR

Millimetre (1 in.=25.400 mm.)

Inch	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.00	.00	.254	.508	.762	1.016	1.270	1.524	1.778	2.032	2.286
.1	2.540	2.794	3.048	3.302	3.556	3.810	4.064	4.318	4.572	4.826
.2	5.080	5.334	5.588	5.842	6.096	6.350	6.604	6.858	7.112	7.366
.3	7.620	7.874	8.128	8.382	8.636	8.890	9.144	9.398	9.652	9.906
.4	10.160	10.414	10.668	10.922	11.176	11.430	11.684	11.938	12.192	12.446
.5	12.700	12.954	13.208	13.462	13.716	13.970	14.224	14.478	14.732	14.986
.6	15.240	15.494	15.748	16.002	16.256	16.510	16.764	17.018	17.272	17.526
.7	17.780	18.034	18.288	18.542	18.796	19.050	19.304	19.558	19.812	20.066
.8	20.320	20.574	20.828	21.082	21.336	21.590	21.844	22.098	22.352	22.606
.9	22.860	23.114	23.368	23.622	23.876	24.130	24.384	24.638	24.892	25.146
1.0	25.400	25.654	25.908	26.162	26.416	26.670	26.924	27.178	27.432	27.686

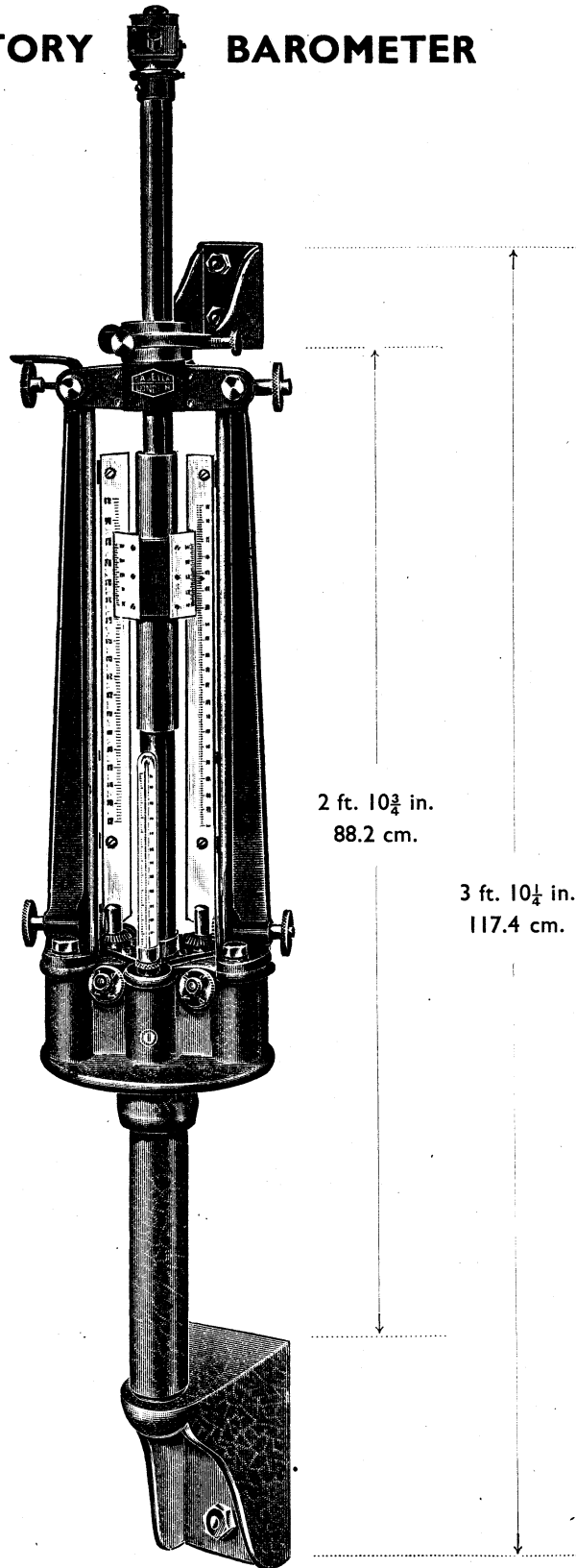
Millibar (1 mm.=1.33322 mb.)

MM.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
.0	.0	.1333	.2666	.4000	.5333	.6666	.7999	.9333	1.0666	1.1999
1.0	1.3332	1.4665	1.5999	1.7332	1.8665	1.9998	2.1332	2.2665	2.3998	2.5331
2.0	2.6664	2.7998	2.9331	3.0664	3.1997	3.3331	3.4664	3.5997	3.7330	3.8663
3.0	3.9997	4.1330	4.2663	4.3996	4.5330	4.6663	4.7996	4.9329	5.0663	5.1996
4.0	5.3329	5.4662	5.5995	5.7329	5.8662	5.9995	6.1328	6.2662	6.3995	6.5328
5.0	6.6661	6.7994	6.9328	7.0661	7.1994	7.3327	7.4661	7.5994	7.7327	7.8660
6.0	7.9993	8.1327	8.2660	8.3993	8.5326	8.6660	8.7993	8.9326	9.0659	9.1992
7.0	9.3325	9.4659	9.5992	9.7325	9.8659	9.9992	10.1325	10.2658	10.3991	10.5325
8.0	10.6658	10.7991	10.9324	11.0658	11.1991	11.3324	11.4657	11.5990	11.7324	11.8657
9.0	11.9990	12.1323	12.2657	12.3990	12.5323	12.6656	12.7989	12.9323	13.0656	13.1989
10.0	13.3322	13.4656	13.5989	13.7322	13.8655	13.9989	14.1322	14.2655	14.3988	14.5321

Millibar (1 in.=33.86395 mb.)

Inch	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.00	.0	.3386	.6773	1.0159	1.3546	1.6932	2.0318	2.3705	2.7091	3.0478
.10	3.3864	3.7250	4.0637	4.4023	4.7410	5.0796	5.4182	5.7569	6.0955	6.4341
.2	6.7728	7.1114	7.4501	7.7887	8.1273	8.4660	8.8046	9.1433	9.4819	9.8205
.3	10.1592	10.4978	10.8365	11.1751	11.5137	11.8524	12.1910	12.5297	12.8683	13.2069
.4	13.5456	13.8842	14.2229	14.5615	14.9001	15.2388	15.5774	15.9161	16.2547	16.5933
.5	16.9320	17.2706	17.6092	17.9479	18.2865	18.6252	18.9638	19.3025	19.6411	19.9797
.6	20.3184	20.6570	20.9957	21.3343	21.6729	22.0116	22.3502	22.6888	23.0275	23.3661
.7	23.7048	24.0434	24.3820	24.7207	25.0593	25.3980	25.7366	26.0752	26.4139	26.7525
.8	27.0912	27.4298	27.7684	28.1071	28.4457	28.7844	29.1230	29.4616	29.8003	30.1389
.9	30.4776	30.8162	31.1548	31.4935	31.8321	32.1708	32.5094	32.8480	33.1867	33.5253
1.0	33.8640	34.2026	34.5412	34.8799	35.2185	35.5572	35.8958	36.2344	36.5731	36.9117

OBSERVATORY BAROMETER

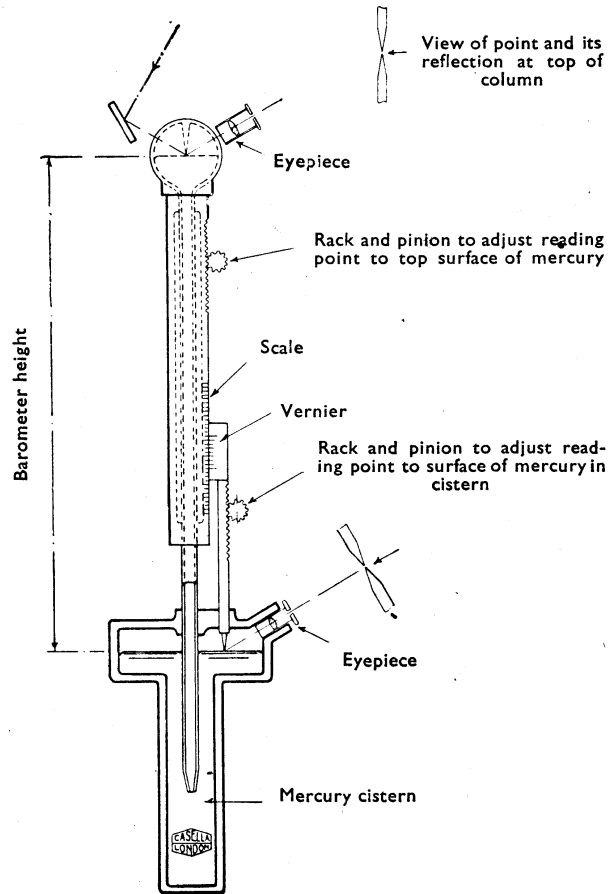




STANDARD OBSERVATORY BAROMETER

Bore 1 in. (25 mm.)

Observation of the fiducial point in this barometer is facilitated by an optical system similar to that in our patent Fortin Barometers Nos. M 186, etc. This is applied not only to the cistern level but to the top of the mercury column.





The diagrammatic view illustrated indicates how this is achieved. Consideration of the problem showed that the glass tube of a barometer merely serves as a support for the mercury and does not influence its height at all. Thus, a point sealed into the top of the tube can be made to touch the mercury surface by simply lowering or raising the glass tube. Since this raises and lowers the cistern mercury level another point is brought into contact with the surface by raising and lowering a scale to which it is fixed. As the vernier in this instrument is attached to the tube surrounding the glass tube the adjustment of the two points, both under optical control, gives the barometer height immediately.

To ensure that the barometer is truly vertical it is rotated about its axis and one of the cistern level points observed at various positions. If it remains in contact throughout, the tube is vertical ; if it does not do so three levelling screws enable it to be adjusted readily to a true vertical. There are two milled heads fitted to raise and lower the tube in the cistern. One gives the usual quick motion, the other the very fine adjustment which has been found necessary to bring the point into exact contact with the mercury surface. In this new instrument consistent readings to less than 0.01 mm. are very easily made, whereas in the ordinary type in which a vernier is adjusted to the top of the column the readings of different observers can vary by more than 0.1 mm.

- M 170. **Observatory Barometer** with millibar and millimetre scales, reading to 0.05 mb. and 0.02 mm. ... MAZAR
- M 172. **N.P.L. Certificate** MAZEB
- M 174. **Ditto** to 0.001 in. and 0.02 mm. MAZIL
- M 176. **N.P.L. Certificate** MBCAN
- M 178. **Ditto** to 0.001 inch and 0.05 mb. MBCEP
- M 180. **N.P.L. Certificate** MBCIR

94 lb. 43 k. $46\frac{1}{4} \times 10 \times 8$ in. $118 \times 25.5 \times 20$ cm.
 Packed 175 lb. 79 k. $55 \times 25 \times 17$ in. $140 \times 62.5 \times 43$ cm.



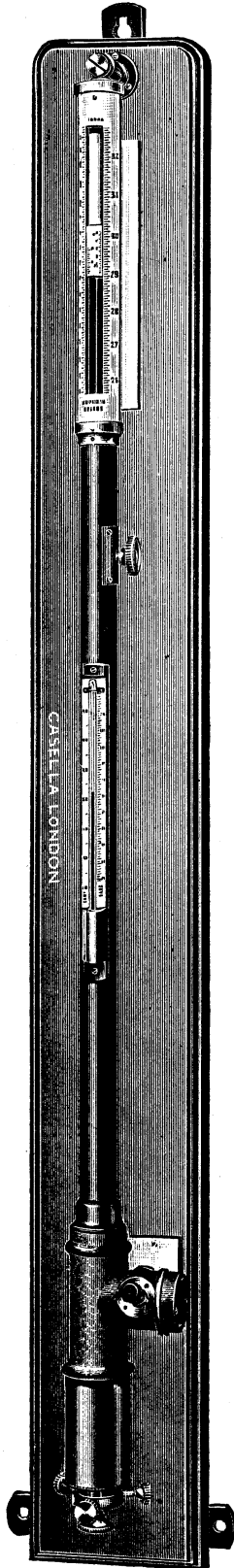
CASELLA'S PATENT FORTIN BAROMETER

Patented in Great Britain. No. 497025

Bore 0.40 in. (10 mm.)

The usual defects found in the older forms of Fortin barometer are these.

1. The curved surface of the cistern makes clear vision of the point impossible.
2. The glass often possesses striae, stone, scratches and other imperfections further militating against accurate setting.
3. The glass is fragile and is usually, in our experience, the first item to be broken.
4. The securing of the fiducial point to the barometer frame is via the cistern top which tends to be disturbed by the often poor fit of the cistern glass and by the sometimes unnecessary tightening of the screws by the user.
5. To clean the cistern mercury means the services of an expert who may easily upset the zero setting.
6. It is difficult to provide any form of effective air cleaner. Thus the cistern mercury rapidly collects dust and dirt from the atmosphere.



We have produced a barometer designed expressly to overcome the above defects, which has now been in use all over the world and has given full satisfaction.

The various defects mentioned above have been overcome in the following manner.

The complete cistern is made of a close-ground cast iron. A subsidiary chamber cast to one side carrying the point firmly screwed into its top portion is used for viewing the fiducial point. The sides of this chamber have holes in opposite faces, carrying a small eyepiece in the front and a glass disc at the back. These are positioned so that the point and its image, reflected in the mercury surface, appear in the centre of the field of view as shown in the illustration. This arrangement gives the utmost clarity to the point and its reflected image and permits setting to be made and repeated by different observers with an accuracy so far unattainable. Since the cistern is of cast iron and the eyepiece and window are robust, no damage is likely to occur to this portion of the instrument, thus defects 1, 2 and 3 are eliminated.



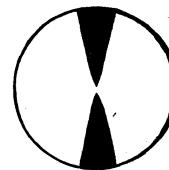
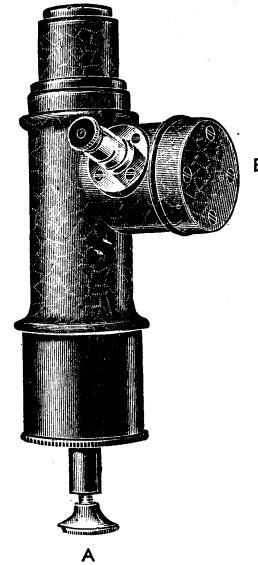
The fiducial point being, as above mentioned, firmly screwed into the cast iron cistern, which in turn has the tube carrying the scale fixed into it, is at an invariable distance from the scale. The subsidiary cistern can be emptied of mercury by lowering the usual setting screw A and then raising it again. This allows the mercury to flow into the main cistern and back again into use with its surface cleared of any floating impurity. The user can thus in a few minutes present a freshly cleaned surface without dismantling anything or interfering with the barometer's normal working.

Under cap B is a filter through which all air entering and leaving the barometer has to pass as the mercury rises and falls.

It can be seen, therefore, that defects 4, 5 and 6 are also overcome with complete success.

A further point to which we pay considerable attention is the initial cleaning of the mercury. This we treble distil and filter before filling the tubes, thus ensuring that no dirt will appear on the top surface of the mercury in the tube. Our tubes are very carefully annealed after working to prevent breakage either in transit or with large temperature changes. They are then well boiled to drive off air and water vapour, thus ensuring good vacua and menisci.

It will be seen that compared to an old type of Fortin barometer this new instrument has many outstanding points which make it extremely convenient and above all accurate for daily or hourly reading.



Zero point and its reflected image as seen through the eyepiece



SINGLE SCALE BAROMETERS

Scales divided on right hand side.

No.	Ordinary Range	Code Word
M 186.	25.7 to 31.6 in.	MBCOT
M 188.	650 to 800 mm.	MBCUV
M 190.	860 to 1065 mb.	MBDAW
M 192.	N.P.L. Certificate	MBDEZ
No.	Long Range	Code Word
M 194.	23.7 to 31.6 in.	MBDIC
M 196.	600 to 800 mm.	MBDOF
M 198.	800 to 1065 mb.	MBDUG
M 200.	N.P.L. Certificate	MBFAK
No.	Extra Long Range	Code Word
M 202.	20 to 31.6 in.	MBFEL
M 204.	510 to 800 mm.	MBFIN
M 206.	680 to 1065 mb.	MBFOP
M 208.	N.P.L. Certificate	MBFUR

BAROMETER SCALES

Scales divided in inches read to 0.002 in.
 „ „ „ millimetres „ „ 0.05 mm.
 „ „ „ millibars „ „ 0.1 mb.

National Physical Laboratory Certificate corrections are rounded to the nearest 0.002 inches or corresponding millimetres or millibars and are accurate to ± 0.006 inches, ± 0.15 mm. or ± 0.30 mb.



DOUBLE SCALE BAROMETERS

Ordinary Range

No.	Range left hand side	Range right hand side	Code Word
M 210.	650 to 800 mm.	25.7 to 31.6 in. ...	... MBGAT
M 212.	860 to 1065 mb.	25.7 to 31.6 in. ...	... MBGEV
M 214.	860 to 1065 mb.	650 to 800 mm. ...	... MBGIW
M 216.	N.P.L. Certificate ...	... ..	... MBGOZ

Long Range

No.	Range left hand side	Range right hand side	Code Word
M 218.	600 to 800 mm.	23.7 to 31.6 in. ...	... MBGUC
M 220.	800 to 1065 mb.	23.7 to 31.6 in. ...	... MBKAD
M 222.	800 to 1065 mb.	600 to 800 mm. ...	... MBKEF
M 224.	N.P.L. Certificate ...	... ..	... MBKIG

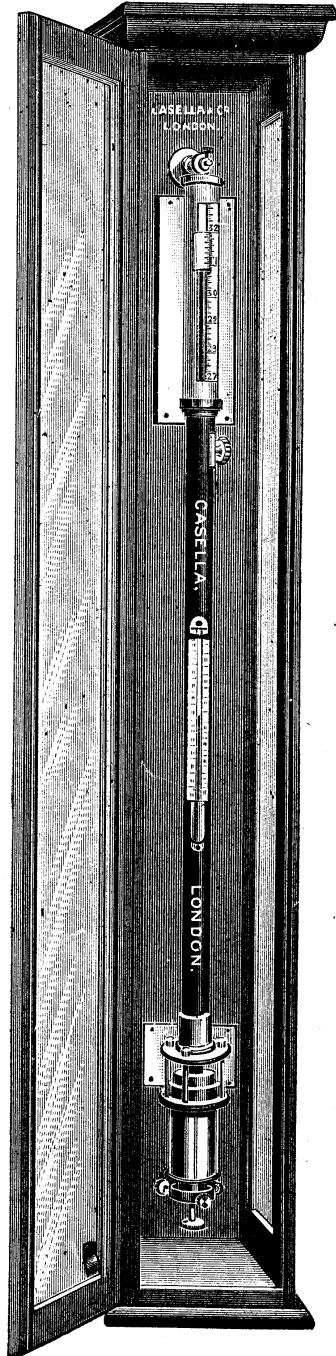
Extra Long Range

No.	Range left hand side	Range right hand side	Code Word
M 226.	510 to 800 mm.	20 to 31.6 in. ...	... MBKOL
M 228.	680 to 1065 mb.	20 to 31.6 in. ...	... MBKUN
M 230.	680 to 1065 mb.	510 to 800 mm. ...	... MBLAP
M 232.	N.P.L. Certificate ...	... ..	... MBLER

Net 16 lb. 7.2 k. 44×7×4 in.
 Gross 30 lb. 13.6 k. 48×9×6 in.

M 234. **Leather Sling Case**, for inspector's use, with velvet-covered tin lining, as supplied to various Meteorological Departments MBLIT

45×7×8 in. 119×18×20 cm. 5 lb. 2.2 k.



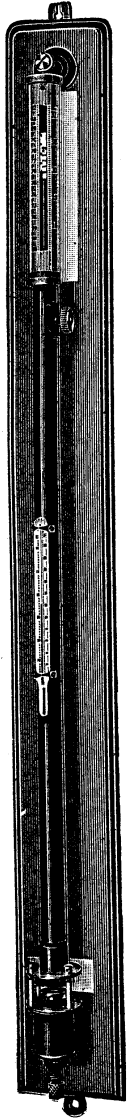
M 240. **Glass Case for Fortin**

Barometer, in mahogany; with glass front and sides, and lock and key, a handsome case, forming a good protection against dust and jarring. Inside dimensions 3 ft. 11½ in. high, 5½ in. wide, 4½ in. back to front (120×14×11.5 cm.) ... MBLOV

14 lb. 6.3 k.

Packed 54×11×9 in.
138×28×23 cm.

Gross, 32 lb. 14.5 k.



M 242. **Fortin Barometer**, with tube of smaller bore (0.25 in., 6.4 mm.), and constructed in a cheaper manner. The scales are on silvered metal protected by a glass sheath, and the vernier gives readings to 0.002 in., 0.05 mm. or 0.1 millibar. The illustration shows the appearance and construction of this barometer. It is mounted on a polished wood board fitted with reflectors. We recommend this pattern where a Fortin is desired at a lower price.

With inch and millimetre scales and Fahrenheit and Centigrade thermometer MBLUW

M 244. **With millimetre and millibar scales and Centigrade and Absolute thermometer** MBNAC

M 246. **With inch and millibar scales and Fahrenheit and Absolute thermometer** MBNEC

M 248. **N.P.L. Certificate** MBNFX

43 × 3½ × 3½ in. 108 × 9 × 9 cm. 6 lb. 4 oz. 3 k.
 Packed 48 × 6 × 6 in. 124 × 15 × 15 cm.
 „ 17 lb. 8 oz. 7.7 k.

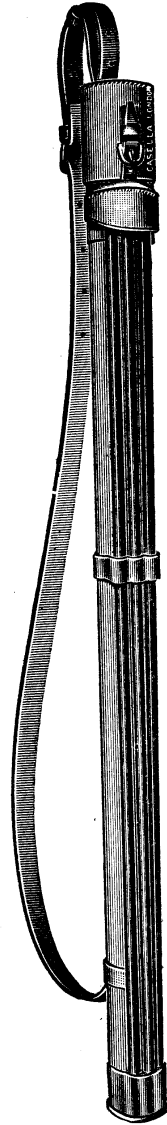
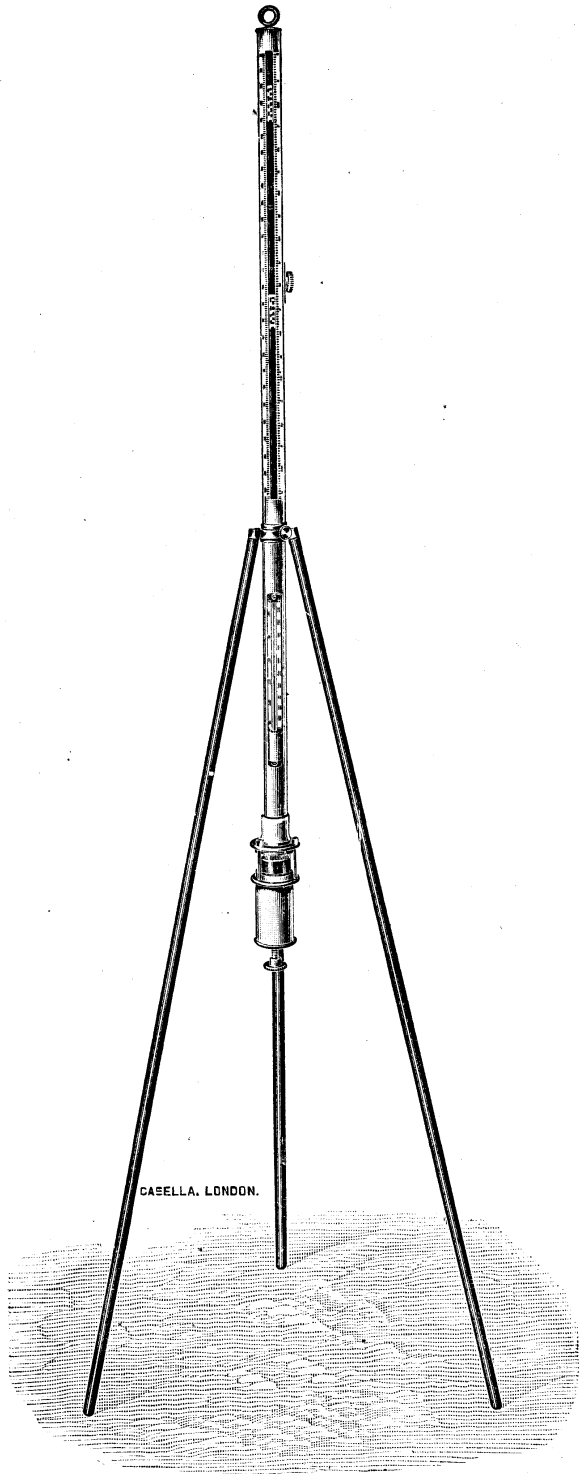


MERCURY BAROMETER for Travellers and Explorers

- M 250. **Standard Mountain Barometer.** Constructed on the Fortin principle, this pattern has been much reduced in size of frame so as to make it easily portable and to remove nearly every difficulty found by travellers in carrying a mercury barometer. The usual scales are inches and millimetres, divided to 15 in. and 385 mm. (equivalent to heights of about 18,700 feet and 5,400 metres) and read by vernier to 0.002 in. and 0.05 mm. A thermometer is fixed to the frame, and a metal tripod and leather-covered shield case with shoulder strap are provided ... MBNID
- M 252. **N.P.L. Certificate** MBNOG

Net 4 lb. 1.64 k. In case, 7 lb. 3.18 k.
41×4×3 in. 104×10×8 cm.

CASELLA
LONDON





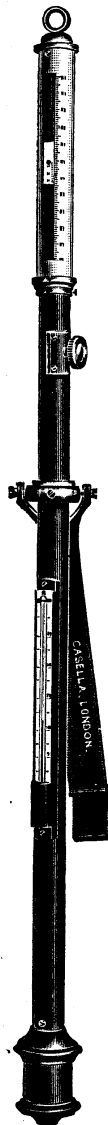
KEW PATTERN BAROMETER

The chief difference between a Kew Barometer and a Fortin is that in the former the scale is contracted to allow for the rise in the cistern level when the barometer falls. Thus, the so-called inches, millimetres, millibars, are not the real units but are shorter by the amount necessary to make the correction, this depending on the ratio between the bore of the tube to the internal diameter of the cistern.

As the mercury in the cistern of a Kew barometer is not raised to a fixed point at each observation, there is no need for a glass cylinder and the cistern is made of stainless steel or iron.

Owing to the impossibility of making a Kew barometer "portable" in the sense that a Fortin can be made portable that is, by screwing up the cistern bag till the mercury occupies the whole of the tube and cistern, it is rather more difficult to handle and to send by rail or steamer than the Fortin pattern.

Station Barometer, Kew pattern, to the specification and drawings of the British Meteorological Office ; bore of tube 8 mm., cistern made of stainless steel ("Staybrite"), with thermometer, gimbal, short suspension arm and bracket packed in varnished pine case, with lock and key and rubber packings.



SINGLE SCALE

No.	Range	Reading to	Code Word
M 256	25.7 to 31.5 in.	0.002 in.	MBNUK
M 258	650 to 800 mm.	0.05 mm.	MBPAL
M 260	870 to 1060 mb.	0.1 mb.	MBPEN

M 262. **N.P.L. Certificate** MBPIR



DOUBLE SCALE BAROMETERS

No.	Range		Code Word
M 264.	650 to 800 mm. and 25.7 to 31.5 in.	... ..	MBPUT
M 266.	870 to 1060 mb. and 25.7 to 31.5 in.	... ..	MBRAV
M 268.	870 to 1060 mb. and 650 to 800 mm.	... ..	MBREW
M 270.	N.P.L. Certificate	... ..	MBRIZ
M 272.	Extra for providing air trap for transportation as recommended by the Meteorological Office		MBROC
	40×4½×4½ in. 102×11×11 cm. 16 lb. 7.2 k.		
M 274.	Gold Slide , for computing the corrections to be applied to the barometer	... ..	MBRUD

Marine Barometer, Kew pattern, similar to Nos. M 256 to M 260, except that the tube is constricted in order to damp the movement of the mercury on board ship; the suspension arm is 12 in. (30½ cm.) long.

No.	Range	Reading to	Code Word
M 276	25.7 to 31.4 in.	0.002 in.	MBSAF
M 278	670 to 760 mm.	0.05 mm.	MBSEG
M 280	890 to 1060 mb.	0.1 mb.	MBSIK

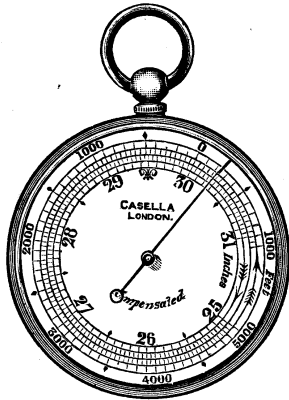
M 282. **N.P.L. Certificate** MBSON



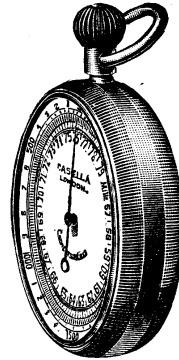
ANEROID BAROMETERS

WATCH SIZE ANEROIDS

With both altitude and barometer scales, fixed or revolving, gilt case, $1\frac{7}{8}$ in. (48 mm.), maroon outer case. Made in two qualities, both compensated for temperature.



Watch Aneroid, reading to 5,000 ft.



Watch Aneroid with revolving altitude scale and keyless motion

Best Quality			Ordinary Quality	
No.	Reading not higher than	Code Word	No.	Code Word
M 290	10,000 ft.	MBSUP	M 298	MBTOW
M 292	3,000 m.	MBTAR	M 300	MBTUF
M 294	15,000 ft.	MBTET	M 302	MBVAG
M 296	4,500 m.	MBTIV	M 304	MBVEK

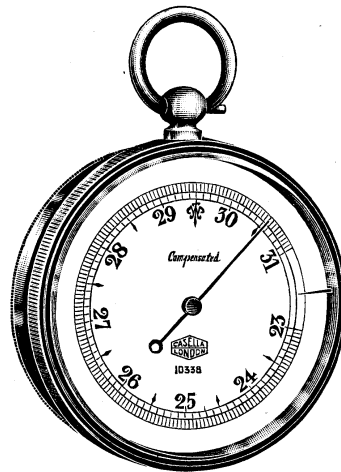
5 oz. 150 grams.



- M 306. If preferred, a **keyless motion** can be supplied for an aneroid with a revolving altitude scale. (See Fig. p. 50) MBVIL
- M 308. **Watch Aneroid**, $1\frac{7}{8}$ in. (48 mm.), best quality movement, compensated, with **expanded graduations**; reading 0.02 in. on the barometer scale; with fixed altitude scale to 2,000 ft., divided to 20 ft. MBVOD
- M 310. **Ditto**, metric MBVUZ
- M 312. **N.P.L. Certificate** MCBAD

WATCH ANEROIDS WITHOUT ALTITUDE SCALES

- M 314. **Watch Aneroid**, $1\frac{7}{8}$ in. diameter, engine-divided silvered dial, range 26 to 31 in., no altitude scale; gilt case, maroon outer case; compensated, best quality. MCBEF
- M 316. **Ditto**, compensated, second quality. MCBIG



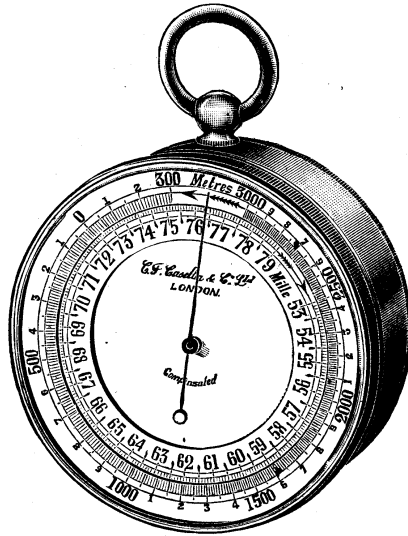
EXTRA FITTINGS FOR WATCH ANEROIDS

Watch aneroids may be fitted with the following accessories at the prices named in the Price List.

- M 318. **Maroon Case**, velvet lined MCBOK
(A maroon case is supplied free with a new aneroid).
- M 320. **Sling Leather Case**, with a new aneroid MCBUL



POCKET SIZE ANEROIDS



Best quality movement, fully compensated, with both altitude and barometer scales, fixed or revolving; gilt case, maroon outer case.

Best Quality 3 in. (76 mm.)			Ordinary Quality 2½ in. (63 mm.)	
No.	Reading not higher than	Code Word	No.	Code Word
M 322	10,000 ft.	MCDAN	M 334	MCFEX
M 324	3,000 m.	MCDEP	M 336	MCFIB
M 326	15,000 ft.	MCDIR	M 338	MCFOD
M 328	4,500 m.	MCDOT	M 340	MCFUG
M 330	20,000 ft.	MCDUV	M 342	MCGAK
M 332	6,000 m.	MCAFAW	M 344	MCGEL

M 346. If preferred, a **keyless motion** can be supplied for an aneroid with a revolving altitude scale. (See Fig. p. 50) MCGIN

13 oz. 400 grams.



- M 348. **Pocket Aneroid**, 3 in. (76 mm.), best quality movement, compensated, with **expanded graduations**, and reading to 0.02 in., with fixed altitude scale to 2,000 ft. divided to 20 ft. This instrument is similar to M 308, being of the same delicate construction MCGOP
- M 350. **Ditto**, metric MCGUR
- M 352. **N.P.L. Certificate** MCKAT

POCKET ANEROIDS WITHOUT ALTITUDE SCALES

- M 354. **Engine-divided Silvered Dial**, giving barometer readings from 26 to 31 in., or corresponding centimetres, no altitude scale ; gilt case, maroon outer case ; compensated, best quality, 3 in. diam. (76 mm.) MCKEV
- M 356. **Ditto**, compensated, second quality, 2½ in. (63 mm.) MCKIW

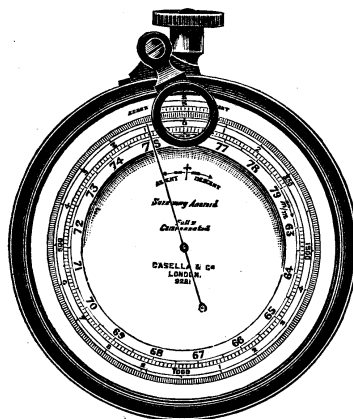
EXTRA FITTINGS FOR POCKET ANEROIDS

- M 358. **Maroon Case**, velvet lined MCKOX
(Supplied free with a new aneroid).
- M 360. **Sling Leather Case** with a new aneroid ... MCKUB



ANEROID BAROMETERS

For Surveying and Mining Purposes



Mining and Surveying Aneroid, size 3 in. (7½ cm.)

No.	Reading not higher than	Vernier reading to	Code Word
M 362	3,000 ft.	1 ft.	MCLAF
M 364	1,000 m.	½ m.	MCLEG
M 366	6,000 ft.	1 ft.	MCLIK
M 368	2,000 m.	½ m.	MCLON
M 370	10,000 ft.	2 ft.	MCLUP
M 372	3,000 m.	1 m.	MCNAR
M 374	15,000 ft.	2 ft.	MCNET
M 376	5,000 m.	1 m.	MCNIV
M 378	20,000 ft.	5 ft.	MCNOW
M 380	6,000 m.	1 m.	MCNUX

M 382. **N.P.L. Certificate** MCPAB



ANEROID BAROMETERS

For Surveying and Mining Purposes



Mining and Surveying Aneroid, best quality, with fixed altitude scale, rackwork vernier with lens ; in strong leather sling case.

Size, 5 in. (12½ cm.)

No.	Reading not higher than	Vernier reading to	Code Word
M 384	3,000 ft.	1 ft.	MCPED
M 386	1,000 m.	½ m.	MCPIF
M 388	6,000 ft.	1 ft.	MCPOG
M 390	2,000 m.	½ m.	MCPUK
M 392	10,000 ft.	2 ft.	MCRAL
M 394	3,000 m.	½ m.	MCREN
M 396	15,000 ft.	2 ft.	MCRIP
M 398	5,000 m.	1 m.	MCROR
M 400	20,000 ft.	5 ft.	MCRUT
M 402	6,000 m.	1 m.	MCSAV

M 404. **N.P.L. Certificate** MCSEW



Aneroid Barometer, brass cylindrical case, index hand, diameter of dial 4 in. (10 cm.) ; in hinged case, as illustration.

Range	...	...	860 to 1050 mb.	26 to 31 in.	650 to 790 mm.
No.	...	...	M 406	M 408	M 410
Code Word	...	...	MCSIX	MCSOB	MCSUD
M 412.	N.P.L. Certificate	...	...	...	... MDBAC

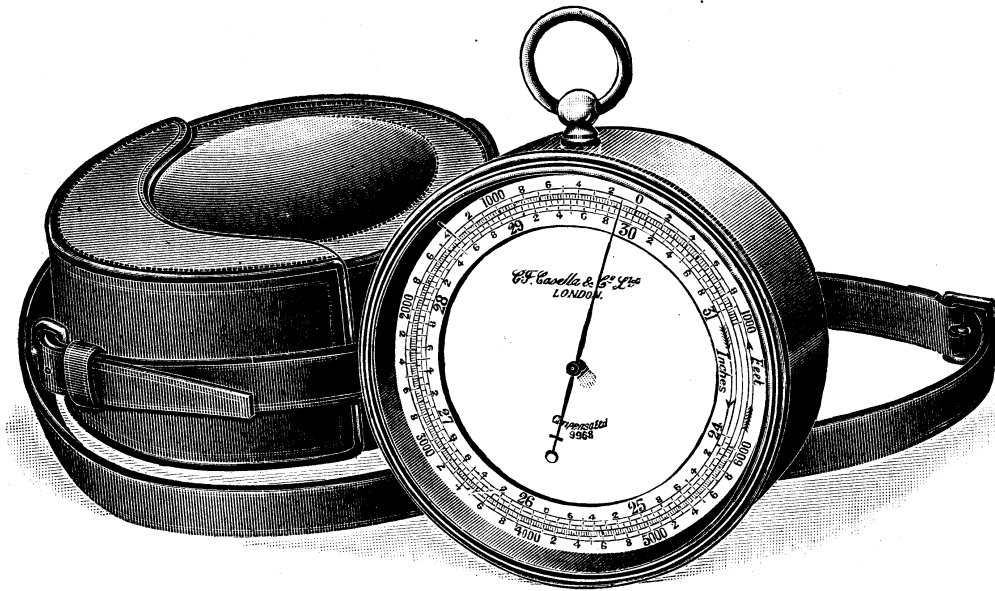
6×6×2½ in. 2 lb. 6 oz.
16×16×7 cm. 1.1 k.



FULL SIZE ANEROIDS

Diameter, $4\frac{1}{2}$ in. ($11\frac{1}{2}$ cm.)

Best quality, fully compensated with both altitude and barometer scales, in stout leather sling case with bulged side for protection.



Fixed Altitude Scale reading

M 414.	Not higher than 10,000 ft.	...	...	...	...	MDBEF
M 416.	„ „ 3,000 metres	...	...	...	...	MDBIG
M 418.	„ „ 15,000 ft.	...	...	...	...	MDBOK
M 420.	„ „ 4,500 metres	...	...	...	...	MDBUL
M 422.	N.P.L. Certificate	...	...	...	...	MDCAN

6×6×3 in. 2 lb. 1 k.
 15×15×7.5 cm. 3 lb. 1.3 k. in case



MINE SURVEYING ANEROID



Mine Surveying Aneroid, 8 in. (20 cm.) dial, best quality, fully compensated, vacuum chamber of beryllium copper, aluminium case, in sling leather case with **N.P.L. Certificate** for temperature and pressure.

M 424. **Range 28 to 33 in.**, reading to 0.005 in. MDCEP

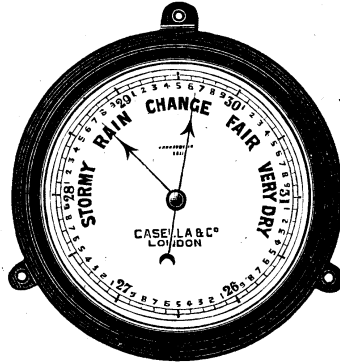
M 426. **Range 710 to 840 mm.**, reading to 0.2 mm. MDCIR

9 × 9 × 3 in. 23 × 23 × 7.5 cm. 3 $\frac{3}{4}$ lb. 1.7 k.

9 $\frac{1}{2}$ × 9 $\frac{1}{2}$ × 3 $\frac{1}{2}$ in. 24 × 24 × 9 cm. 5 $\frac{1}{2}$ lb. 2.5 k. in case

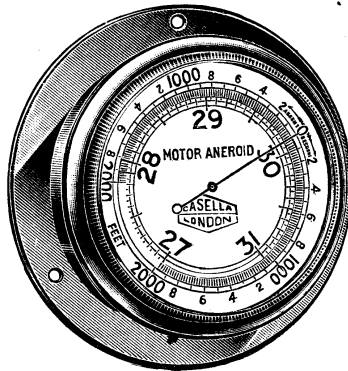


MARINE ANEROID BAROMETER



- M 428. **Marine Aneroid Barometer**, in bronzed case, silvered dial $6\frac{1}{2}$ in. ($16\frac{1}{2}$ cm.), with three lugs for hanging, range 26 to 31 inches MDCOT
- M 430. **Ditto**, range 650 to 790 millimetres MDCUV
- $9 \times 9 \times 3$ in. $23 \times 23 \times 7.5$ cm.

MOTOR CAR ANEROID BAROMETER

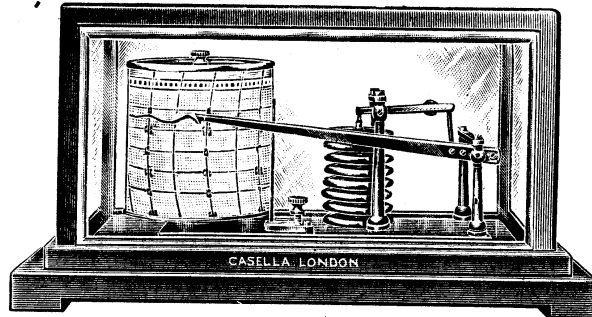


Motor Aneroid, for the dashboard of a car, range $-2,000$ to $+6,000$ feet (-600 to $+2,000$ metres), also barometer readings, in nickel-plated case with flange.

- M 432. **English reading** MDFAW
- M 434. **Metric reading** MDFEX
- $3\frac{1}{2}$ in. 9 cm. 8 oz. 220 grams.



BAROGRAPHS



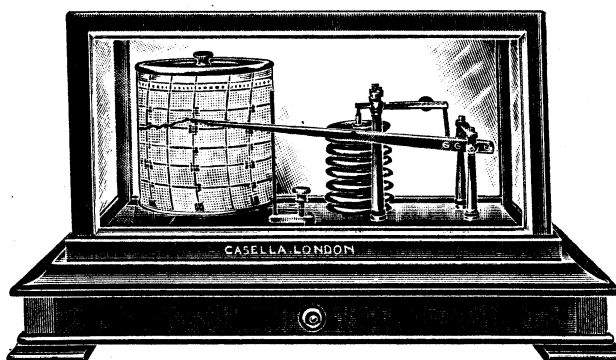
By means of a series of aneroid boxes the barometric pressure is recorded on a weekly chart, the movement being compensated for temperature changes. The movement is fixed to a polished mahogany base having a lift-off lid with bevelled plate glass windows on the four sides and on the top, the whole forming a handsome adjunct to a reception hall, director's office, club house or private house.

The instrument is supplied with pen, ink and a series of 55 charts.

- | | | | | |
|--------|---|---------------|-----|-------|
| M 436. | Barograph , range 28 to 31 in. | Chart No. 276 | ... | MDFIB |
| M 438. | Ditto , range 710 to 790 mm. | Chart No. 485 | ... | MDFOC |
| M 440. | Ditto , range 950 to 1050 mb. | Chart No. 277 | ... | MDFUG |
| | Size of Chart, $11\frac{3}{4} \times 3\frac{9}{16}$ in. 30 × 9 cm. | | | |
| | Diameter of Clock, $3\frac{3}{4}$ in. 93 mm. | | | |
| | $13\frac{1}{2} \times 7\frac{3}{4} \times 7$ in. 34 × 20 × 15.5 cm. 11 lb. 5 k. | | | |
| M 442. | Spare series of Charts | ... | ... | MDGAK |
- For details of spares for the above instrument, see p. 112.



BAROGRAPHS



This is of similar quality to the instrument shown on page 60 but the base of the instrument is provided with a drawer which has two partitions enabling the used charts to be kept easily in date sequence in one partition with the new chart ready for changing in the other.

M 444. **Barograph**, range 28 to 31 in. Chart No. 276 ... MDGEL

M 446. **Ditto**, range 710 to 790 mm. Chart No. 485 ... MDGIN

M 448. **Ditto**, range 950 to 1050 mb. Chart No. 277 ... MDGOP

Size of Chart, $11\frac{3}{4} \times 3\frac{9}{16}$ in. 30 × 9 cm.

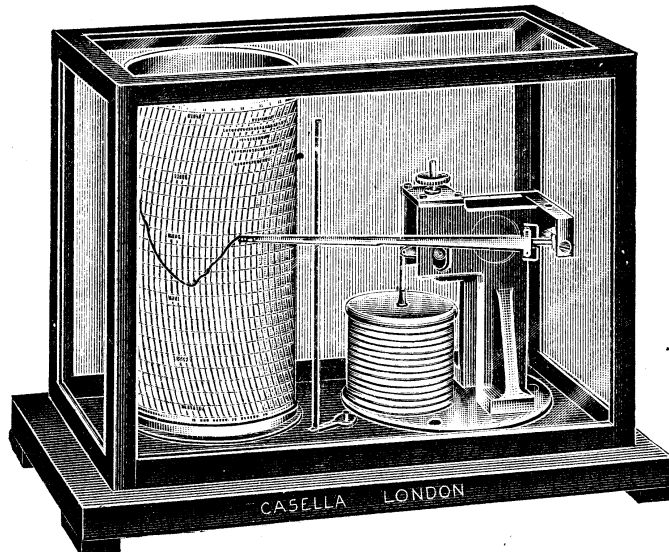
Diameter of Clock, $3\frac{3}{4}$ in. 93 mm.

$14\frac{3}{4} \times 9 \times 8\frac{1}{4}$ in. 38 × 23 × 21 cm. 14 lb. 6·3 k.

M 450. **Spare series of Charts** MDGUR
For details of spares for the above instrument, see p. 112.



MICRO BAROGRAPH



A Barograph with a high degree of sensitivity, the movement of the pen is plainly visible during storms. Compensated for temperature, metal case, lift-off cover, bevelled plate glass sides and top.

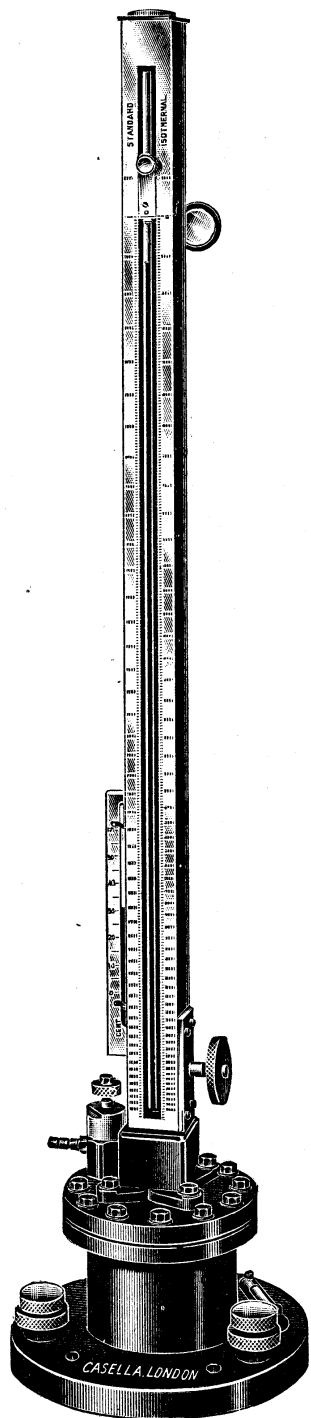
Size of Chart, $10\frac{3}{4} \times 6\frac{1}{2}$ in. 27×16.5 cm.

Diameter of Clock, $3\frac{1}{2}$ in. 90 mm.

M 452.	Range, 28.50 to 31.00 in.,	daily chart	...	...	MDKAT
M 454.	„ „ „	weekly chart	...	...	MDKEW
M 456.	„ 720 to 785 mm.	daily chart	...	...	MDKIX
M 458.	„ „ „	weekly chart	...	...	MDKOB
M 460.	„ 960 to 1040 mb.	daily chart	...	...	MDKUC
M 462.	„ „ „	weekly chart	...	...	MDLAD
M 464.	Spare Series of charts		...	...	MDLEG
	$12\frac{1}{2} \times 7\frac{1}{2} \times 9$ in.	$10\frac{3}{4}$ lb.			
	$32 \times 19 \times 23$ cm.	4.8 k.			



APPARATUS FOR TESTING & COMPARING ANEROID BAROMETERS



Standard Test Barometer on the Kew principle, for calibrating and testing aneroids, barographs, altimeters, etc. The glass tube, bore 0.5 in. (12 mm.), is mounted in a rectangular metal frame designed so that **four scales** may be engraved on it if desired. The frame is of satin-chromium-plated brass, and is fitted with a rack and vernier and a thermometer, the cistern is of cast-iron and is provided with a nozzle and valve for connecting the apparatus to a vacuum pump.

The following scales can be provided :—

Inches, 3.40 to 31, reading to 0.002 in.

Millimetres 90 to 790 to 0.05 mm.

Altitude in feet up to 50,000 (Isothermal or I.C.A.N.)

M 470.	Two scales	...	...	MDLIK
M 472.	Three scales	...	...	MDLON
M 474.	Four scales	...	...	MDLUP
M 476.	N.P.L. Certificate			MDPAR
M 478.	Special transport case, pyramid shape	...		MDPET

Height, 41½ in. 105 cm.

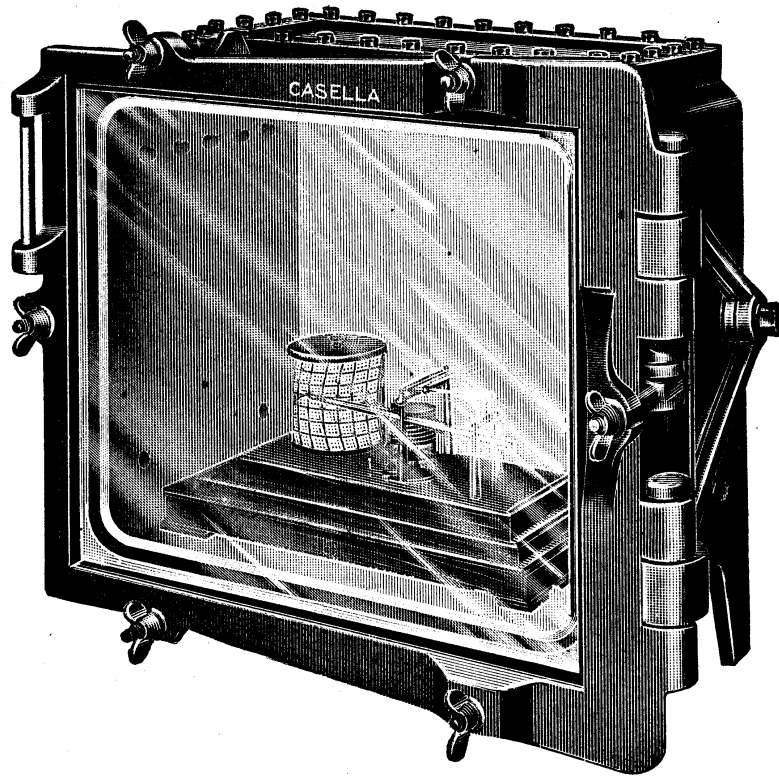
49 lb. 22 k.

Packed, 47×23×21 in.

120×58×53 cm. 112 lb. 50 k.



VACUUM CHAMBER



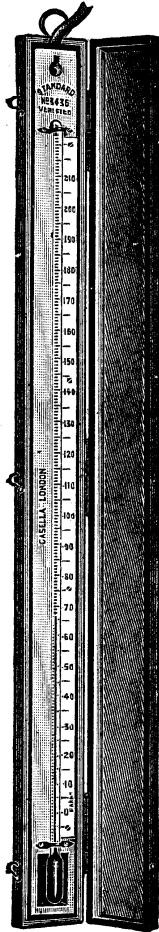
This is for use in conjunction with the Test Barometer shown on page 63. It has a heavy plate glass door with clamps which make a seal on to a rubber ring, and a fixed window in the top. It will take a complete barograph or a number of aneroids, altimeters, etc. The chamber is supplied with a needle valve for regulating the vacuum applied to the chamber and barometer, the connection being made with the usual copper pipes, unions, tees, etc., while there are also terminals for making electrical connections to an instrument or to a heater for temperature tests. Inside dimensions $20\frac{1}{2} \times 17 \times 13$ in.

M 484. **Vacuum Chamber** MDPIV

26 × 28 × 18 in. 66 × 72 × 46 cm. 500 lb. 227 k.



THERMOMETERS



M 500. **Standard Thermometer**, tube 15 inches long (38 mm.), engine-divided on the stem and figured on raised metal scale, 0° to 220° Fahr. in $\frac{1}{2}^{\circ}$, in maroon case ; outside dimensions, $17\frac{5}{8} \times 1\frac{5}{8} \times \frac{7}{8}$ in. (45 × 4.1 × 2.2 cm.), with **N.P.L. Certificate** MDREC

M 502. **Ditto**, but range -20° to +105°C. divided to 0.2°, with **N.P.L. Certificate** MDRIF

M 504. **Ditto**, but range 10° to 160° F. divided to 0.2°, with **N.P.L. Certificate** MDROG

M 506. **Ditto**, but range -10° to +70° C. divided to 0.1°, with **N.P.L. Certificate** MDRUK

20 oz. 550 grams.



MAXIMUM THERMOMETERS

Maximum Thermometers. In the maximum thermometer used for meteorological observations, there is a constriction in the bore close to the bulb, which allows the mercury to be forced through as it expands, but causes a break in the mercury column when it begins to contract again after reaching the maximum temperature.

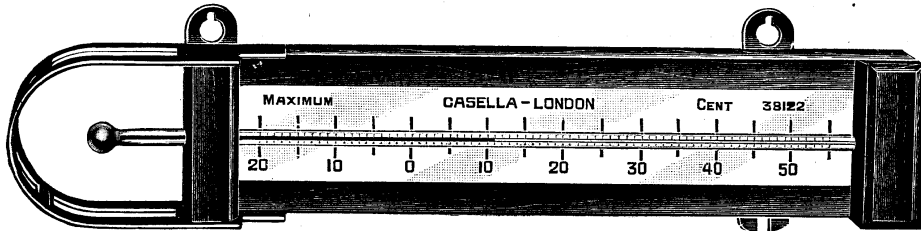
The thermometer is supported nearly horizontal, with the bulb slightly lower than the other end, and the index is reset by swinging the thermometer, bulb downwards. If the length of mercury forming the index does not remain at the maximum reading when the temperature begins to fall, or if it slips forward when the thermometer is hung up again, the supports must be altered so as to provide the correct inclination.



Maximum Thermometer, for shade temperatures, to the specification of the British Meteorological Office. Overall length $13\frac{1}{2}$ in. (34 cm.). The thermometer stem is fused to the outer glass sheath and as the latter is completely sealed no condensation of moisture can take place on the divisions or figures.

M 508.	Range, 0° to 130° F. in 1°	MDSAL
M 510.	Range, -20° to $+55^{\circ}$ C. in $\frac{1}{2}^{\circ}$	...	...	...	...	MDSEW
M 512.	N.P.L. Certificate	...	...	...	...	MDSIP

3 oz. 80 grams.



Maximum Thermometer, engine-divided on the stem and indelibly figured on an opal glass scale, which effectually resists frost and all effects of weather. In polished mahogany mount; overall length $13\frac{1}{2}$ in. (34 cm.).

- M 514. **Range**, 0° to 130° F. in 1° MDSOR
- M 516. **Range**, -20° to $+55^{\circ}$ C. in $\frac{1}{2}^{\circ}$ MDSUT
- M 518. **N.P.L. Certificate** MDTAV

$13\frac{1}{2} \times 3\frac{1}{2} \times 1$ in. $34 \times 9 \times 2.5$ cm. 12 oz. 340 grams.



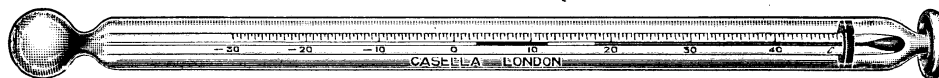
- M 520. **Maximum Thermometer**, as M 514, but simpler mounting, 10 in. (25 cm.) 0° to 130° F. in 1° ... MDTEB
- M 522. **Ditto**, -20° to $+55^{\circ}$ C. in 1° MDTIC
- M 524. **N.P.L. Certificate** MDTOD

$10\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{2}$ in. $27 \times 3.5 \times 1.5$ cm. 4 oz. 113 grams.



MINIMUM THERMOMETERS

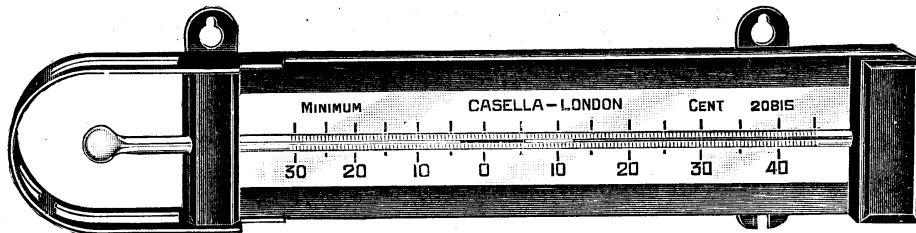
Minimum Thermometers. The minimum thermometer has a spirit column in which is placed a small glass index, the end of the index farthest from the bulb giving the reading. It is supported, like the corresponding maximum thermometer, almost horizontal, with the bulb slightly lower than the other end. As the temperature falls the index is carried back by the column of spirit, as it is unable to pierce the surface film, but it remains at the lowest point it has reached when the alcohol or other liquid begins to expand again. It is set by being tilted till the index slides up to the meniscus. For meteorological readings the liquid is usually uncoloured, and great care must be taken to make sure that there are no bubbles, or short lengths of column remaining detached, otherwise the readings will, of course, be too low.



Minimum Thermometer, for shade temperatures, to the specification of the British Meteorological Office. Overall length $13\frac{1}{2}$ in. (34 cm.) The thermometer stem is fused to the outer glass sheath and as the latter is completely sealed no condensation of moisture can take place on the divisions or figures.

- | | | | | | |
|--------|--|-----|-----|-----|-------|
| M 526. | Range, -30° to $+100^{\circ}$ F. in 1° | ... | ... | ... | MDTUF |
| M 528. | Range, -30° to $+45^{\circ}$ C. in $\frac{1}{2}^{\circ}$ | ... | ... | ... | MFBAC |
| M 530. | N.P.L. Certificate | ... | ... | ... | MFBED |

3 oz. 80 grams.



Minimum Thermometer, engine-divided on the stem and indelibly figured on an opal glass scale, which effectually resists frost and all effects of weather. In polished mahogany mount ; overall length $13\frac{1}{2}$ in. (34 cm.).

- | | | | | | |
|--------|--|-----|-----|-----|-------|
| M 532. | Range, -20° to $+110^{\circ}$ F. in 1° | ... | ... | ... | MFBIG |
| M 534 | Range, -30° to $+45^{\circ}$ C. in $\frac{1}{2}^{\circ}$ | ... | ... | ... | MFBOK |
| M 536. | N.P.L. Certificate | ... | ... | ... | MFBUL |

$13\frac{1}{2} \times 3\frac{1}{2} \times 1$ in. 12 oz.

$34 \times 9 \times 2.5$ cm. 340 grams.

- | | | | | | |
|--------|--|-----|-----|-----|-------|
| M 538. | As M 532, but simpler mounting, 10 in. (25 cm.) | | | | |
| | -20° to $+110^{\circ}$ F. in 1° (See Fig. p. 67) | ... | ... | ... | MFDAN |
| M 540. | Ditto, -30° to $+45^{\circ}$ C. in 1° | ... | ... | ... | MFDEP |
| M 542. | N.P.L. Certificate | ... | ... | ... | MFDIR |

$10\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{2}$ in. 4 oz.

$27 \times 3.5 \times 1.5$ cm. 113 grams.



'ORDINARY' THERMOMETERS

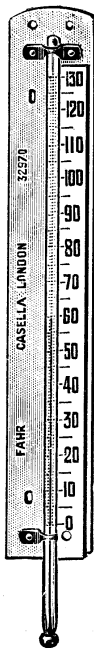
BRITISH METEOROLOGICAL OFFICE PATTERNS



M 544

Glass Sheath Pattern, to British Standard Specification.

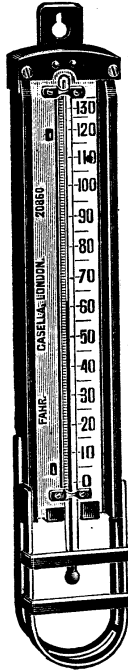
- | | | | |
|--------|---|-----|-------|
| M 544. | Range, -15° to $+115^{\circ}$ F. in 1° | ... | MFDOT |
| M 546. | Ditto, -25° to $+45^{\circ}$ C. in $\frac{1}{2}^{\circ}$ | ... | MFDUV |
| M 548. | Ditto, 0° to 130° F. in 1° | ... | MFGAW |
| M 550. | Ditto, -15° to $+55^{\circ}$ C. in $\frac{1}{2}^{\circ}$ | ... | MFGEX |
| | 13 in. 33 cm. $2\frac{1}{2}$ oz. 70 grams. | | |
| M 552. | N.P.L. Certificate | ... | MFGIB |



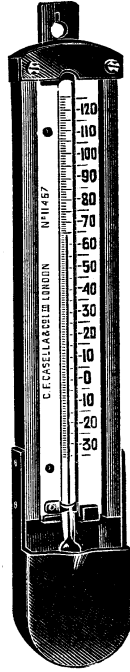
M 558

Mounted on porcelain scale, $9\frac{3}{4}$ in. (24.5 cm.)

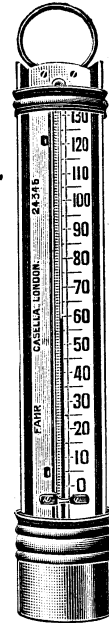
- | | | |
|--------|---|-------|
| M 554. | Mark I, range, -10° to $+110^{\circ}$ F. in 1° | MFGOC |
| M 556. | Ditto, range -20° to $+45^{\circ}$ C. in $\frac{1}{2}^{\circ}$ | MFGUD |
| M 558. | Mark III, range 0° to 130° F. in 1° | MFKAG |
| M 560. | Ditto, range, -15° to $+55^{\circ}$ C., in $\frac{1}{2}^{\circ}$ | MFKEL |
| | 11 in. 28 cm. 3 oz. 80 grams. | |
| M 562. | N.P.L. Certificate | MFKIN |
| M 564. | M.O. pattern threaded wick for the
above thermometers when used as a
wet bulb | MFKOP |



M 566
Air

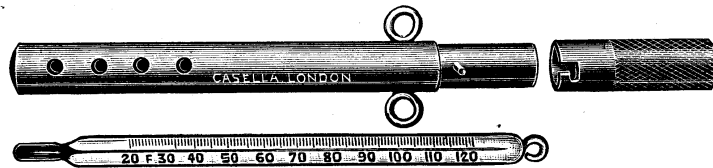


M 568
Sea Water



M 570
Sea Water

- | | | | | | | |
|--------|---|-------|-----|-----|-----|-------|
| M 566. | Empty mahogany case for thermometers M 554 to M 560 | ... | ... | ... | ... | MFKUR |
| M 568. | Ditto, | ditto | ... | ... | ... | MFLAT |
| M 570. | Empty copper case | ditto | ... | ... | ... | MFLEV |



Fronde Thermometer, in nickelled case for the pocket for ascertaining the true temperature of the air.

This thermometer is swung rapidly above the head about six times by means of a silk cord.

- | | | | | | |
|--------|---------------------------|-----------------------|-----|-----|-------|
| M 572. | 4½ in. (11.5 cm.) | 20° to 120° F. in 1° | ... | ... | MFLIW |
| M 574. | 4½ in. (11.5 cm.) | -5° to +50° C. in ½° | ... | ... | MFLOX |
| M 576. | 6½ in. (16.5 cm.) | 10° to 130° F. in 1° | ... | ... | MFLUB |
| M 578. | 6½ in. (16.5 cm.) | -10° to +55° C. in ½° | ... | ... | MFNAB |
| M 580. | N.P.L. Certificate | ... | ... | ... | MFNEC |



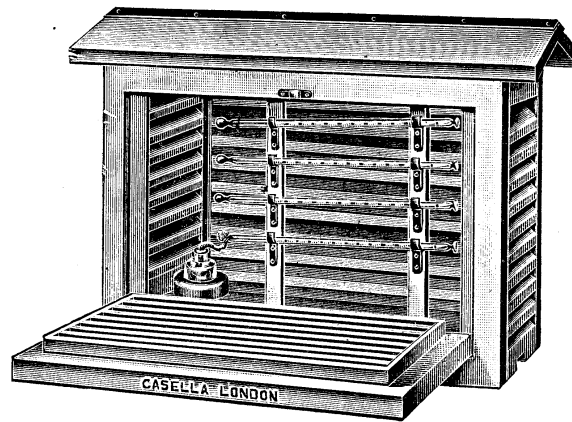
THERMOMETER SCREEN

To obtain meteorological readings which will be comparable with those of other observers, it is necessary to expose the maximum and minimum thermometers and the hygrometer in a special wooden screen.

The general appearance of the screens is shown in the illustrations ; they are made of best yellow pine, tenoned and morticed, with double louvres on each side, and are painted white.

Exposure. The screen should stand on four legs above short grass with the base of the screen about 3 ft. 6 in. (106 cm.) above the ground ; it should be fixed north of the rain gauge (in the northern hemisphere) not nearer it than 10 ft. (3 m.), and the opening side should be slightly east of north so that the sun will not shine on the thermometers while readings are being taken. The distance of the screen from any buildings or trees ought not to be less than twice their height. A roof does not make a suitable exposure for a thermometer screen.

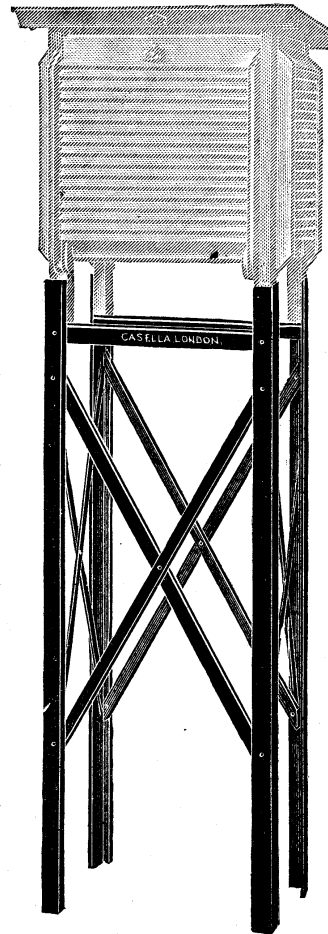
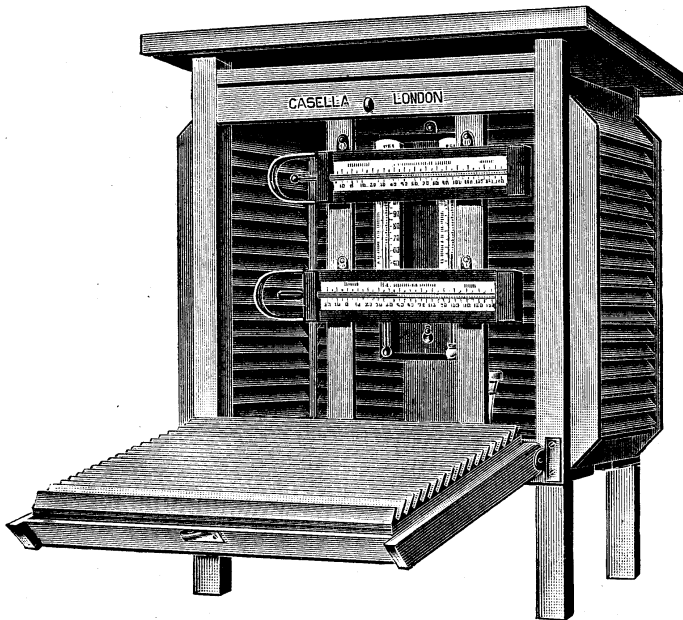
We list two patterns, the British Meteorological Office pattern for sheathed thermometers, and the Stevenson screen for thermometers in wooden frames.



- M 582. **Bilham Screen**, British Meteorological Office specification, with clips to take maximum, minimum, dry bulb and wet bulb thermometers, all in glass sheaths ; inside dimensions, $16\frac{1}{2} \times 12\frac{1}{2} \times 6\frac{1}{2}$ in. deep ($42 \times 30 \times 16$ cm.). Without stand... MFNIT
 $24 \times 17 \times 11$ in. $60 \times 43 \times 28$ cm. 19 lb. 8.6 k.
- M 584. **Iron Stand**, for above screen to the specification of the Meteorological Office MFNOG
 $53 \times 17\frac{1}{2} \times 10$ in. $134 \times 44 \times 25$ cm. 50 lb. 22.6 k.



STEVENSON SCREEN



M 586. **Stevenson Screen** to hold a Mason's hygrometer, No. M 874 or M 876 a maximum and a minimum thermometer (in wooden frames, see pp. 67 and 69). Inside dimensions $17\frac{1}{2} \times 16 \times 9\frac{1}{4}$ in. deep. Without stand MFNUC

$26 \times 23 \times 16\frac{1}{2}$ in. 32 lb.
 $58 \times 54 \times 42$ cm. 14.5 k.

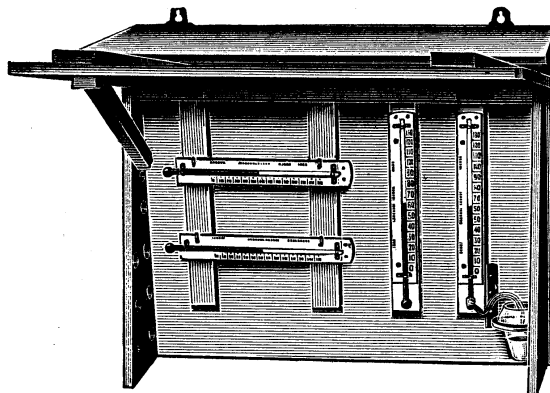
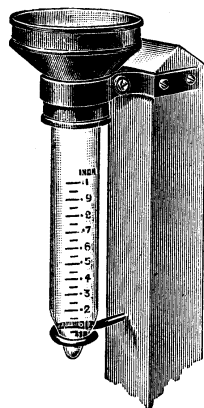
M 588. **Iron Stand** for the above screen MFPAR

$54 \times 19 \times 12$ in. 50 lb.
 $138 \times 48 \times 30$ cm. 22.6 k.



METEOROLOGICAL OUTFIT

SUITABLE FOR SCHOOLS, ETC.



This set consists of a wall screen made of seasoned deal, painted white, with hinged front, and the following instruments, all of standard quality ; maximum thermometer 520, minimum thermometer 538, dry bulb thermometer, 558, wet bulb ditto, rain gauge 1096, twelve meteorological charts 1270.

M 590. **English scales**, complete MFPEG

M 592. **Metric scales**, complete MFPIV

24×20×8½ in. 60×50×21·5 cm. 17 lb. 8·6 k.

The same Set, but without the rain gauge :—

M 594. **English scales** MFPOL

M 596. **Metric scales...** MFPUG

M 598. **N.P.L. Certificates** for the 4 thermometers ... MFRAY



THERMOMETERS FOR MEASURING SOLAR RADIATION



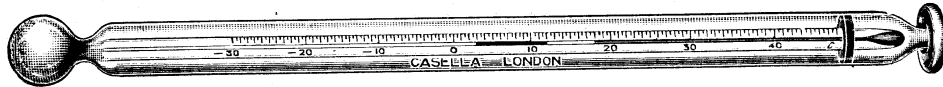
For measuring the intensity of the sun's radiation a maximum thermometer is sometimes used, of which the bulb and one inch of the stem are coated with dull lamp-black so as to provide a suitable receiving surface. The whole of the thermometer is enclosed in a glass shield, which is deprived of air. The difference between the "black bulb reading" and the maximum reading in the stem is used to denote the intensity of the solar radiation, but the readings are not now considered very reliable, or comparable one with another.

Solar Radiation Thermometer, black bulb, *in vacuo*.

- | | | |
|--------|---|-------|
| M 600. | Range, 10° to 200° F. in 1° | MFREK |
| M 602. | Range, —10° to +95° C. in 1° | MFRIX |
| | 16×2 in. 41×5 cm. 8 oz. 220 grams. | |
| M 604. | N.P.L. Certificate | MFRON |
| M 606. | Brass Clip, for fixing solar radiation thermometer
to a wooden post | MFRUK |



THERMOMETERS FOR MEASURING TERRESTRIAL RADIATION



This is often called a "grass minimum thermometer." It is used for estimating, as far as this is possible, the radiation at night from the surface of the earth to space, and for providing information as to the occurrence of ground frosts. It is supported horizontally on two twigs, or, better, on two Y-shaped pieces of wood, over short grass so as just to touch the blades.

A grass minimum thermometer usually gives a reading some degrees lower than a minimum thermometer in a screen.

Grass Minimum Thermometer, round bulb, to British Standard Specification 692—1936. The divided tube is mounted in a glass shield, which is hermetically sealed so that the scale shall not become obscured by dew.

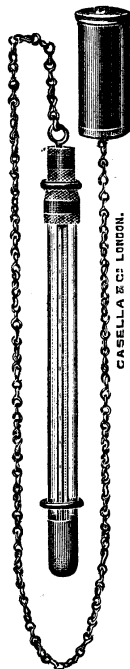
M 608.	Range, -30° to $+100^{\circ}$ F. in 1°	MFTAX
M 610.	Range, -30° to $+45^{\circ}$ C. in $\frac{1}{2}^{\circ}$	...	...	MFTEN
	$13\frac{1}{2}$ in. 34 cm. $2\frac{1}{2}$ oz. 60 grams.			
M 612.	N.P.L. Certificate	...	...	MFTIC



EARTH THERMOMETERS

These are for reading the temperature at various levels below the ground surface. The thermometer is fused into a stout glass shield, with paraffin wax between the bulb and the shield to make it insensitive to a change of temperature when being withdrawn to the surface for reading. The thermometer is lowered into a pointed steel tube driven into the ground. The thermometers all being of the same length, the tube being of the appropriate length as listed below. The range of the Fahrenheit thermometer is 20° to 100° in 1° and the range of the Centigrade -10° to $+45^{\circ}$ in 1° . Complete with copper cap and brass chain and steel tube.

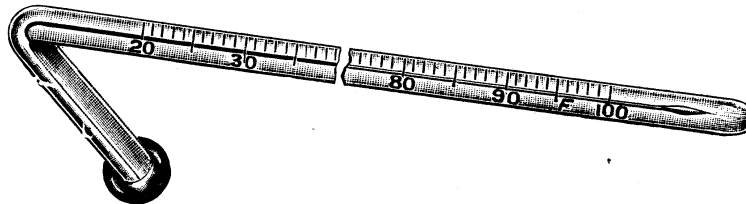
Note.—The steel tubes are intended to project six inches above ground and the length supplied is, therefore, that much more than the depth at which the thermometer is to indicate.



M 614.	1 foot Fahrenheit	22 in.	2 lb. ...	MFTOR
M 616.	2 feet	„	34 in. 3 lb. ...	MFTUN
M 618.	4 „	„	58 in. 5 lb. ...	MFVAB
M 620.	10 „	„	130 in. 11 lb. ...	MFVER
M 622.	30 cm. Centigrade	56 cm.	0.9 k. ...	MFVID
M 624.	60 cm.	„	86 cm. 1.3 k. ...	MFVOW
M 626.	120 cm.	„	146 cm. 2.2 k. ...	MFVUP
M 628.	300 cm.	„	326 cm. 5 k. ...	MGBAD
M 630.	Thermometer only, Fahrenheit	...	...	MGBEX
M 632.	Ditto, Centigrade	...	...	MGBIV
M 634.	N.P.L. Certificate	...	...	MGBOP



EARTH THERMOMETERS



M642 4 in. (10 cm.), immersion

Earth Thermometer, Right Angle Pattern, to Specification of the British Meteorological Office. The thermometer is divided on the stem which is of constant length, 8 in. (20 cm.), the bulb portion being of various lengths as listed below. No case or outer tube is used, the thermometer merely being inserted into a hole in the ground with the divided stem lying along the surface.

The range of the Fahrenheit thermometer is 20° to 100° in 1°, the Centigrade —5° to +40° in ½°.

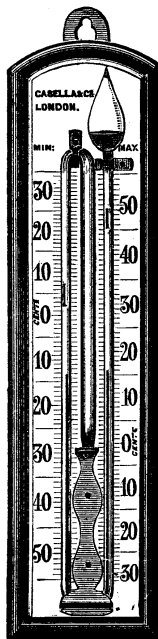
M 640.	For a depth of 2 in.	Fahrenheit ...	...	MGDAF
M 642.	„ „ 4 in.	... ..	...	MGDEB
M 644.	„ „ 8 in.	... ..	...	MGDIW
M 646.	„ „ 5 cm.	Centigrade ...	...	MGDOR
M 648.	„ „ 10 cm.	... ..	...	MGDUK
M 650.	„ „ 20 cm.	... ..	...	MGFAK
M 652.	N.P.L. Certificate	... ..	...	MGFEC



SIX'S THERMOMETERS

In this pattern, invented by James Six in 1782, the maximum and minimum readings are obtained from one instrument. The tube is in the form of a U, having a bulb at each end, one bulb being completely filled with creosote or other liquid, the other only partially filled so as to act as a safety chamber. As the temperature rises the liquid in the filled bulb expands and pushes in front of it a column of mercury in the lower part of the U, having an iron index at each end. The indexes remain at the farthest point to which they are pushed by the mercury as it travels backwards or forwards, and thus indicate both the maximum and minimum temperatures, readings being taken from the ends nearest the mercury. The indexes are reset by means of a magnet.

Six's thermometers are sometimes rather troublesome to correct if they have been put out of order in transit. Swinging and tapping are the only remedies which the user can adopt as a rule. If these do not avail, or if either of the indexes has become embedded in the mercury, it is necessary to return the thermometer.



Six's Thermometer, opal glass or zinc scale, mounted on oak or mahogany back, with magnet.

Opal Glass Scale

M 658. 10 in. Range, -30° to $+120^{\circ}$ F. MGFOT

M 660. 25 cm. „ -30° to $+55^{\circ}$ C. MGFUL

Zinc Scale

M 662. 10 in. Range, -30° to $+120^{\circ}$ F. MGKAL

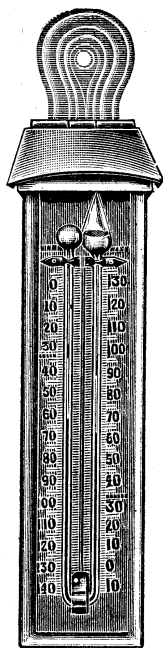
M 664. 25 cm. „ -30° to $+55^{\circ}$ C. MGKEF

$11 \times 2\frac{1}{2} \times 1$ in. $28 \times 6 \times 2.5$ cm. 8 oz. 220 grams.



SIX'S THERMOMETERS

Six's Thermometer, single scale, in white-painted metal case, with magnet.



M 668

M 666.	8 in. Boxwood scale, -10° to $+130^{\circ}$ F.	MGKIB
M 668.	8 in. Zinc scale, -10° to $+130^{\circ}$ F.	MGKOV
M 670.	8 in. Opal glass scale	MGKUN
M 672.	20 cm. Boxwood scale, -25° to $+60^{\circ}$ C.	MGLAN
M 674.	20 cm. Zinc scale, -25° to $+60^{\circ}$ C.	MGLEK
M 676.	20 cm. Opal glass scale	MGLIC
M 678.	10 in. Boxwood scale, -10° to $+130^{\circ}$ F.	MGLOW
M 680.	10 in. Zinc scale, -10° to $+130^{\circ}$ F.	MGLUP
M 682.	10 in. Opal glass scale,	MGNAP
M 684.	25 cm. Boxwood scale, -25° to $+60^{\circ}$ C.	MGNEL
M 686.	25 cm. Zinc scale, -25° to $+60^{\circ}$ C.	MGNID
M 688.	25 cm. Opal glass scale	MGNOX

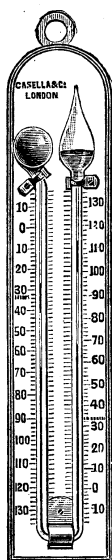
Copper Cases for the above, instead of painted.

M 690.	8 in. or 20 cm.	MGNUR
M 692.	10 in. or 25 cm.	MGPAP

11×3×2 in. 28×7.5×5 cm. 5 oz. 150 grams.

14×3×2 in. 36×7.5×5 cm. 9 oz. 250 grams.

Six's Thermometer, single scale. Tube mounted divided and figured on the boxwood ; with magnet.



M 694

M 694.	8 in. range, -10° to $+130^{\circ}$ F. ...	MGPEN
M 696.	20 cm. .. -25° to $+60^{\circ}$ C. ...	MGPFI
M 698.	10 in. .. -10° to $+130^{\circ}$ F. ...	MGPBO
M 700.	25 cm. .. -25° to $+60^{\circ}$ C. ...	MGPUP

9×2×1 in. 23×5×2.5 in. 5 oz. 150 grams.

11×2×1 in. 28×5×2.5 in. 7 oz. 220 grams.



SIX'S THERMOMETERS

Six's Thermometer, single scale, stem divided tube, mounted on a turned boxwood stick, $1\frac{1}{2} \times 1\frac{1}{8}$ in. (29×3 cm.) for insertion in a tube to register the temperature of the earth or the hold of a ship.

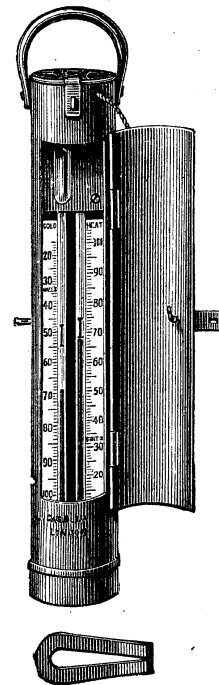
Rubber rings are fitted to prevent the thermometer from becoming broken while being inserted or removed for the reading to be taken. Complete with magnet.

- M 702. Range, 10° to 120° F. in 1° MGRAT
 M 704. Range, -10° to $+50^{\circ}$ C. in 1° MGREP



The Casella-Miller Deep-Sea Thermometer, for registering the maximum, minimum, and present temperatures of the sea to a depth of 3 miles, guaranteed to bear a pressure of 3 tons per square inch. Complete with magnet.

- M 706. Range, 30° to 100° F.
 in 1° MGRIK
 M 708. Range, 0° to 40° C. in
 1° MGROC
 $13\frac{1}{2} \times 3 \times 2\frac{1}{2}$ in. $1\frac{1}{2}$ lb.
 $34 \times 7.5 \times 6$ cm. 0.6 k.
 M 710. N.P.L. Certificate MGRUV

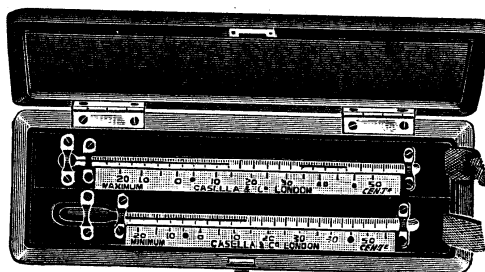




POCKET SET OF MAXIMUM AND MINIMUM THERMOMETERS

This convenient pocket set of thermometers was originally designed by L. Casella for Dr Livingstone. It was supplied to Captains Burton and Speke, and since then to many members of the Alpine Club and the Royal Geographical Society.

The thermometers are divided on the stem, and are mounted on ebonite backs with engraved German silver scales.



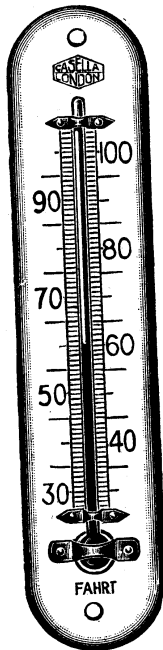
Outside dimensions of case, $6\frac{1}{2} \times 2\frac{1}{8} \times 1\frac{1}{4}$ in. ($16.5 \times 5.5 \times 3$ cm.)

- M 712. **Fahrenheit scales, 0° to 130° and -20° to $+110^{\circ}$** MGTAV
- M 714. **Centigrade scales, -20° to $+55^{\circ}$ and -30° to 45°** MGTER
- M 716. **National Physical Laboratory Certificates for the two thermometers** MGTIL

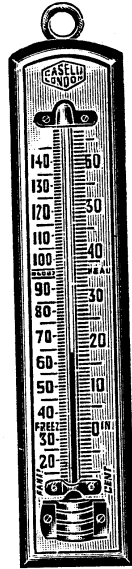
8 oz. 220 grams.



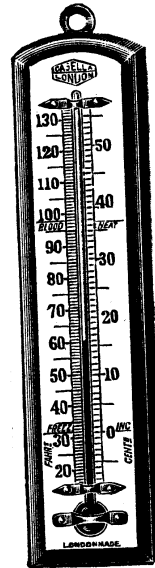
WALL THERMOMETERS



M 718



M 720



M 724

M 718. **Thermometer on porcelain mount, mercury column, Fahr. scale only. 30° to 105°, 10×2 in. (25×5 cm.)** MGTOD

Boxwood Thermometer, polished, with elliptical top, bevelled edges; enamelled tube, double scale Centigrade and Fahrenheit; 10° to 130°F. and -10° to +55°C. mercury column.

M 720. 8 in. (20 cm.) MGTUW

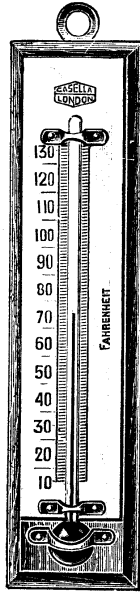
M 722. 10 in. (25 cm.) MGVAW

M 724. **Wall Thermometer**, hardwood back, mahogany finish, ivorine scale, Fahrenheit and Centigrade, 20° to 130°F. and -5° to +55°C. red spirit; 8½×2 in. (22×5 cm.) MGVET

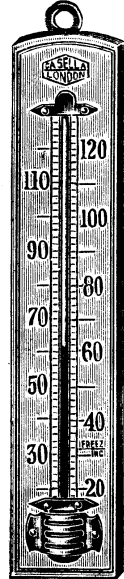
• M 726. As M 724 but **mercury column** instead of spirit... MGVIN



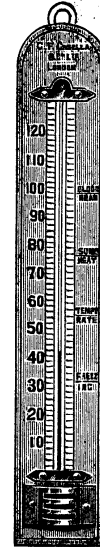
WALL THERMOMETERS



M 728



M 732



M 736

- M 728. **Thermometer, opal scale, on wood mount, mercury column, suitable for use outdoors, single scale, 10° to 130° F.** MGVOF
- M 730. **Ditto, —10° to +55°C.** MGVUX
 $8\frac{1}{4} \times 2$ in. 21×5 cm. 6 oz. 160 grams.
- M 732. **Boxwood Thermometer, bold figures, black spirit column, single scale, 20° to 120°F.** ... MKBAX
- M 734. **Ditto, —5° to +50°C.** MKBET
 $8\frac{1}{2} \times 1\frac{5}{8}$ in. 22×4 cm. 3 oz. 80 grams.
- M 736. **Boxwood Thermometer, polished mount, mercury column, single scale, 20° to 120°F.** ... MKBIN
- M 738. **Ditto, —5° to +50°C.** MKBOF
 $8\frac{1}{2} \times 1\frac{1}{2}$ in. 22×4 cm. 3 oz. 80 grams.



CHEMICAL THERMOMETERS



Engine-divided on stem, in card cases.

	Length	Range	Divided to	Code Word
M 740.	4 in.	20° to 120°F.	1°	MKBUL
M 742.	10 cm.	-5° to +50°C.	½°	MKDAB
M 744.	6 in.	10° to 130°F.	1°	MKDEV
M 746.	15 cm.	-10° to +55°C.	½°	MKDIP
M 748.	12 in.	0° to 120°F.	1°	MKDOG
M 750.	30 cm.	-20° to +50°C.	½°	MKDUN
M 752.	15 in.	20° to 130°F.	5ths	MKFAC
M 754.	38 cm.	-5° to +55°C.	10ths	MKFEW

CHEMICAL THERMOMETERS, INSULATED PATTERN



Opal Scale 12 inch, straight tube, diameter $\frac{3}{8}$ in. (10 mm.)

	Length	Range	Divided to	Code Word
M 756.	12 in.	0° to 120°F.	1°	MKFIR
M 758.	30 cm.	-20° to +50°C.	½°	MKFOL

For other lengths and ranges see separate catalogue.



THERMOMETERS, GLASS

DIRECTIONS FOR USE AND HINTS ON MANAGEMENT

Column Divided. When a thermometer is sent by post or rail it is liable to arrive with the column of mercury or alcohol divided into several portions. It can usually be put right by swinging it bulb downwards or by tapping it carefully on one's knee or on a pad. Spirit thermometers when thus corrected must be allowed to hang vertical for five or ten minutes in order to let the alcohol drain down the walls of the tube. They should also be examined after being used at temperatures near the top of the scale, to make sure that no alcohol has condensed in the upper part of the tube and remains detached from the main column. This applies more particularly to spirit thermometers used in a horizontal position. Occasionally, when the column cannot be reunited in the way described above, it is necessary to heat the tube carefully till the mercury or alcohol occupies most of the space in the tube. Great care must be exercised in doing this, especially if the thermometer is not provided with a safety chamber at the top.

In the case of a chemical thermometer, or any mercury thermometer which is not mounted in a sheath or frame, the easiest way to correct it is to hold it bulb uppermost and tap the end of the bulb lightly with, say a pocket rule or pencil. This causes the mercury to run down the vacuum part of the bore and the column reunites.

Scale indistinct. A thermometer etched on the stem whose figures and divisions have become indistinct can be put right by rubbing in a little Brunswick black, or lampblack or graphite moistened with oil, the excess being removed by wiping lightly with a cloth or the finger. The black colouring material we use, however, combines chemically with the glass and ought not to require renewing.



CONVERSION TABLES

CENTIGRADE TO FAHRENHEIT

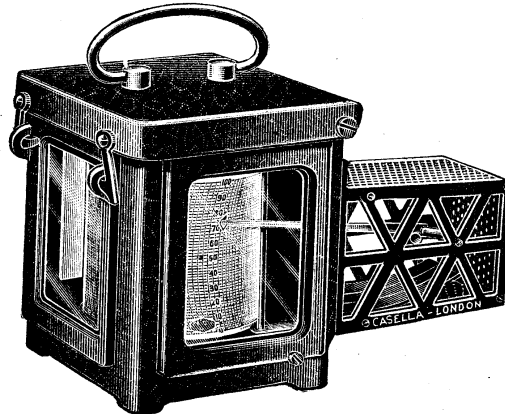
Cent.	Fahrenheit									
	0	1	2	3	4	5	6	7	8	9
—10	14·0	15·8	17·6	19·4	21·2	23·0	24·8	26·6	28·4	30·2
0	32·0	33·8	35·6	37·4	39·2	41·0	42·8	44·6	46·4	48·2
10	50·0	51·8	53·6	55·4	57·2	59·0	60·8	62·6	64·4	66·2
20	68·0	69·8	71·6	73·4	75·2	77·0	78·8	80·6	82·4	84·2
30	86·0	87·8	89·6	91·4	93·2	95·0	96·8	98·6	100·4	102·2
40	104·0	105·8	107·6	109·4	111·2	113·0	114·8	116·6	118·4	120·2
50	122·0	123·8	125·6	127·4	129·2	131·0	132·8	134·6	136·4	138·2

FAHRENHEIT TO CENTIGRADE

Fahr.	Centigrade									
	0	1	2	3	4	5	6	7	8	9
10	—12·22	—11·67	—11·11	—10·56	—10·00	—9·44	—8·89	—8·33	—7·78	—7·22
20	—6·67	—6·11	—5·56	—5·00	—4·44	—3·89	—3·33	—2·78	—2·22	—1·67
30	—1·11	—0·56	0·00	0·56	1·11	1·67	2·22	2·78	3·33	3·89
40	4·44	5·00	5·56	6·11	6·67	7·22	7·78	8·33	8·89	9·44
50	10·00	10·56	11·11	11·67	12·22	12·78	13·33	13·89	14·44	15·00
60	15·56	16·11	16·67	17·22	17·78	18·33	18·89	19·44	20·00	20·56
70	21·11	21·67	22·22	22·78	23·33	23·89	24·44	25·00	25·56	26·11
80	26·67	27·22	27·78	28·33	28·89	29·44	30·00	30·56	31·11	31·67
90	32·22	32·78	33·33	33·89	34·44	35·00	35·56	36·11	36·67	37·22
100	37·78	38·33	38·89	39·44	40·00	40·56	41·11	41·67	42·22	42·78
110	43·33	43·89	44·44	45·00	45·56	46·11	46·67	47·22	47·78	48·33
120	48·89	49·44	50·00	50·56	51·11	51·67	52·22	52·78	53·33	53·89
130	54·44	55·00	55·56	56·11	56·67	57·22	57·78	58·33	58·89	59·44



THERMOGRAPH



This is a robust and simple bi-metallic instrument for recording temperatures within the range -10° to $+250^{\circ}\text{F.}$ or -25° to $+120^{\circ}\text{C.}$ The standard range covers 100°F. or 50°C. , which can be selected from the stock series shown below.

A special feature of this recorder and of recorders M 1040 and M 1050 distinguishing them from others on the market, is that they can easily be corrected by the user if they should get out of adjustment in transit or from any other cause.

M 760. **Thermograph**, with 55 charts, ink and instructions MKFUP

STOCK SERIES OF RANGES

Supplied with either **Weekly** or **Daily** clock, both run for a week without rewinding. Please state which is required.

Fahrenheit	Centigrade
-10° to $+90^{\circ}$	-25° to $+25^{\circ}$
0° to 100°	-10° to 40°
20° to 120°	0° to 50°
30° to 130°	30° to 80°
80° to 180°	50° to 100°

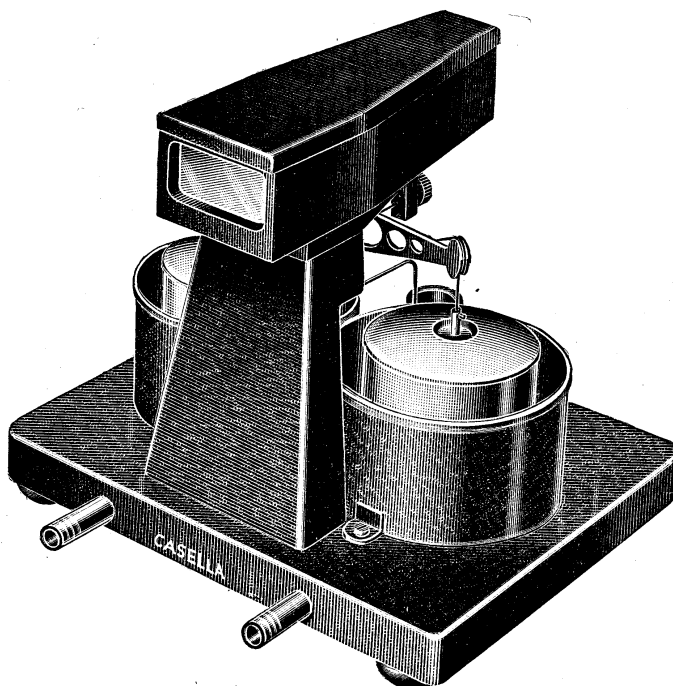
$10 \times 6 \times 6\frac{1}{2}$ in. $25 \times 15 \times 16$ cm. 6 lb. 10 oz. 3 k.

M 762. **Extra Charts, 55** MLBOW
 M 764. **Extra Charts, per 100** MLBUC

For details of spares for the above instrument see page 112.



ASCOT-CASELLA MICROMANOMETER



This instrument reads directly to 0.0001 in. (0.0025 mm.) of water on a scale. The principle is new and patented (8967/47). Two thin copper bells are suspended in a liquid of low surface tension from opposite ends of a beam suspended not on bearings but on a torsion strip. This strip eliminates any tendency to "stiction" and is also robust for its sensitivity. Pressure or suction introduced under one of the bells causes it to rise or fall and move the beam. To this is attached a lever carrying a transparent scale which is projected by lenses and mirrors to a screen at the front of the instrument. Since this scale is divided into 0.0002 in. (0.005 mm.) each division can be readily subdivided and read to 0.0001 in. (0.0025 mm.).

The direct range is 0.01 in. (0.25 mm.) which can be extended by a system of subsidiary weights applied to one end of the beam.

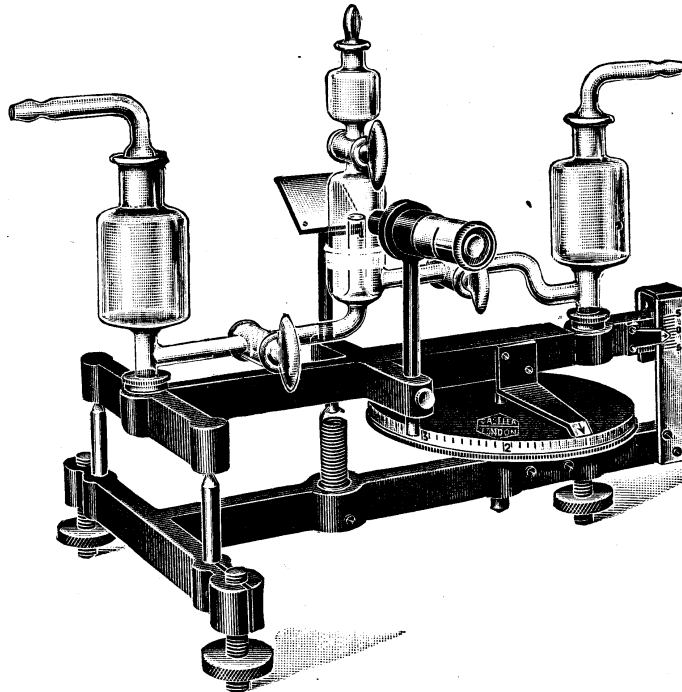
To our knowledge this is the only instrument which gives a direct reading of such small pressure and marks an important step forward in the ease and accuracy of making very small pressure measurements.

It has been developed by the Research Laboratories of Ascot Gas Water Heaters Ltd., and was described in the "Journal of Scientific Instruments," Vol. 24, page 295 (November, 1947).

M 780. MKGAD
 14 × 10½ × 9½ in. 36 × 26.5 × 24 cm. 17 lb. 7.7 k.



CHATTOCK-FRY TILTING PRESSURE GAUGE



This gauge is one of the most sensitive pressure gauges on the market, since a difference of pressure can be detected of 0.000065 inches of water.

It has a range of 0.65 inches of water, and is thus suitable for measuring very small air velocities in wind tunnels, flues, etc., as well as the usual small pressures in connection with industry and research.

The principle is that of observing the change in level of the interface of water and light oil. Water is contained in the two outer vessels, to which the sources of pressure are connected, these outer vessels communicate with the central chamber. The left hand vessel connects with the central tube, while the right hand vessel connects to the space outside it. The upper portion of this latter part has oil floating on the water so that pressure on the left hand vessel causes the water to rise in the central tube and form a "bubble." The top of this bubble when viewed through the small microscope against a diaphragm gives the zero.

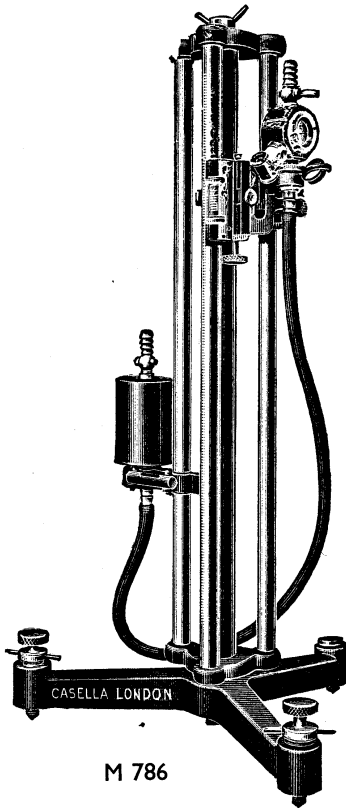
When the pressure is altered either way the "bubble" rises or falls, and is restored to the zero by tilting the gauge. From a knowledge of the gauge constants (pitch of screw, centre distances, etc.), the value of one micrometer division can be expressed in inches of water.

M 782. MKGEX

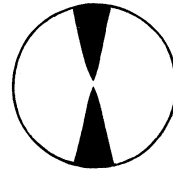
17 × 15 × 10½ in. 43 × 38 × 27 cm. 16 lb. 7.2 k.



MEASURING POINT MANOMETERS



M 786



Zero point and its reflected image
as seen through the eyepiece

This series of instruments has been produced with the object of providing a pressure gauge of robust design to measure pressure differences up to 1 metre head. The principle is that the measuring point, to which the water level is brought, comprises a steel point fixed with the point upwards underneath the water surface. An eyepiece is arranged to view this point at 45° under water. In consequence the image of the point by total internal reflection, together with the point itself, appear as shown in the illustration. Since the

point is always under water no trouble is experienced with surface tension as occurs if the point is above the water.

A vernier enables the whole range to be covered to 0.05 mm.

M 786. **Scale range, 0 to 50 cm.** MKGON

M 788. **Ditto, 0 to 100 cm.** MKGUR

34 × 18 × 15 in. 86 × 46 × 38 cm. 90 lb. 41 k.

52 × 18 × 15 in. 152 × 46 × 38 cm. 104 lb. 47 k.

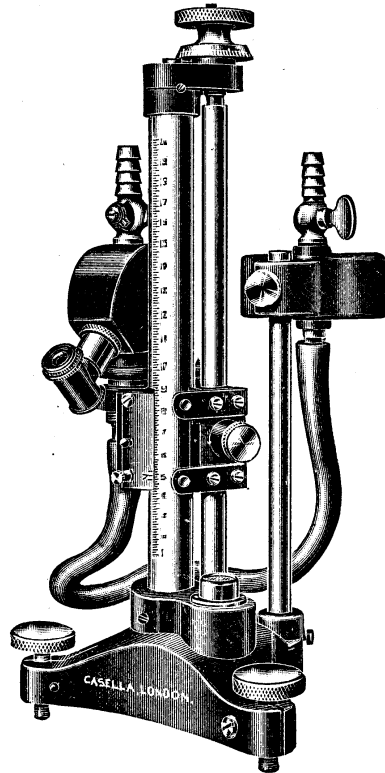
Approximate weights and Dimensions :—

	Gross (packed)	Volume (packed)
M 786.	113 lb., 51 k.	3.7 cub. ft., 0.1 cub. m.
M 788.	140 lb., 63 k.	6 cub. ft., 0.17 cub. m.

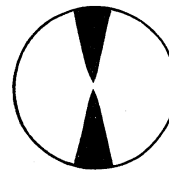


MEASURING POINT MANOMETER

In M 790 or M 792 when generally small pressures are being measured to a high accuracy the reading can be taken to 0.01 mm. or 0.001 in. over the range of the micrometer, viz. : 20 mm. or $\frac{3}{4}$ in. The total range is 0-170 mm.



M 790



Zero point and its reflection as seen through the eyepiece

There are many uses for such pressure gauges as these in industry and research, such as air flows—with Pitot tubes—pressures in gas mains, flues, ventilating shafts, etc.

M 790. **Scale range, 0 to 170 mm. in mahogany case ... MKLAF**

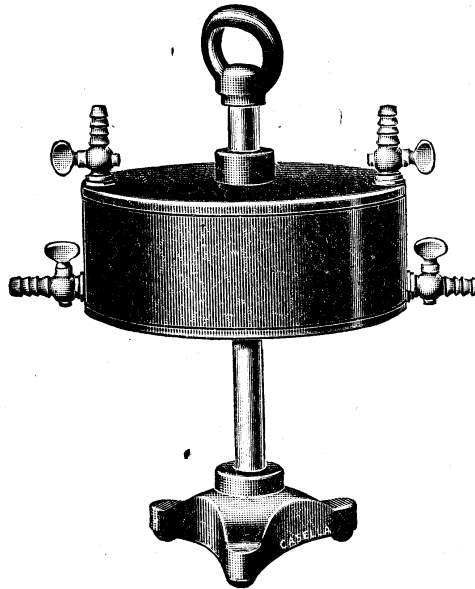
M 792. **Scale range, 0 to $6\frac{3}{4}$ in., in mahogany case MKLEB**

18×8×7 $\frac{1}{2}$ in. 46×20×19 cm. 16 lb. 7 k. in case.

A further use for the smaller version of this instrument, viz. : M 794 is for taking levels of foundations, shafting, machinery, rails, etc., which can be obtained to the value stated above, viz. : 0.01 mm. or 0.001 in. This usually involves having another measuring chamber M 798 on a simpler stand to act as zero with a capacity chamber M 800. With this set-up, long lengths such as printing press beds, test tank rails, turbine and generator shafts, etc., can be levelled over large distances such as 400 feet.



MEASURING POINT MANOMETER FOR ACCURATE LEVELLING



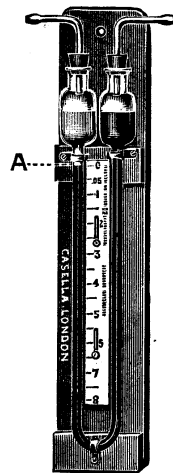
M 800

A special base is provided with a screw thread of a standard series so that the instrument can be made to fit on any shape, such as rails, shafts, etc., by means of special adaptors. The length of the column is reduced, since levels are only required to small differences of height. This short column enables the instrument to be used in more confined spaces than was formerly the case.

- | | | |
|--------|---|-------|
| M 794. | Measuring Chamber, on stand, millimetre scale
with fine adjustment, in mahogany case | MKLIV |
| M 796. | Ditto, inch scale | MKLOP |
| M 798. | Ditto, but on simpler stand, fine adjustment, no scale | MKLUT |
| M 800. | Cistern, 9 in. (23 cm.) on stand
16×13×9 in. 41×33×23 cm. 11½ lb. 5·2 k. | MKNAG |
| M 802. | Special Rubber Tubing for joining the bottoms of
the chambers and cisterns, per foot | MKNEC |
| M 804. | Ordinary Rubber Tubing , for joining the tops of
the chambers and cisterns, for use out of doors in
gusty weather, per foot | MLCAW |



DIFFERENTIAL PRESSURE AND VACUUM GAUGE



M 806

This is a convenient manometer, mounted on an oak board, for measuring light currents, such as the draught in flues. The construction of the gauge will be seen clearly from the illustration. The lower part of the U-tube is of narrow bore, but each limb terminates in a chamber having a cross section of much greater area.

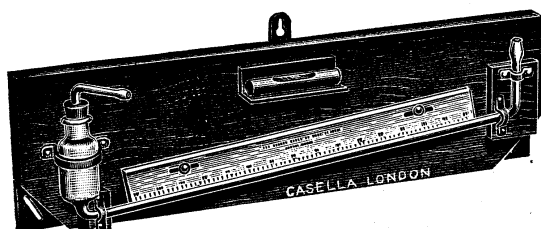
Two liquids are used, which are of different colours and do not mix, the junction between the two (marked A in the figure) forming the index by which the pressure or vacuum is read on the scale. The movement of the surface at A is magnified in proportion to the difference in areas between the cross sections at the wide and the narrow parts of the U-tube—usually about 10 to 1.

The limit of difference of levels in the large chambers is, for the ordinary pattern one inch, but special gauges can be made with a maximum difference greater than this. The scale is divided to 0.05 in. and two bottles of liquid are provided.

M 806.	Range 1 in., scale in twentieths	...	...	...	MKNIW
M 808.	Range, 25 mm., scale in millimetres	...	...	...	MKNOR
	$18\frac{1}{2} \times 3\frac{1}{2} \times 2$ in.	$47 \times 9 \times 5$ cm.	$1\frac{1}{4}$ lb.	0.5 k.	
M 810.	Range, 2 in., scale in twentieths	...	...	...	MKNUB
M 812.	Range, 50 mm., scale in millimetres	...	...	...	MKPAL
	$40 \times 3\frac{1}{2} \times 2$ in.	$100 \times 9 \times 5$ cm.	3 lb.	1.3 k.	



WATER GAUGES



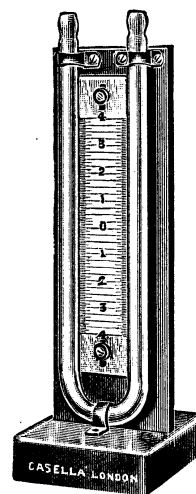
For those who prefer the simplicity of water, but who want more accuracy than a plain "U" tube, this gauge will be found most useful. It has a range of 0 to 1.5 in. (0 to 40 mm.) and can be read directly to 0.02 in. (0.5 mm.)

For this and any other water gauge we recommend the use of a wetting agent. This has the advantage of making the meniscus of more constant shape with increasing and decreasing pressures.

- | | | | | | |
|--------|-------------------------------------|------------------|---------------------|--------|--------|
| M 814. | Inclined Water Gauge, inches | ... | ... | ... | MKPED |
| M 816. | Ditto, millimetres | ... | ... | ... | MKPIX |
| | | 19 × 6½ × 2½ in. | 48 × 16.5 × 6.5 cm. | 2½ lb. | 1.3 k. |

U Tube Gauge, simple form, adjustable box-wood scale, wooden mount, divided to 0.2 in. or 1 mm.

- | | | | | | |
|--------|----------------|--------------------|-------|--------|-------|
| M 818. | Range, 4 in. | ... | ... | ... | MKPOT |
| M 820. | „ 6 in. | ... | ... | ... | MKPUC |
| M 822. | „ 10 in. | ... | ... | ... | MKRAN |
| M 824. | „ 12 in. | ... | ... | ... | MKREF |
| M 826. | „ 10 cm. | ... | ... | ... | MKRIB |
| M 828. | „ 15 cm. | ... | ... | ... | MKROV |
| M 830. | „ 25 cm. | ... | ... | ... | MKRUD |
| M 832. | „ 30 cm. | ... | ... | ... | MKTAP |
| M 818. | 10 × 6 × 5 in. | 25.5 × 15 × 13 cm. | 1 lb. | 0.45 k | |

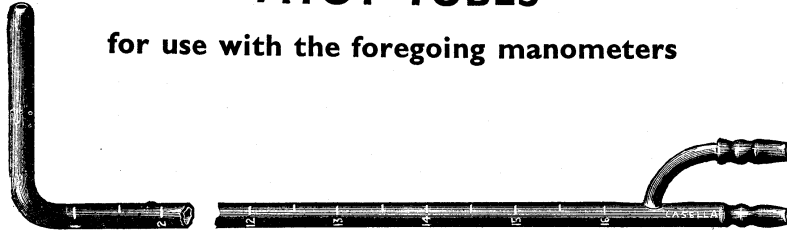


M 818



PITOT TUBES

for use with the foregoing manometers



Combined Pitot and Static Tube, in brass, concentric tubes, N.P.L. pattern, this is not suitable for use in pipes less than 6 in. diameter

	Overall length	Divided in	Weight	Code
M 834.	18 in.	$\frac{1}{2}$ in.	5 oz. ...	MKTEG
M 836.	46 cm.	cm.	140 grams. ...	MKTIC
M 838.	24 in.	$\frac{1}{2}$ in.	6 oz. ...	MKTOW
M 840.	61 cm.	cm.	160 grams. ...	MKTUF
M 842.	36 in.	$\frac{1}{2}$ in.	8 oz. ...	MKVAR
M 844.	92 cm.	cm.	220 grams. ...	MKVEL
M 846.	48 in.	$\frac{1}{2}$ in.	10 oz. ...	MKVID
M 848.	122 cm.	cm.	280 grams. ...	MKVOX
M 850.	N.P.L. Certificate ...	...	...	MKVUG

Formulae, for normal conditions of temperature, gravity and pressure:

$$V = 4.01 \sqrt{h}$$

V = velocity in metres/sec.

h = pressure height, mm. of water

$$V = 66.2 \sqrt{h}$$

V = velocity in feet/sec.

h = pressure height, in. of water



M 852.	Combined Pitot and Static Tube , another form, in brass, stem divided in half inches. Overall length $11\frac{1}{2}$ in. (29 cm.)	$11\frac{1}{2} \times 2 \times 1\frac{1}{4}$ in.	6 oz....	MLBAV
M 854.	Ditto , in centimetres.	$29 \times 5 \times 3$ cm.	160 grams.	MLBED
	Formulae, $V = 3.33 \sqrt{h}$.	$V = 54.9 \sqrt{h}$		
M 856.	Rubber Tubing , per yard	...	...	MLBIX



DESCRIPTION OF HYGROMETERS

Hygrometers of the conventional, well tried types fall into classes ; the use to which the subsequent information is to be put, the convenience of operating and the accuracy determining the class chosen.

The simplest type is one employing two matched thermometers, one of which has a wetted muslin sleeve fitted over the bulb. Evaporation of the water from the so-called "wet bulb" causes its temperature to drop and produce a "depression," from which the relative humidity may be determined by means of tables. This type is most often used in factories and store rooms where air movement is relatively constant.

To obtain more reliable results an induced ventilation is required over the wet bulb since it has been found that as ventilation is increased the depression increases, but that above a critical value no further depression is produced. To provide this ventilation simply the "whirling" or "sling hygrometer" can be used as shown on pages 102 and 103.

A more accurate instrument on the same principle is the Assmann Hygrometer which employs mechanical means of providing ventilation as shown on page 104.

The dew point instruments have a different method which has a definite theoretical basis. A brightly polished surface is cooled by ether or other medium, until the formation of dew is seen. The mean temperature between the formation and disappearance of the deposit is the temperature at which the original air would be saturated. The relative humidity can then be obtained from tables.

For many meteorological and industrial purposes the simplest and most satisfactory method of measuring the relative humidity directly, is by using a substance whose dimensions change markedly with change in relative humidity. Of the known substances, human hair is the most widely used and reliable and forms the basis for all our direct reading hygrometers and hygrographs.



WET AND DRY BULB THERMOMETERS

**Suitable for mounting in Wall or Stevenson Screens
Glass Sheath pattern.**

- M 860. **Range, 0° to 130°F. in 1°** MLCEF
- M 862. **Ditto, -15° to +55°C. in ½°** MLCIB
13 in. 33cm. 2½ oz. 70 grams.
- M 864. **N.P.L. Certificate** MLCOX

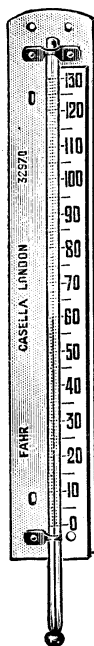
Porcelain Scale mount, 9¾ in. (24.5 cm.)

- M 866. **Range, 0° to 130°F. in 1°** MLCUD
- M 868. **Ditto, -15° to +55°C. in ½°** MLDEX
11 in. 28 cm. 3 oz. 80 grams.
- M 870. **N.P.L. Certificate** MLDEG
- M 872. **M.O. pattern threaded wick for wet bulb** MLDIC

Humidity Tables for above, see page 99.



M 860



M 866



MASON'S HYGROMETER

Mason's Hygrometer, Kew pattern mounted on polished mahogany board, porcelain scales 10 in. (25 cm.)

Recommended for use in Stevenson Screen M 586, illustrated on page 73.

For Thermometers without boards, see page 98.

M 874. **Range, 0° to 130°F. in**
1° MLDOB

M 876. **Ditto, -15° to +55°C.**
in ½° MLDUF

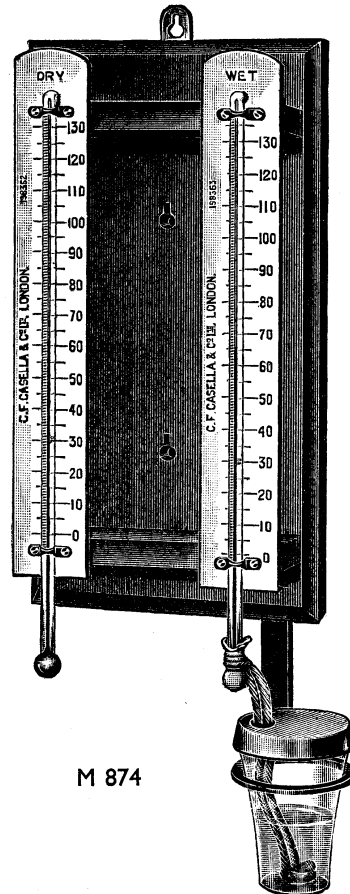
M 878. **N.P.L. Certificates**
for both thermo-
meters MLFAB

M 880. **Tables for Mason's**
Hygrometers (M.O.
265), Fahrenheit ... MLFEK

M 882. **Ditto for Mason's Hygrometers, Centigrade** ... MLFID

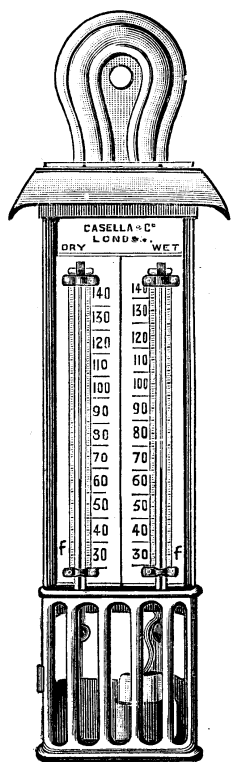
M 884. **M.O. pattern threaded wick for wet bulb** ... MLFOC

13 × 5½ × 2 in. 33 × 14 × 5 cm. 1¼ lb. 0.5 k.





MASON'S HYGROMETER



M 886

Mason's Hygrometer, in painted metal case, with screen to protect the bulbs and reservoir ; best quality. Made in two sizes :—

Length of scale, 8 in. (20 cm.) overall 14 in. (36 cm.)

Ditto, 10 in. (25 cm.) overall 16 in. (40 cm.)

Fahrenheit, range, 30° to 140°F.

Centigrade, range, 0° to 60°C.

Opal Glass Scale

M 886.	8 in. F.	...	...	...	MLFUG
M 888.	20 cm. C.	...	...	...	MLGAC
M 890.	10 in. F.	...	...	...	MLGEN
M 892.	25 cm. C.	...	...	...	MLGIF

Boxwood Scale

M 894.	8 in. F.	MLGOD
M 896.	20 cm. C.	MLGUK
M 898.	10 in. F.	MLKAG
M 900.	25 cm. C.	MLKEP
	14×3×2 in. 10 oz.	
	36×7.5×5 cm. 280 grams.	

Zinc Scale

M 902.	8 in. F.	MLKIK
M 904.	20 cm. C.	MLKOF
M 906.	10 in. F.	MLKUL
M 908.	25 cm. C.	MLNAK
	16×3×2 in. 14 oz.	
	40×7.5×5 cm. 390 grams.	

Copper case, in place of painted case.

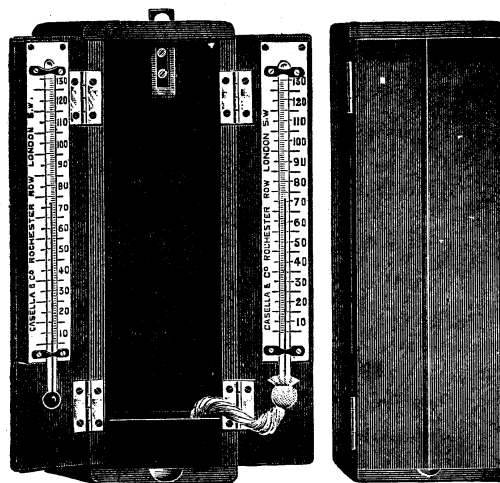
M 910.	8 in. or 20 cm.	...	...	...	MLNER
M 911.	10 in. or 25 cm.	...	...	...	MLNIG

Humidity Tables for above, see page 99.

Spare Muslin and Wicks, see page 99.



MASON'S HYGROMETER



Mason's Hygrometer, pocket form, in polished mahogany case with hinged doors. Very compact, and suitable for travellers and exploring expeditions; constructed as a companion to the pocket set of thermometers Nos. M 712 and M 714.

M 912. Range, 30° to 130°F. in 1° MLNIG

M 914. Range, 0° to 55°C. in 1° MLNOK

$6\frac{3}{4} \times 2\frac{1}{4} \times 1\frac{3}{8}$ in.

$6\frac{1}{2}$ oz.

17 × 6 × 3.5 cm.

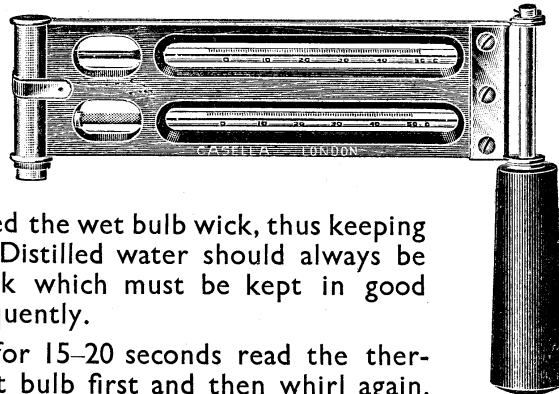
170 grams.



WHIRLING HYGROMETER

As mentioned on page 97 ventilating the wet bulb gives greater accuracy of humidity determination. In this instrument the frame has a metal reservoir at

one end into which is dipped the wet bulb wick, thus keeping it continually moistened. Distilled water should always be used for wetting the wick which must be kept in good condition and changed frequently.



After whirling rapidly for 15–20 seconds read the thermometers quickly, the wet bulb first and then whirl again. This is repeated until two consecutive readings are the same, when the depression of the wet bulb against the dry bulb reading will give the humidity from the tables. During whirling, the hygrometer should be shielded from solar radiation and held as far from the body as possible with the hygrometer up-wind if wind is present. It is sometimes advisable in still air to step backwards and forwards while whirling, since the presence of the hygrometer and the observer may set up local variations in humidity.

The thermometers are etched on the stem with lens fronts, and have a scale length of about 4 inches (100 mm.)

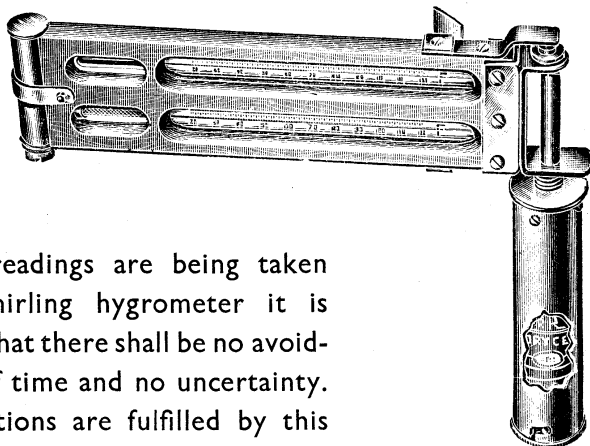
M 916.	Range,	0° to 100°F. in 1°	...	...	...	MLNUP
M 918.	„	20° to 120°F. in 1°	...	...	...	MLPAN
M 920.	„	50° to 150°F. in 1°	...	...	...	MLPET
M 922.	„	–15° to +45°C. in $\frac{1}{2}^{\circ}$	...	...	...	MLPIR
M 924.	„	–5° to +50°C. in $\frac{1}{2}^{\circ}$	...	...	...	MLPOV
M 926.	„	10° to 65°C. in $\frac{1}{2}^{\circ}$	...	...	...	MLPUW
M 928.	Leather Sling Case	...	...	...	...	MLRAP
M 930.	Tables, Fahrenheit (Marvin's)	...	...	...	...	MLREV
M 932.	„ Centigrade	...	...	...	...	MLRIT
M 934.	N.P.L. Certificates for two thermometers	...	...	...	...	MLROW
M 936.	Spare Thermometer, $6\frac{1}{2}$ in. (16.5 cm.)	state	...	...	...	MLRUX
	range	...	...	...	...
M 938.	Spare Wicks, each	...	...	...	...	MLTAR
M 940.	Ditto, per yard	...	...	...	...	MLTEW

$8\frac{1}{4} \times 6\frac{3}{4} \times 1\frac{1}{4}$ in. $21 \times 7 \times 3$ cm. $7\frac{1}{2}$ oz. 200 grams.

In case, 1 lb. 0.45 k.



WHIRLING HYGROMETER WITH ILLUMINATED SCALES



When readings are being taken from a whirling hygrometer it is important that there shall be no avoidable loss of time and no uncertainty. Both conditions are fulfilled by this instrument, which is particularly convenient for use on a dull day or in a dark situation. The scales are illuminated by a small lamp, dry cells being fitted into the handle of the hygrometer.

M 942.	Range,	0° to 100°F. in 1°	...	...	...	MLTIV
M 944.	„	20° to 120°F. in 1°	...	...	...	MLTOX
M 946.	„	50° to 150°F. in 1°	...	...	...	MLTUT
M 948.	„	-15° to +45°C. in ½°	...	...	...	MNBAC
M 950.	„	-5° to +50°C. in ½°	...	...	...	MNBEW
M 952.	„	10° to 65°C. in ½°	...	...	...	MNBIR
M 954.	Leather Sling Case	...	...	...	...	MNBOK
M 956.	Tables, Fahrenheit (Marvin's)	...	...	...	...	MNBUD
M 958.	„	Centigrade	...	...	...	MNCAD
M 960.	N.P.L. Certificates, for 2 thermometers	...	...	...	...	MNCEX
M 962.	Spare Thermometer, 6½ in. (16.5 cm.)	state	...	...	...	MNCIT
	range	...	...	...	...
M 964.	Spare Wicks, each	...	...	...	...	MNCOL
M 966.	Ditto, per yard	...	...	...	...	MNCUF
	Hygrometer, 8½ × 8 × 2 in.	22 × 20.5 × 5 cm.	1 lb.	0.45 k.		



ASSMANN HYGROMETER

FOR DETERMINING HUMIDITY

This Hygrometer is a special form of the wet and dry bulb type in which the wet bulb is kept ventilated by means of a fan until an equilibrium point is reached.

The bulbs are screened from radiation by polished and plated tubes so that the instrument can be used in bright sunshine without errors. It will give correct results when used in aircraft and for meteorological observations no Stevenson screen is necessary.

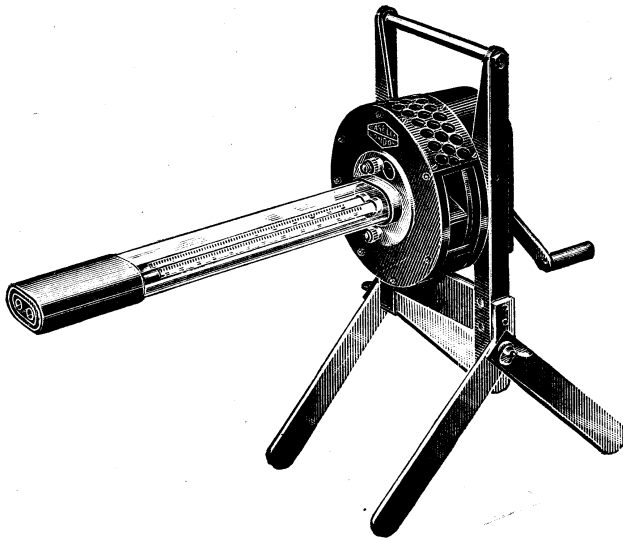
The muslin covering the wet bulb is moistened, but not soaked, before each observation by means of the tube and rubber bulb provided. Distilled or filtered rain water should be used, and the muslin renewed when dirty or greasy.

The frame carrying the thermometers has been re-designed and is now made of a transparent plastic. Interchangeable electric, clockwork, or hand driven fans are available. In all cases the speed of air movement past the wet bulb is more than sufficient to ensure that equilibrium conditions are always obtained.

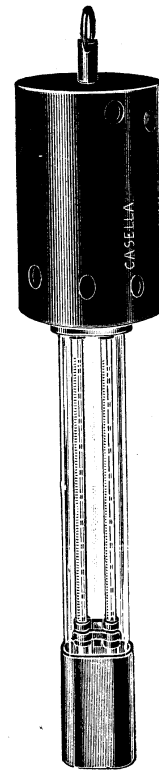


ASSMANN HYGROMETER

Improved patterns, as supplied to the British and other
Meteorological Offices



Hand Drive
M 974



Electric or Clock Drive
M 970 or M 972



- M 970. **Assmann Hygrometer, Clock Drive** MNDEB
 23×5½×5 in. 58×14×13 cm. 8½ lb. 3·8 k.
- M 972. **Assmann Hygrometer, Electric Drive** 110 v. or
 200/250 v. MNDIV
 23×5½×5 in. 58×14×13 cm. 8½ lb. 3·8 k.
- M 974. **Assmann Hygrometer, Hand Drive** MNDOP
 19×14×7½ in. 48×35×19 cm. 7 lb. 3·1 k.

M 970 and M 972 are complete in case with 2 stem-divided thermometers, wick, rubber bulb, glass tube, pinch cock and suspension rod.

State the range of thermometers required from the list below.

- M 976. **Fahrenheit, 0° to 100° in 1°** MNDUG
- M 978. „ 20° to 120° in 1° MNFAG
- M 980. „ 40° to 140° in 1° MNFEC
- M 982. „ 50° to 150° in 1° MNFIW
- M 984. **Centigrade, —15° to +40° in ½°** MNFOR
- M 986. „ —5° to +50° in ½° MNFUK
- M 988. „ 5° to 60° in ½° MNGAK
- M 990. „ 10° to 65° in ½° MNGED
 Scale length 6 in. (15 cm.). Overall length, 11 in. (28 cm.)
- M 992. **N.P.L. Certificates** for 2 thermometers MNGIX
- M 994. **Tables, Fahrenheit** (Marvin's) MNGOT
- M 996 **Tables, Centigrade** MNGUL
- M 998. **Spare Wicks, each** MNKAL
- M 1000. **Ditto, per yard** MNKEF



DEW POINT APPARATUS

This hygrometer was designed chiefly to meet a demand from entomologists and botanists and is suitable also for use with stored products and materials. It is compact, robust and convenient.

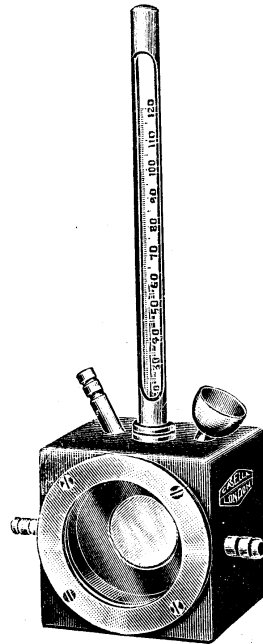
A thermometer passes into an ether chamber in front of which is a compartment for holding the sample of air under examination, the capacity of which is 10 ml. Air is drawn into the sample chamber by means of a rubber bulb or by sucking the end of a rubber tube, and the temperature is lowered to the dew point by evaporating ether in the usual way. The use of a flat mirror in front of the thermometer bulb in place of the customary curved thimble adds greatly to the ease and accuracy of the dew point observations.

As a further aid in easy recognition of the dew point, one half of the mirror is lagged so that dew only forms on one half.

To special order we can supply a thermo-couple soldered to the mirror in place of the thermometer.

The length of the thermometer scale is $2\frac{3}{4}$ in. (70 mm.)

$6\frac{3}{4} \times 3 \times 1\frac{3}{4}$ in. $17 \times 7\frac{1}{2} \times 4\frac{1}{2}$ cm. 7 oz. 200 grams.



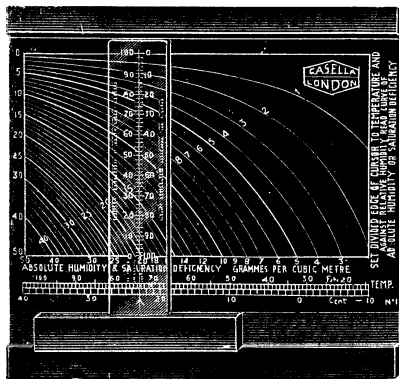
M 1010.	With Fahrenheit Thermometer, 0° to 90° in 1°	MNLEG
M 1012.	Ditto, 30° to 120° in 1°	MNLIC
M 1014.	With Centigrade Thermometer -20° to +35° in $\frac{1}{2}$ °	MNLOW
M 1016.	Ditto, 0° to 50° in $\frac{1}{2}$ °	MNLUR
M 1018.	Rubber Aspirator for use with above	MNPAR
M 1020.	Spare Thermometer, state range	MNPEK
M 1022.	N.P.L. Certificate	MNPID



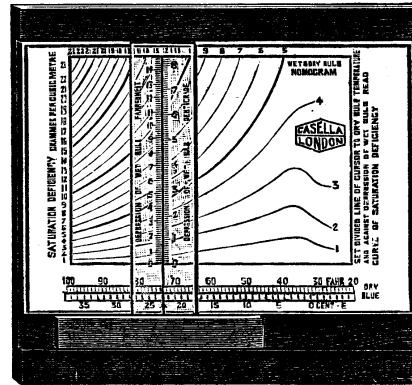
HUMIDITY NOMOGRAMS

Designed by Dr John R. Baker

The following Nomograms allow the drying power of the air, in which one is primarily interested to be determined accurately and quickly. They are made in two patterns.



M 1024



M 1026

The graph lines are in white on a black ground, mounted on a black plastic board with a straight edge on which the cursor is moved.

M 1024. **No. 1** for use when the relative humidity is known MNPOX

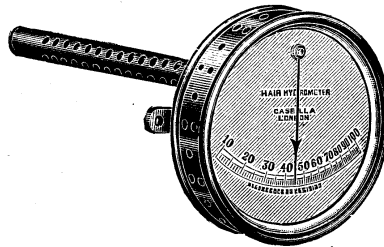
M 1026. **No. 2** for use with wet and dry bulb thermometers over the range of 20° to 100°F. and -7° to 38°C. MNPUT

8 × 7½ × ½ in. 20 × 19 × 1.5 cm. 14 oz. 350 grams.



HUMIDITY INSTRUMENTS

Hair Hygroscope, indicating on a dial the percentage of humidity ; made in two forms, with **horizontal stem** as in illustration or with **vertical stem** ; 5 in. dial (12½ cm.) The range is 20 % to 100%, not 10% as illustrated.



M 1028

(Accuracy about 10%).

M 1028. **Horizontal stem**, 12 in. (30 cm.) MNRAT

M 1030. **Vertical stem**, 10½ in. (26.5 cm.) MNREL

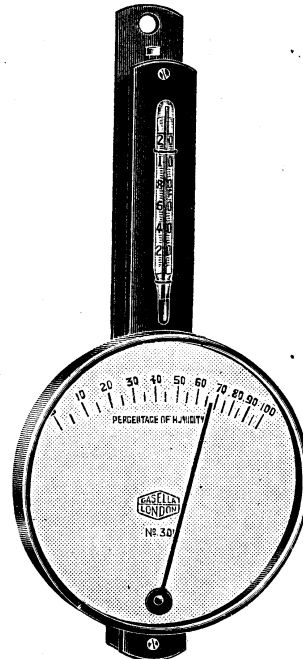
14 × 5¾ × 5¾ in. 36 × 14.5 × 14.5 cm. 2 lb. 1 k.

Hair Hygroscope with Thermometer, or **Polymer**, giving temperature and percentage of humidity at a glance, 4 in. dial (10 cm.) Accuracy about 5%.

M 1032. **Fahrenheit Thermometer** MNRIF

M 1034. **Centigrade ditto** MNROB

9½ × 4⅝ × ¾ in. 24 × 12 × 2 cm. 2 lb. 1 k.

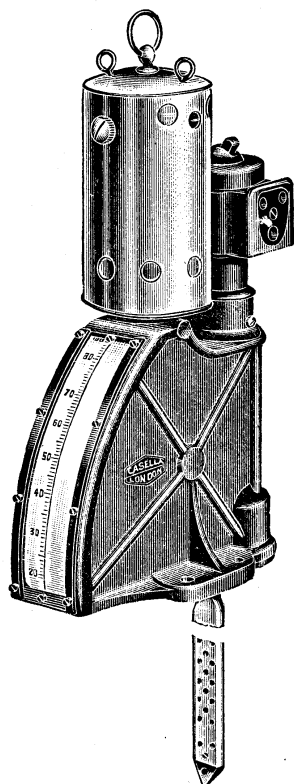


M 1032



ASPIRATED HAIR HYGROMETER

In most forms of indicators and recorders the bundle of hairs is called upon to perform a certain amount of work, and is, therefore, usually under considerable tension. This is found to be a disadvantage since the tension tends to make the readings inaccurate when the hair is subjected to prolonged exposure at extremes of humidity, and/or temperature and is then returned to normal.



In this instrument one end of the hair is fixed at the outer end of a perforated tube. The other end of the hair is attached to a small pivoted spindle to which an optical lever is fixed. Thus, very weak forces can be employed. A patch of light travels up and down a translucent scale on the front of the instrument divided in percentages of relative humidity.

An electrically driven fan is attached to the top of the case which draws air over the bundle of hairs and assists in bringing stable readings in about one-tenth of the time required with the usual type.

(Accuracy about 1%).

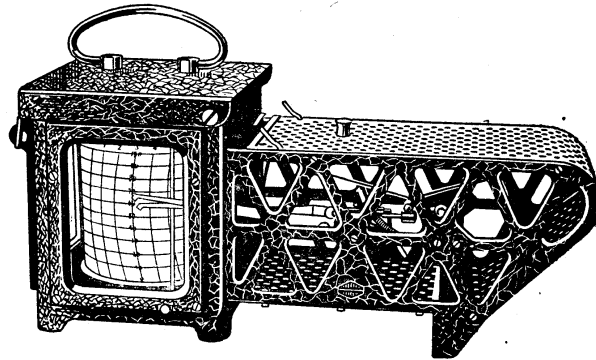
M 1036. Complete with resistance MNRUV

Hygrometer, 7½ lb. 3.5 k. 24 × 8 × 4 in. 61 × 20 × 10 cm.

Resistance, 5¼ lb. 2.4 k. 15 × 6½ × 4½ in. 38 × 16 × 11.5 cm.



THERMO-HYGROGRAPH



M 1040. **Thermo-Hygrograph.** Temperature and percentage of humidity are both recorded on the chart of this instrument, different coloured inks being used for the two pens. It is in common use in cotton mills, tobacco factories, etc., in all parts of the world and is one of our most popular recorders. With 55 charts, inks and instructions MNTEP

Stock Series of Ranges

Supplied with either **Weekly** or **Daily** clock, both run for a week without rewinding. Please state which is required.

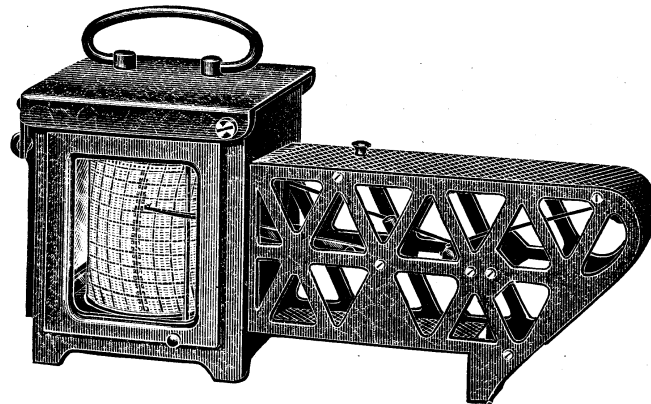
Fahrenheit	Humidity	Centigrade	Humidity
-10° to 90°	... 0 to 100%	-25° to +25°	... 0 to 100%
0° to 100°	... 0 to 100%	-10° to +40°	... 0 to 100%
10° to 110°	... 10 to 100%	-5° to +45°	... 0 to 100%
20° to 120°	... 0 to 100%	0° to 50°	... 0 to 100%
30° to 130°	... 0 to 100%	30° to 80°	... 0 to 100%
80° to 180°	... 0 to 100%	50° to 100°	... 0 to 100%
14×6×6½ in. 35×15×16 cm. 8 lb. 4 oz. 3.7 k.			

M 1042. **Extra Charts**, 55, 11¼×3⅞ in. MNTIG
 M 1044. **Extra Charts**, per 100, 30×9 cm. MNTOC
 M 1046. **Charts for special range**, if required, 55 MNTUW
 M 1048. **Ditto**, per 100 MPBAX

For details of spares for the above instrument, see page 112.



HAIR HYGROGRAPH



Hair Hygograph. This recorder is similar to No. M 1040, except that there is no thermograph element. The curve indicates percentage of relative humidity on an equal scale and the instrument is suitable for works and general laboratories, mines, textile mills, hospitals, etc.

M 1050.	Weekly Clock,	55 charts, ink and instructions	MPBET
M 1052.	Daily Clock,	" " " " ...	MPBIL
		14×6×6½ in. 35×15×16 cm. 7½ lb. 3 k.	
M 1054.	Extra Charts,	55, 11¼×3⅞ in. ...	MPBOF
M 1056.	Extra Charts,	per 100, 30×9 cm. ...	MPBUC

Spare Parts for Thermographs and Hygographs

M 1058.	Clock, Daily	(26 hours) wound once a week	... MPCAB
M 1060.	Clock, Weekly	(8 days)	... MPCEV
M 1062.	Set of Change Wheels	to convert daily to weekly or vice versa	... MPCIN
M 1064.	Pen,	long pattern	... MPCOG
M 1066.	Pen,	short pattern	... MPCUD
M 1068.	Pen Arm,	for temperature element	... MPDAC
M 1070.	Pen Arm,	for humidity element	... MPDEW
M 1072.	Bottle of Ink		... MPDIR
M 1074.	Bundle of Prepared Hairs		... MPDOK
M 1076.	Spring	for humidity cams	... MPDUF



RAIN GAUGES

The gauge should be firmly planted in level ground to such a depth that the rim is 1 foot above the surface, and it should be placed at some distance from buildings or trees, the distance being, if possible, not less than twice the height of the object. In many cases the gauge will be placed on the same plot as the thermometer screen ; if so, in the British Isles it should be 10 feet from the screen, and on its southern side, as the sheltering effect will be reduced to a minimum here owing to the fact that northerly winds are the driest.

The rain is measured by pouring the contents of the inner can or bottle into the measuring jar which accompanies the gauge. The jar is usually graduated to hundredths of an inch, holding $\frac{1}{2}$ or 1 inch, or to tenths of a millimetre, holding 10 or 20 mm.

Snow is melted by warming the gauge or by adding a known volume of warm water, and measured as rain. A special form of jacketed funnel is also provided at an extra charge ; this is called a **snow-melting chamber** ; it is filled with hot water which melts the snow collected in the funnel.



M 1080

8-INCH RAIN GAUGES

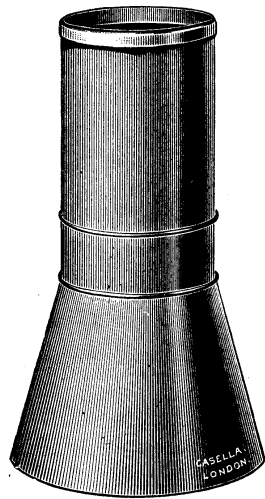
British Meteorological Office Patterns

The rain gauges recognized by the British Meteorological Office, and consequently the only kinds used by its observers, have a deep funnel, known as the "Snowdon funnel," which permits of the correct measurement of snow and prevents loss of rain by splashing. The dimensions of the gauge are : diameter, 8 inches (20.3 cm.) ; height, 22 inches ; capacity about 13 inches. Weight 10 lb. (4.5 k.)

M 1080.	Stout Copper , with glass measure, $\frac{1}{2}$ in.	...	MPFEX
M 1082.	Ditto , with glass measure, 10 mm.	...	MPFIT
M 1084.	Leaded Iron , with glass measure, $\frac{1}{2}$ in.	...	MPFOL
M 1086.	Ditto , with glass measure, 10 mm.	...	MPFUG
M 1088.	M.O. Certificate for gauge and jar	...	MPGAF



RAIN GAUGES

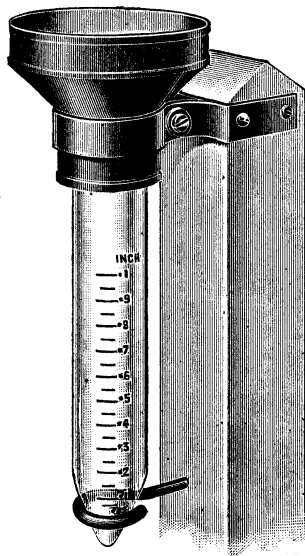


M 1090

M 1090. **8-inch Rain Gauge with splayed base**, enabling it to be fixed more firmly in the ground ; **in stout copper** with glass measure, $\frac{1}{2}$ in. (capacity 13 inches) **MPGEB**

M 1092. **Ditto**, with glass measure, 10 mm. **MPGIV**

M 1094. **M.O. Certificate for gauge and jar** ... **MPGON**
 $24 \times 14 \times 14$ in. 12 lb.
 $60 \times 36 \times 36$ cm. 5.4 k.



M 1096

RAIN GAUGE FOR FIXING TO A POST

This gauge is not provided with a deep Snowdon funnel and is therefore unsuitable for official records, but it is inexpensive and convenient and may be fixed without trouble to a post or fence.

The funnel is made of galvanized iron sprayed with blue cellulose paint, the measure is of stout glass, accurately divided to $\frac{1}{20}$ th inch of rain (or 1 mm.), throughout its length, and tapered at the base so that light rainfall may be measured to $\frac{1}{40}$ th inch (or 0.5 mm.)

Capacity 1 in. or 25 mm.

M 1096. **Diameter of rim**, 5 in., inch reading ... **MPGUK**

M 1098. **Ditto**, rim 127 mm., millimetre reading ... **MPKAG**

$15 \times 5 \times 5$ in. $38 \times 12.5 \times 12.5$ cm. $1\frac{1}{2}$ lb. 0.6 k.



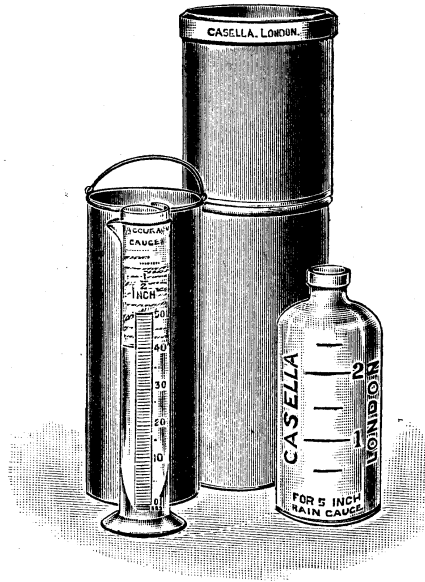
RAIN GAUGES

CASELLA'S INSULATED SNOWDON RAIN GAUGE

The ordinary Snowdon gauge has a metal funnel 5 inches in diameter, with a vertical rim, 4 inches deep. This funnel fits over a metal cylinder, which is sunk into the ground, and contains a metal can, and within it a glass bottle in which the rain is collected, capacity about $5\frac{1}{2}$ in. (14 cm.)

Casella's pattern is a 5-inch (127 mm.) gauge similar in dimensions and capacity to an ordinary Snowdon, but has the advantage that it is almost **impossible for the contents to freeze in winter or evaporate in summer.** The advantage of the former point will be readily admitted by anyone who has experienced the trouble of melting the ice in his gange.

With each gauge is supplied a "Camden" jar (holding $\frac{1}{2}$ in. or 10 mm.), and an inner bottle.



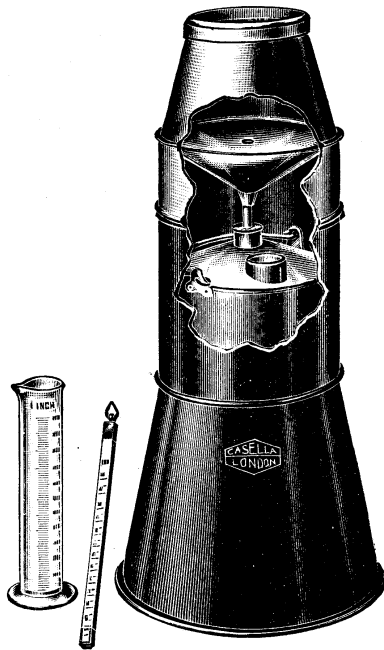
17×5 in. 43×12.7 cm. 6 lb. 2.7 k.

M 1100.	Copper Case,	with glass measure,	$\frac{1}{2}$ in. ...	...	MPKEC
M 1102.	Ditto	" "	" 10 mm. ...	...	MPKIW
M 1104.	Leaded Iron	" "	" $\frac{1}{2}$ in. ...	...	MPKOR
M 1106.	Ditto	" "	" 10 mm. ...	...	MPKUL
M 1108	M.O. Certificate	for gauge and jar	...	...	MPLAK



MONTHLY RAIN GAUGES WITH 5-INCH FUNNELS

The **Octapent Rain Gauge** intended for the monthly measurement of rainfall, is provided with the funnel of a five-inch gauge and the body of an eight-inch. The splayed outer body and the inner can are made of sheet copper, the lower part of the body being japanned black.



A graduated dip rod and a jar No. M 1134 are included in the price, also a "frost protector" consisting of a reinforced rubber tube with a lead plug at one end, size $18 \times 2\frac{3}{8}$ in. (45×6 cm.). If the water in the gauge becomes frozen the "frost protector" takes up the expansion and no damage is done to the instrument.

Capacity of the inner can, 27 in. (68 cm.).

- | | | | | |
|---------|---|-----|-----|--------|
| M 1110. | With jar divided in hundredths of an inch | ... | ... | MPLIED |
| M 1112. | With jar divided in millimetres | ... | ... | MPLIX |
| M 1114. | Without frost protector | ... | ... | MPL0T |

$27 \times 13\frac{1}{4} \times 13\frac{1}{4}$ in. $68 \times 34 \times 34$ cm. 13 lb. 5.8 k.

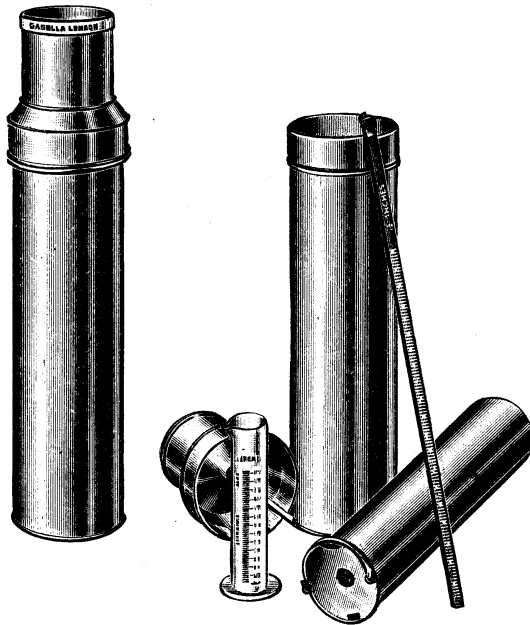


MONTHLY RAIN GAUGES WITH 5-INCH FUNNELS

The gauges described below are 28 in. (72 cm.) in height, hold about 18 in. (46 cm.) of rain, and are largely employed by waterworks' engineers and by observers who wish to measure the rainfall in more or less inaccessible places where it is not convenient to visit the gauge more than once a month. They are provided with :

An inner can ;

A measuring jar, 1 in. or 20 mm.



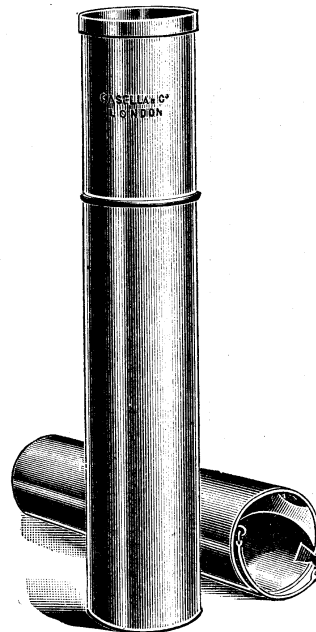
M 1116

M 1116. **Copper insulated**,
 capacity, 18 in. (46
 cm.) MPLUN
 32×7×7 in. 80×18×18 cm.
 10½ lb. 4·7 k.

M 1118. **Copper**, not insulated,
 capacity 18 in. (46
 cm.) MPNAL

M 1120. **Leaded Iron**, not in-
 sulated, capacity 18
 in. (46 cm.) MPNEF
 29½×5×5 in. 74×12·5×12·5 cm.
 8 lb. 3·6 k.

M 1122. **M.O. Certificate** for gauge and jar MPNIB



M 1118

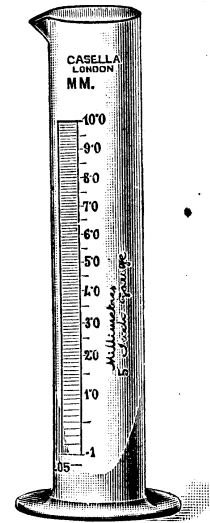


MEASURING JARS FOR RAIN GAUGES

**Camden pattern, tapered at bottom,
the engine-divided scale and figures are etched**

5-inch (127 mm.)

M 1124.	$\frac{1}{2}$ in. in 0.01 in.	...	...	...	MPNOV
M 1126.	10 mm. in 0.1 mm.	...	...	...	MPNUR
	10×3×3 in.	11 oz.			
	25×8×8 cm.	300 grams.			
M 1128.	M.O. Certificate	...	...	...	MPRAN



M 1126

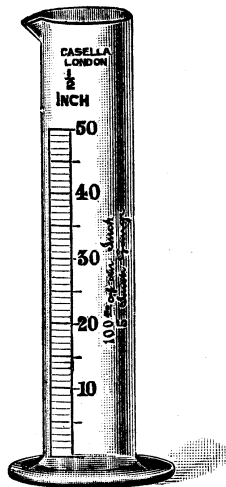
**Ordinary pattern, flat bottom, the engine-divided
scale and figures are etched**

5-inch Gauge (127 mm.)

M 1130.	$\frac{1}{2}$ in.	...	...	...	MPREG
M 1132.	10 mm.	...	...	...	MPRIC
M 1134.	1 in.	...	...	...	MPROW
M 1136.	20 mm.	...	...	...	MPRUT

8-inch Gauge (203 mm.)

M 1138.	$\frac{1}{2}$ in.	...	...	...	MPTAR
M 1140.	10 mm.	...	...	...	MPTEK
	10×3½×3½.	25×9×9 cm.	13 oz.	360 grams.	
M 1142.	M.O. Certificate	...	...	...	MPTID



M 1130



BRITISH METEOROLOGICAL OFFICE PATTERNS

The following measures are made to the design of the British Meteorological Office.

As the illustration shows, the shape of the lower end of the jar is more truly conical than the Camden jars listed above and it is easier to read small quantities with accuracy.

The fact that the jar has no base to stand on has not been found to be a serious drawback.

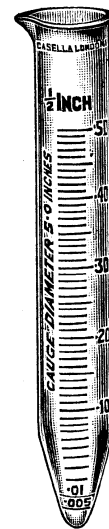
The engine-divided scale and figures are etched

5-inch Gauge (127 mm.)

M 1144.	$\frac{1}{2}$ in.	...	...	...	...	MPTOX
M 1146.	10 mm.	...	...	...	...	MPTUV

8-inch Gauge (203 mm.)

M 1148.	$\frac{1}{2}$ in.	...	...	...	...	MRBAW
M 1150.	10 mm.	...	...	...	...	MRBEK
M 1152.	M.O. Certificate	...	...	...	...	MRBIX



M 1144

MEASURING JARS FOR SPECIAL RANGES

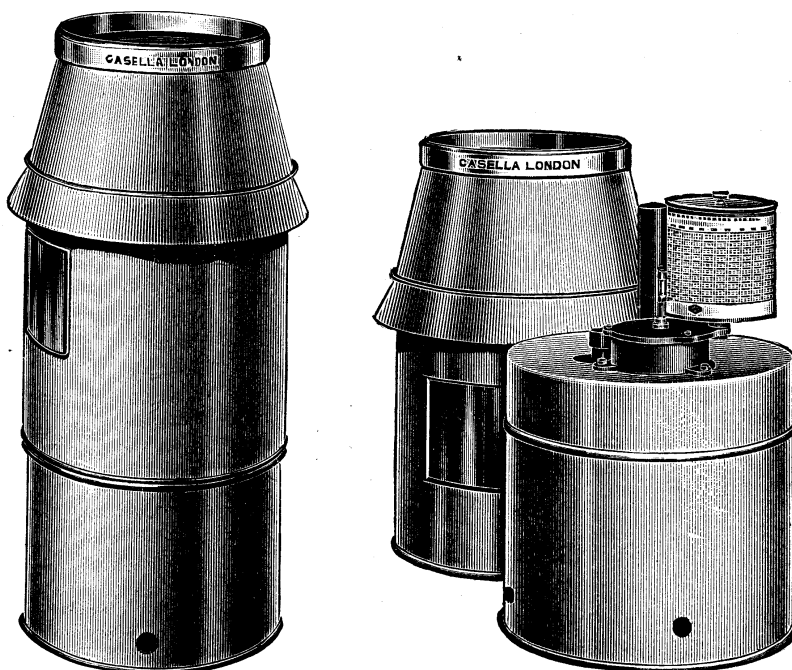
We shall be pleased to quote for jars to measure rain collected from gauges with different diameter rings in inch or metric measurements.

The information we require is the diameter or area of the ring and the amount of rain it is desired to measure.



RECORDING RAIN GAUGES

CASELLA'S SIPHON RAINFALL RECORDER



M 1160

This instrument employs a natural siphon action which is free from the defects commonly found in siphoning types. There are no moving parts other than the float and, therefore, nothing delicate to adjust. The siphon is free from "dribbling" since the "bend" is of capillary dimensions but large area, thus starting the siphon suddenly and completing in 12 to 15 seconds the emptying of the float chamber.

$25 \times 10\frac{1}{2} \times 10\frac{1}{2}$ in. $63.5 \times 26.5 \times 26.5$ cm. 22 lb. 10 k.

Packed $32 \times 19 \times 18$ in. $81 \times 48 \times 46$ cm. 48 lb. 22 k.

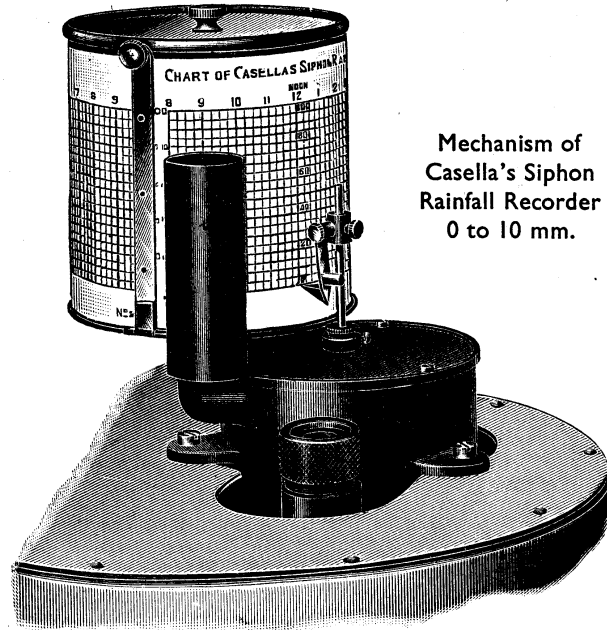


The ring is 8 in. (203 mm.) in diameter and the chart is so open that each siphoning represents 0.4 in. (10 mm.) of rain.

We have supplied these instruments in large numbers to Meteorological Offices, Public Authorities, River Catchment Boards, Agricultural Research Stations, Drainage Departments, and private individuals all over the world.

- | | | |
|---------|--|-------|
| M 1160. | Siphon Rainfall Recorder in Leaded Iron Case,
fixed window, with 55 charts, measuring jar, ink
and instructions, inch reading (0 to 0.4) ... | MRCEL |
| M 1162. | Ditto, millimetre reading (0 to 10) ... | MRCIB |
| M 1164. | Siphon Rainfall Recorder in stout copper case,
fixed window, with 55 charts, measuring jar, ink
and instructions, inch reading (0 to 0.4) ... | MRCOG |
| M 1166. | Ditto, millimetre reading (0 to 10) ... | MRCUD |
| M 1168. | Siphon Rainfall Recorder in stout copper case,
hinged window (British Meteorological Office
pattern) with 55 charts, measuring jar, ink and
instructions, inch reading (0 to 0.4) ... | MRDAB |
| M 1170. | Ditto, millimetre reading (0 to 10 mm.) ... | MRDEN |
| M 1172. | M.O. Certificate, for any of the above ... | MRDIC |
| M 1174. | Celluloid Template, for determining duration and
rate of rainfall ... | MRDOK |

*When ordering, please state whether daily or weekly clock is desired.
A daily clock (weekly wind) is recommended for readings taken in Great
Britain, as on a daily chart the duration of light showers is recorded clearly.*



Mechanism of
Casella's Siphon
Rainfall Recorder
0 to 10 mm.

A special funnel with a diameter of $5\frac{1}{16}$ in. (129 mm.) can be supplied for use in countries subject to tropical storms. This smaller diameter prevents the pen writing an almost continuous band of ink due to repeated siphoning taking place before the chart could revolve enough to separate the individual traces. 1 in. (25 mm.) of rainfall on the chart of this instrument corresponds to 0.4 in. (10 mm.) on the ordinary chart.

When ordering please add **Tropical** to Nos. M 1160 to M 1170.

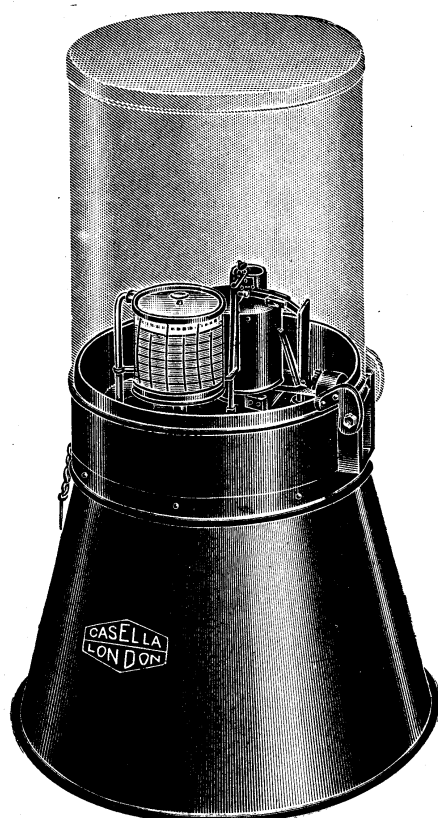
Spare Parts for Rainfall Recorders M 1160 to M 1170

M 1180.	Copper Float with pen rod and guide	...	...	...	...	MRFEP
M 1182.	Pen , complete with block to fit on to pen rod	...	...	...	...	MRFID
M 1184.	Pen , to fit into block only	...	...	...	...	MRFOL
M 1186.	Extra Charts , 55	...	...	...	...	MRFUG
M 1188.	Extra Charts , per 100	...	...	...	...	MRGAD



THE DINES RAINFALL RECORDER

British Meteorological Office Pattern



M 1200. This rain gauge operates on the siphon principle and is provided with a tilting device to start the siphon. The rain enters a float-chamber which is normally in an upright position, but as soon as 5 mm. or 0.2 inch of rain have been recorded the float-chamber is released from its upright position, and tilts, the pen being held off the chart until the chamber has siphoned itself empty ... MRKEV

Overall height : 34 in. (86 cm.)

Diameter of base : 20 in. (51 cm.)

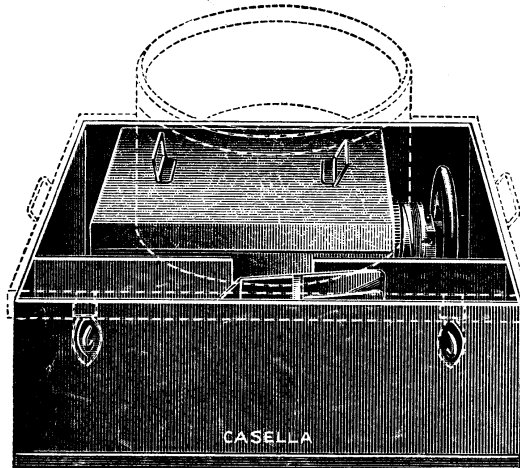
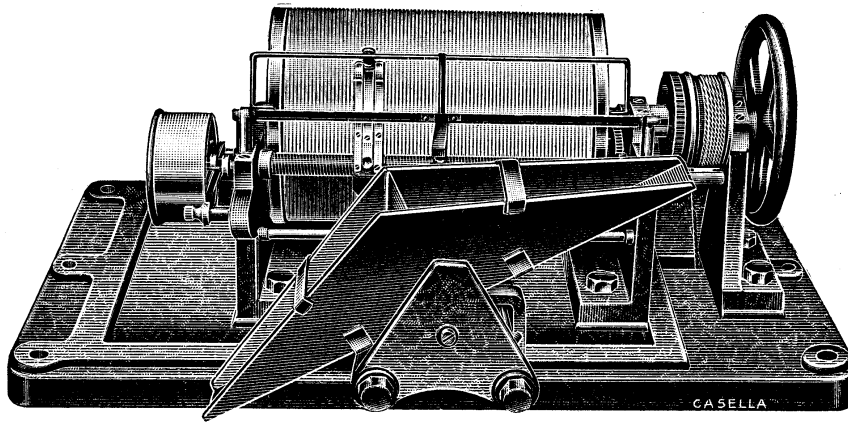
Diameter of funnel : 11.31 in. (28.7 cm.)

Daily clock : 1 mm. of rain = 10 mm. on the chart.

Net weight, about 60 lb. (27 k.)



95-DAY RAINFALL RECORDER



M 1202



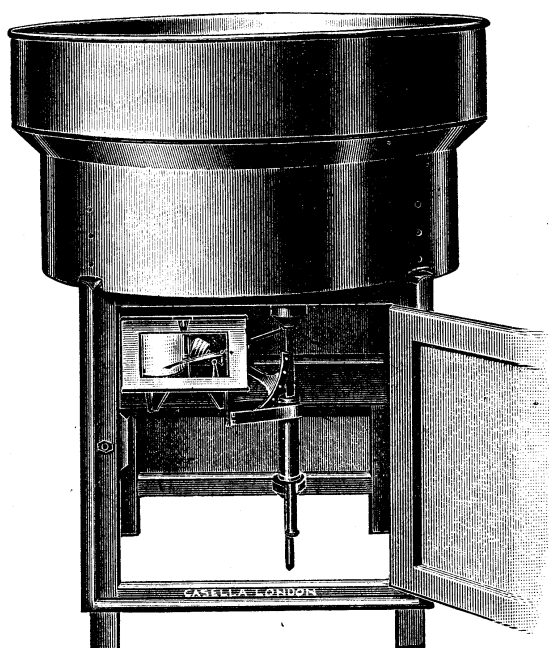
95-DAY RAINFALL RECORDER

To meet the demand for a recording gauge which can be installed in a district which is inaccessible for reasons of distance, height, climate, etc., except at long intervals, we have produced this instrument. It records continuously for 95 days on a chart 24 inches (60.8 cm.) in circumference which revolves once in 24 hours, the marking point advancing on a helix so that each day's record is separated by 0.1 in. (2.5 mm.). The principle is that of the balanced tilting bucket, whose tilting actuates a needle which pricks a small hole in the chart. Since each tilt represents a tenth of an inch of rain and the time scale of the chart is 1 in. (25 mm.) per hour, it will be seen that adequate spacing is allowed for heavy rates of rainfall. The drum is rotated and the pricker advanced by power from a weight which has a fall of 54 in. (152 cm.) the timing being controlled by a temperature compensated escapement. The shape of the funnel and buckets is such that the whole gauge can be frozen up without damage and will start to record again when it unfreezes. All steel parts are rust proofed, and oil impregnated bearings are fitted so that high temperatures and humidities will not affect the working. As far as possible the weight of individual parts has been kept to a minimum by the use of light alloys, the drive weights being split into units of 20 lb. (9 k.) each, so that transportation to difficult sites is rendered as easy as possible.

- M 1202. 95-day Rainfall Recorder with 16 in. (40.6 cm.)
diameter funnel complete with inner case over
drum and gearing, inch reading MRKIG
- M 1204. Ditto, but millimetre reading MRKOP
32×25×25 in. 82×63×63 cm. 194 lb. 88 k.



JARDI RATE-OF-RAINFALL RECORDER



M 1206

The general appearance of this recorder is shown in the illustration. It is made in accordance with the specification and drawings of the British Meteorological Office, and we have the Director's permission to supply it to other Departments or to individuals.

The funnel and upper portion of the recorder are made of stout copper and the lower portion is enclosed in a wooden case, covered with asbestos sheeting.



JARDI RATE-OF-RAINFALL RECORDER

A very useful instrument for providing information as to the rate of rainfall, which is of great importance in designing drainage systems for airfields, plantations, etc. The principle is that the rainfall is led into a float chamber from which it escapes through an orifice at the bottom. The size of this orifice is controlled by a tapered needle attached to the float. The greater the rate of rainfall, the larger the orifice becomes, since the float rises in the chamber until for a given rate a steady condition is reached where the rate of inflow balances the rate of outflow. The pen will now trace a horizontal line corresponding to the rate. A further increase in the rate will make the float rise until a new balance point is reached, when the pen will again trace a horizontal line corresponding to the new rate. As soon as rainfall ceases, the pen returns to the bottom of the chart and will only rise again when rainfall recommences. Thus it does not record total rain but only the rate.

The range of rates which can be recorded can be varied by varying the area of the funnel. Thus we can provide rates from 160 to 480 mm. per hour according to the probability of the rate in the locality where the gauge will be used.

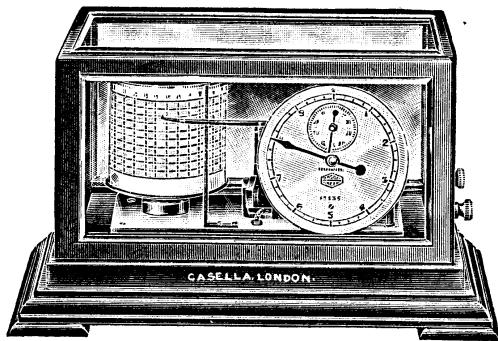
The standard ranges available on a $3\frac{1}{2}$ in. (90 mm.) high chart are as listed below.

M 1206.	0-160 mm. per hour, 38 in. (96 cm.) diam. ring ...	MRKUL
	47×40×40 in. 110×102×102 cm. 168 lb. 76 k.	
M 1208.	0-240 mm. per hour	MRLAG
M 1210.	0-320 mm. per hour, 26 in. (66 cm.) diam. ring ...	MRLEW
	41×27×27 in. 104×69×69 cm. 120 lb. 54 k.	
M 1212.	0-480 mm. per hour	MRLIK

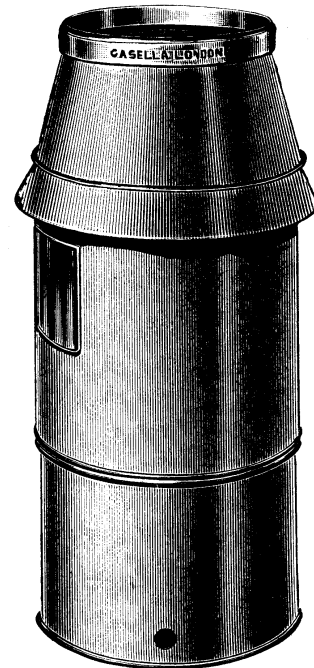


ELECTRICAL RAIN GAUGES

The rain is collected in an 8 in. (203 mm.) funnel and actuates a tilting bucket with which is connected a mercury switch, and each tilt completes a circuit, causing the pen to rise a step. The recorder can, therefore, be indoors, miles from the funnel if need be, and forms an attraction in an hotel or country club, especially if combined with one of our wind direction and velocity instruments shown on page 23, while it also matches in appearance with the recording anemometer on page 20, and the barographs on pages 61-63.



Recorder



Receiver

- M 1214. **Electrical Rain Recorder, inch scale**, complete with batteries, 50 feet of insulated wire, 55 charts, ink, etc. MRL0T
- M 1216. **Ditto, millimetre scale** MRLUN

Please state whether daily or weekly clock is desired. (Both daily and weekly clocks are wound once a week).



SUNSHINE RECORDERS

Directions for Setting-up, Card Measurement, Etc.

Setting up. The instrument must be accurately levelled from east to west and exposed so that at all times of the year no obstruction will prevent the sun's rays reaching the instrument. It must face due south in the Northern Hemisphere and due north in the Southern Hemisphere, so that at noon local apparent time the sun will focus on the noon line of the card when this line is opposite the noon line on the bowl.

Adjustment for Meridian. To obtain local mean time from G.M.T., add or subtract 4 minutes for each degree of longitude west or east of Greenwich, then add or subtract the correction for the equation of time (from almanacks or Observer's Handbook) to give the local apparent time.

Adjustment for Latitude. This is made by sliding the bowl in its socket until the line on the bowl is opposite the correct division on the scale.

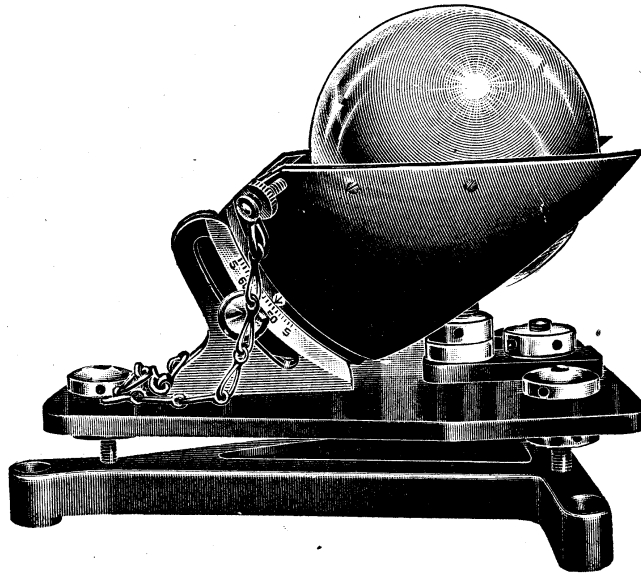
Measurement of Cards. It should be remembered that the value of the hourly divisions on the curved cards is not constant when totalling up the number of hours of sunshine. The edge of a sheet of paper placed along the burn and marked off with the length of each burn, sliding the paper along to add up as one continuous line, can then be laid off on the special scale or along the appropriate part of a card on which the burn has been made for that day.

Care of the Instrument. The glass ball should be cleaned with a chamois leather at frequent intervals and the grooves in the bowl kept clean, snow or hoar frost should be removed at once ; the cards should be changed after sunset if possible.

The spheres and bowls of all the instruments described below (with the exception of the rings of M 1238) conform to the specifications of the British Meteorological Office. The specifications prescribe limits for the diameters, refractive index, focal length, width of card slots, etc.



SUNSHINE RECORDERS

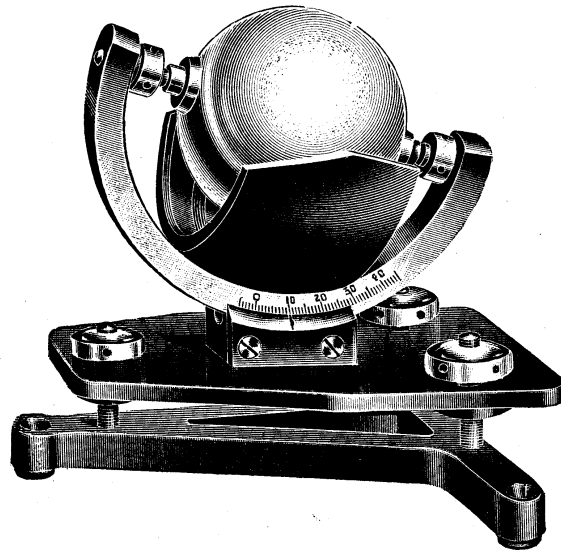


The Campbell-Stokes Sunshine Recorder was designed by S. F. Campbell and later improved by Sir G. G. Stokes. It employs a glass sphere to focus the sun's rays and burn a trace on a specially treated card.

- M 1220. **Campbell-Stokes Sunshine Recorder Temperate**, pattern of the British Meteorological Office, with levelling base and card clamping screw (to prevent birds moving the cards by pecking at them). For latitudes 45° to 65°; with glass sphere. For use in Northern or Southern Hemisphere MRNEX
 9×8½×8 in. 23×21.5×20 cm. 10 lb. 4.5 k.
- M 1222. **M.O. Test of Sphere** MRNIL
 For details of cards for use with the above recorder, see page 133.



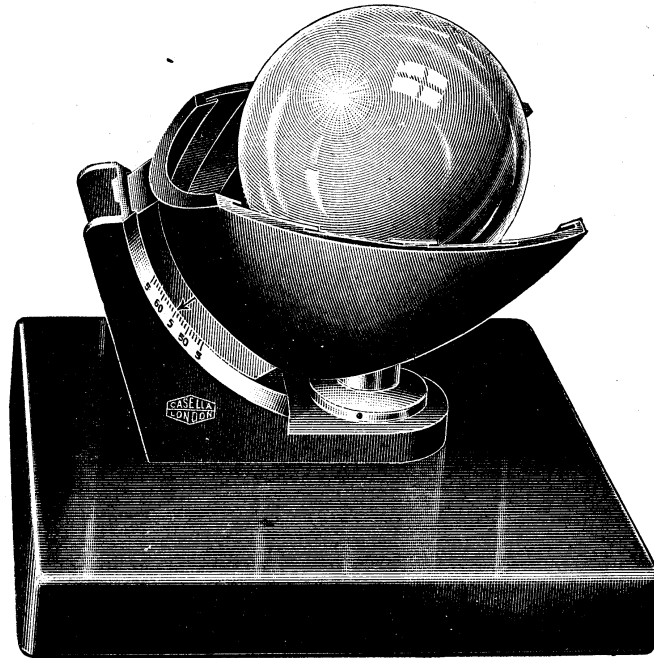
SUNSHINE RECORDERS



- M 1224. **Campbell-Stokes Sunshine Recorder, Tropical,**
pattern of the British Meteorological Office, with
levelling base and card clamping screw.
For latitudes, 5°N. to 45°S. or 5°S. to 45°N. ... MRNOV
9 × 8½ × 8½ in. 23 × 21.5 × 21.5 cm. 14 lb. 6.3 k.
- M 1226. **M.O. Test of Sphere** MRNUP
For details of cards for use with the above re-
corder, see page 133.



SUNSHINE RECORDERS

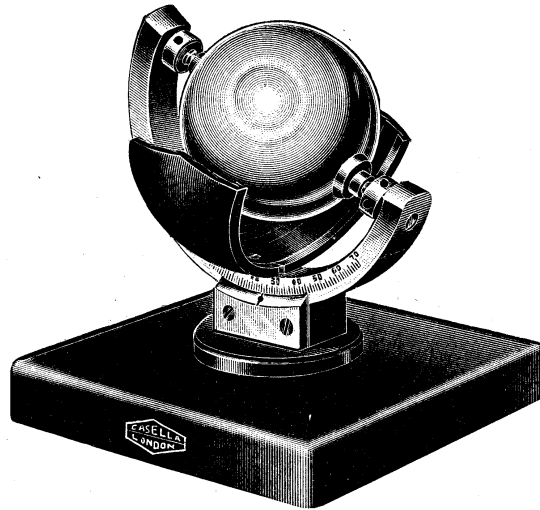


M 1228. **Campbell-Stokes Sunshine Recorder, Temperate** pattern for latitudes 45° to 65° , for use in Northern or Southern Hemisphere, mounted on polished slate base MRPAL
 $8 \times 8 \times 7\frac{1}{2}$ in. $20 \times 20 \times 19$ cm. 16 lb. 7 k.

M 1230. **M.O. Test of Sphere** MRPEB
 For details of cards for use with the above recorder, see page 133.



SUNSHINE RECORDERS

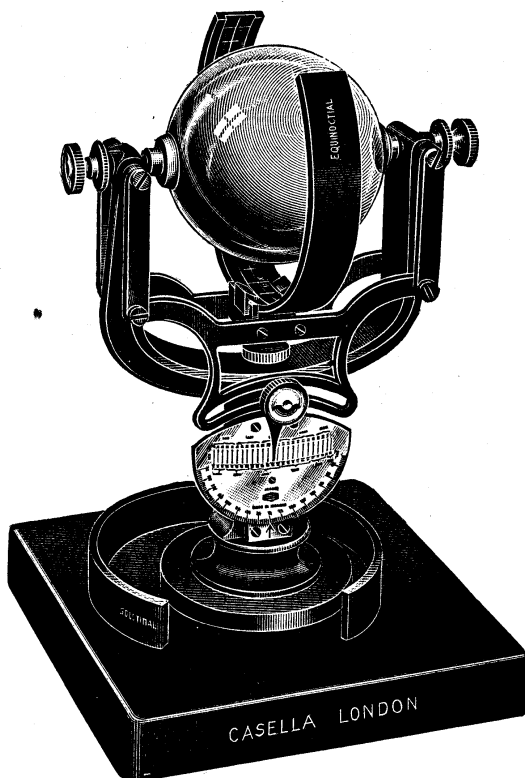


- M 1232. **Campbell-Stokes Sunshine Recorder, Tropical Pattern**, for latitudes 5° N. to 45° S., or 5° S. to 45° N. ; mounted on polished slate base ... MRPIN
 8×8×8 in. 20×20×20 cm. 17 lb. 7·7 k.
- M 1234. **M.O. Test of Sphere** ... MRPOW
- M 1236. **One Year's Supply of Cards** for recorders M 1220, 1224, 1228 and 1232, for **Northern Hemisphere**, viz. : ... MRPUT
 150 long curved, April 12th to Sept. 2nd
 150 short curved, Oct. 15th to Feb. 28th
 100 straight, March 1st to April 11th, and Sept. 3rd to Oct. 14th
- M 1238. **Ditto**, for **Southern Hemisphere**, viz. : ... MRTAN
 150 long curved, Oct. 15th to Feb. 28th
 150 short curved, April 12th to Sept. 2nd
 100 straight, March 1st to April 11th, and Sept. 3rd to Oct. 14th
 13×6×2½ in. 32·5×15×6·5 cm. 4 lb. 1·8 k.



SUNSHINE RECORDERS

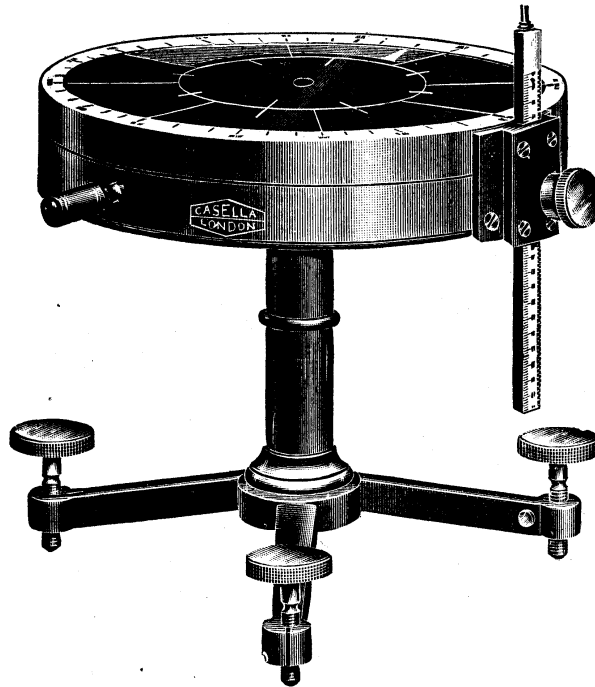
This Recorder was mainly designed by G. M. Whipple, a former superintendent of Kew Observatory, it is universal and can be used in any part of the world.



- M 1240. **Whipple-Casella Universal Sunshine Recorder**
 mounted on polished slate base MRTEC
 12×8×8 in. 30×20×20 cm. 18 lb. 8 k.
- M 1242. **M.O. Certificate** MRTIP
- M 1244. **One Year's Supply of Cards** for the above, viz : MRTOX
 200 Solstitial Cards No. 249, May 6th to Aug. 7th
 and Nov. 8th to Feb. 3rd
 200 Equinoctial Cards No. 250, Feb. 4th to May
 5th and Aug. 8th to Nov. 7th
 14×2½×1½ in. 36×6.5×4 cm. 2 lb. 4 oz. 0.97 k.



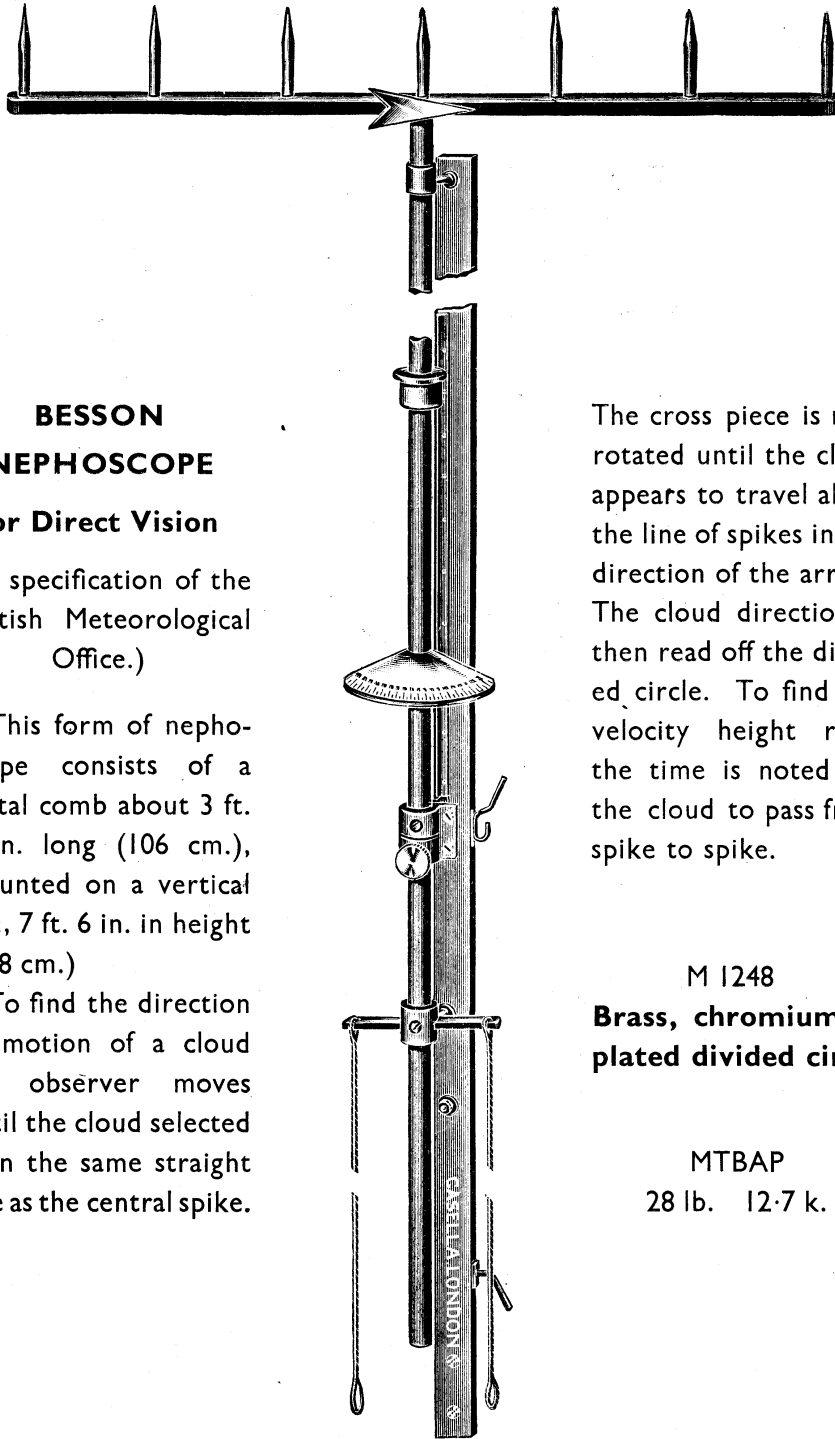
NEPHOSCOPES



Fineman Nephoscope, pattern of the British Meteorological Office. This consists of a circular plate of black glass bearing compass points and circles 25 mm. difference in radii. A rotatable pointer is provided whose height above the glass can be set and measured on a scale, while a compass needle is suspended under the black glass and is visible through an opening. To find the cloud direction, level and orient the glass and stand so that the cloud's image, the pointer and the glass centre are in a straight line. The point at which the image leaves the circumference gives the direction. The velocity ratio is found from the time for the image to pass from one circle to the next.

M 1246. Complete in case MRTUV

$9\frac{1}{2} \times 8 \times 7$ in. $24 \times 20 \times 17.5$ cm. 9 lb. 4 k.



**BESSON
NEPHOSCOPE
for Direct Vision**

(to specification of the
British Meteorological
Office.)

This form of nephoscope consists of a metal comb about 3 ft. 6 in. long (106 cm.), mounted on a vertical rod, 7 ft. 6 in. in height (228 cm.)

To find the direction of motion of a cloud the observer moves until the cloud selected is in the same straight line as the central spike.

The cross piece is now rotated until the cloud appears to travel along the line of spikes in the direction of the arrow. The cloud direction is then read off the divided circle. To find the velocity height ratio the time is noted for the cloud to pass from spike to spike.

M 1248

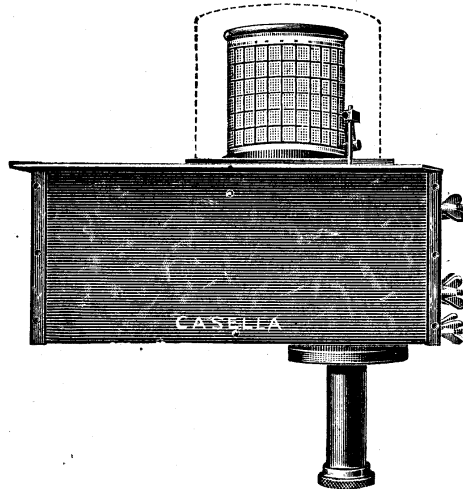
Brass, chromium-plated divided circle

MTBAP

28 lb. 12.7 k.



WATER FLOW METER



This instrument is designed to record in simple fashion the rate of flow from field drainage systems, small irrigation layouts and similar purposes. (See Journal of Scientific Instruments, Vol. XVII, No. 4). The water to be measured, which can be the whole amount or a known proportion, is run into the first part of the tank. This is separated from the recording part by a strainer for filtering out solid matter which would otherwise silt up in the bottom or choke the weir. In this latter portion a float can rise and fall according to the difference in in-flow and out-flow over a weir, or through a diaphragm of any desired form. This movement of the float is recorded on a chart revolved once a day or a week as desired. Since the float is the only moving part the meter can be left unattended, with the exception of chart changing, for long periods with no fear of anything going wrong.

M 1250. **Water Flow Meter**, without a weir or diaphragm MTBED

$13\frac{1}{2} \times 10 \times 15$ in. $33.5 \times 25 \times 38$ cm.



LIGHTHOUSE AND LIGHT VESSEL INSTRUMENTS

PRESSURE SIREN RECORDERS

This instrument operates on the Bourdon tube principle for recording the pressure which is used to work a siren in a lightship or lighthouse for warning shipping in fogs.

The time scale of the chart is made very open, so that the times of operation of the siren can be noted exactly. Thus, if there is any dispute over collisions or wrecks due to alleged non-operation of the siren, proof of the times at which the siren was sounded can be produced.

M 1252. Records pressures up to 35 lb. per sq. in. on a chart
5 $\frac{3}{4}$ in. (14.5 cm.) high MTBIR

EXPLOSIVE FOG SIGNAL RECORDER

Another form of siren recorder is for use with the explosive type of fog signal. A series of vacuum boxes are connected to a pen through a system of levers. The pressure wave produced by the explosion of the signal causes the boxes to shorten their length and produce a big vertical movement of the pen at the exact moment of the explosion.

Thus, this instrument performs the same function as the above siren recorder in defining the exact times at which the fog warning was given.

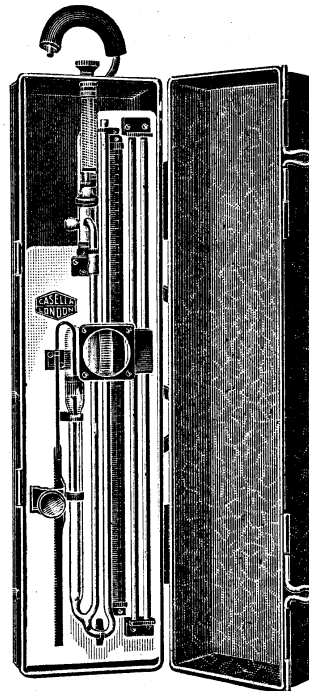
M 1254. Chart, height, 3 $\frac{1}{2}$ in. (9 cm.) MTBOL



GRAHAM'S PRESSURE SURVEYING APPARATUS

For mine surveying in steeply inclined seams an aneroid requires considerable care owing to the creep which occurs subsequent to a sudden change of pressure. To overcome these difficulties J. Ivon Graham, then of the Mining Research Laboratories, University of Birmingham, designed an instrument which employs the changes of a volume of air due to the pressure change in place of the deformation of the aneroid diaphragm.

The air is contained in a tube immersed in ice in a vacuum flask and connected to a "U" gauge. By means of a plunger the "U" gauge can be set so that the expected pressure change moves the liquid in the "U" gauge over a convenient portion of the scale. It has been found that the air temperature remains constant to within 0.008°C. for 3 days, and the instrument gives readings to an accuracy of 0.001 in. of mercury. A vertical height of about 700 feet can be surveyed with the original setting of the "U" gauge and, of course, over any length. The method of surveying is exactly as that used with an aneroid, the usual corrections for barometric height, etc., being applied.



M 1256. **Graham's Pressure Surveying Apparatus** ... MTBUW
20 × 4 $\frac{1}{4}$ × 6 in. 50 × 10.5 × 15 cm. 9 lb. 4 k.



COMPASSES



M 1262



M 1264

- M 1260. **Service Prismatic Compass**, 2 in. (50 mm.) radius painted points, index line on bezel, divided scale on outer case, **Dry Card**, in leather case MTCEF
- M 1262. **Ditto**, but card floats in **liquid**, in leather case, as illustration MTCIV
- M 1264. **Liquid Compass**, in hunter case, similar to illustration, diameter of dial $1\frac{1}{4}$ in. (32 mm.), size of case, $1\frac{3}{4}$ in. (45 mm.) MTCON
- M 1266. **Pocket Compass**, nickel hunter case, diameter of dial $1\frac{1}{4}$ in. (32 mm.), size of case $1\frac{3}{4}$ in. (45 mm.) MTCUX
- M 1268. **Ditto**, with bar needle instead of card MTDAY



METEOROLOGICAL CHARTS AND REGISTERS

- M 1270. **Pad of Meteorological Charts**, to last one year :
for readings of barometer, thermometers, hygrometer, rain gauge, anemometer, etc. MTDEG
 $17 \times 10\frac{3}{4}$ in. 43×27 cm.
- M 1272. **Meteorological Register** for 1 year, published
by the British Meteorological Office, paper cover MTDIW
 $11 \times 8\frac{1}{2}$ in. 28×21.5 cm.
- M 1274. **Mill's Pocket Rainfall Register**, for 1 year ... MTDOP
 $6 \times 2\frac{1}{2}$ in. 15×6 cm.
- M 1276. **Meteorological Pocket Register**, for 1 year,
stiff cover MTDUB
 $9\frac{1}{2} \times 7\frac{1}{2}$ in. 24×19 cm.
- M 1278. **The Observer's Handbook**, p. 162 MTFAW
 $9\frac{1}{2} \times 6$ in. 24×15 cm.

HUMIDITY TABLES

- M 1280. **For Ventilated Hygrometers**, Assmann and
Whirling, Fahrenheit (Marvins), p. 87 MTFEK
 $9 \times 5\frac{3}{4}$ in. 23×15 cm.
- M 1282. **Ditto**, Centigrade, one sheet MTFIX
 $10\frac{1}{2} \times 8$ in. 27×20 cm.
- M 1284. **For Unventilated Hygrometers**, (Mason's,
Ordinary Wet and Dry Bulb in Stevenson Screen)
Fahrenheit (M.O. tables), p. 45 MTFOR
 $9\frac{1}{2} \times 6$ in. 24×15 cm.
- M 1286. **Ditto**, Centigrade, one sheet MTFUC
 $10\frac{1}{2} \times 8$ in. 27×20 cm.



PUBLICATIONS

The following publications are recommended :—

- Journal of The Royal Meteorological Society, monthly.
- “Weather,” published monthly, available at Bookstalls.
- “Meteorology,” by D. Brunt, Oxford Press.
- “The Drama of the Weather,” by Sir Napier Shaw. Cambridge Press.
- “Clouds,” by Clarke. Constable.
- “Physical and Dynamic Meteorology,” by D. Brunt, Cambridge Press.
- “Synoptic and Aeronautical Meteorology,” by Byers. McGraw.
- “Meteorological Instruments,” by Knowles Middleton. Univ. Toronto Press.

H. M. Stationery Office Publications

Cloud Forms	...	...	...	...	...	...	Ref. M.O. 223
Weather Map	...	...	...	...	...	...	„ „ 225i
Meteorological Glossary	...	...	...	...	...	...	„ „ 225ii
A Short Course in Elementary Meteorology	...	...	...	...	...	...	„ „ 247
Meteorology for Aviators	...	...	...	...	...	...	„ „ 432
Cloud Atlas for Aviators	...	...	...	...	...	...	„ „ 450
Meteorological Air Observer’s Handbook	...	...	...	...	...	...	„ „ 470
Meteorological Handbook for Pilots and Navigators	...	...	...	...	...	...	„ „ 448

Prices of the above publications can be obtained direct from the publishers.



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