

H.&M.
RECORDING & INDEX
THERMOMETERS.

List No. 112.

Recording
and
Index Thermometers
for
Industrial Requirements.

The Cambridge Scientific Instrument Co., Ltd.,
CAMBRIDGE,
England.

Terms of Business.

INLAND ORDERS. Strictly nett, monthly account.

FOREIGN ORDERS must be accompanied by either a remittance, or instructions for payment in London on delivery of bills of lading, etc.

CHEQUES to be drawn payable to "The Cambridge Scientific Instrument Co., Ltd.," and crossed "Barclay & Co., Cambridge."

PACKING CASES are not included in the List or Quoted Prices. The full invoice price is allowed for returned packing cases, when actually received in good condition, carriage paid, within fourteen days from delivery.

DELIVERY. All prices are for goods free delivered in the United Kingdom or F.O.B. English Port. The greatest care is exercised in packing, but we cannot hold ourselves responsible for breakages in transit. All goods should be examined in the presence of the carriers' representative or signed for "unexamined." If goods are damaged an advice should be sent to us within 3 days of receipt, and a claim will be made on our customer's behalf.

Telephone: Cambridge, No. 642 (2 lines).

Telegraphic and Cable Address: Instrument, Cambridge.
A.B.C. Code, 5th Edition, and Western Union Code used.

Telegraphic Orders.

In all Telegraphic or Cable Orders for Thermographs the length of Capillary Tubing required and the number of the Chart must be given. The Standard Chart Ranges, with their numbers, will be found on page 12. Charts of Special Range can be supplied at a small additional charge.

In the case of the Index Thermometers, the length of Capillary Tubing should be stated. The number for the Chart Range signifies the range of the Instrument.

Shipping Data.

APPROXIMATE NETT WEIGHTS.

Thermograph with six feet of Tubing and Plain Bulb complete with 100 Charts and Bottle of Ink	17½ lbs. (7.9 kilos.)
Index Thermometer with six feet of Tubing and Plain Bulb	8½ lbs. (3.9 kilos.)

The H. & M. Recording and Index Thermometers.

Although no new principle is involved in the construction of these instruments, yet we may claim that owing to attention to small details an instrument has been produced which will be found capable of working continuously and accurately at temperatures up to 540° Centigrade (1000° F.).

We also claim that the instruments are capable of withstanding the trying conditions so often met with in factories.

They are :

ACCURATE to about one per cent.

SENSITIVE for all practical requirements.

EASILY READ—The record for the past few hours or days can be seen at a glance (see reproduction facing page 12).

NON-ELECTRICAL—So that the man with absolutely no electrical knowledge can manipulate them.

CONVENIENT—Because the standard types of bulbs have been designed to meet the varied requirements met with in industrial practice. Specially designed bulbs can be supplied where demanded.

H. & M. Thermometers.

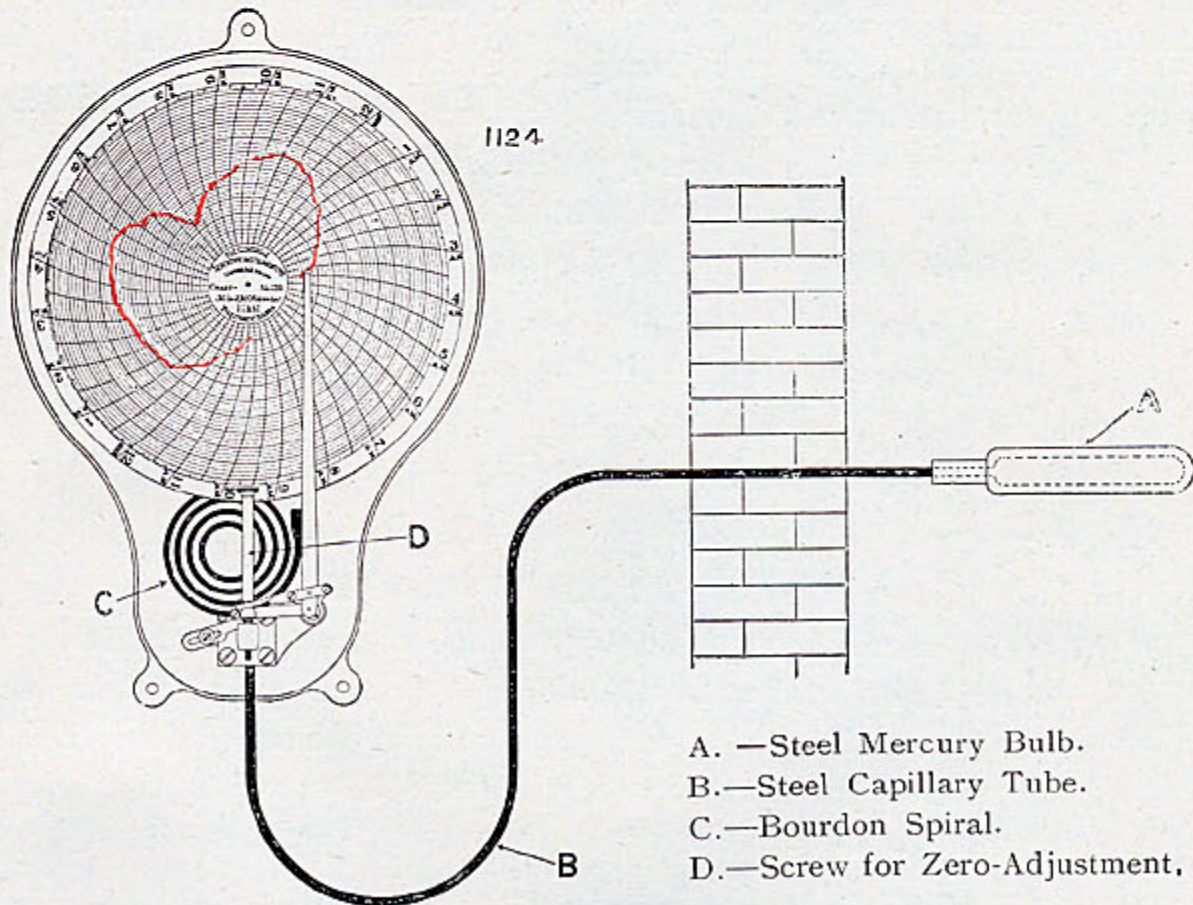


FIG. 1—DIAGRAM SHOWING THE PRINCIPLE OF THE H. & M. THERMOGRAPH.

THE PRINCIPLE upon which the working of the H. & M. Recording and Index Thermometers depends will be clearly understood by referring to Fig. 1 (above). A is a steel bulb, connected by means of a steel capillary tube, B, to a special form of steel Bourdon spiral, C. The whole system is filled with mercury, and changes of temperature of the bulb give rise to corresponding changes of pressure in the system, which are magnified and recorded or indicated by means of a simple pen or pointer mechanism in connection with the Bourdon spiral.

H. & M. Thermometers.

TEMPERATURE RANGES. -40° to 1000° F. or -30° to 540° C. See list of Standard Ranges on page 12.

THE BULB is made in a number of sizes, each of which can be fitted with suitable connections to meet various requirements. Four types of bulb-connection are illustrated and described in the following pages, and each of these will suggest a wide range of usefulness.

THE CAPILLARY TUBE is fairly flexible, and, being made of steel, is very robust. Six feet is the usual length of capillary tube supplied with the recording and indicating outfits, but greater lengths can be supplied to order. See notes on the following pages.

THE RECORDER or "**THERMOGRAPH**" is a robust instrument consisting essentially of a pen attached to one end of the Bourdon spiral and arranged to move over a circular chart revolved by clockwork. The whole is mounted on a cast-iron base, with cast-iron case fitted with lock and key (see Fig. 2).

THE CHARTS used are nine and a half inches in diameter and are clearly printed with *uniform scale divisions*. The chart speeds are one revolution in twenty-four hours, or one revolution in seven days.

THE INDEX THERMOMETER can be arranged with an eight-inch or thirteen-inch diameter dial. In this instrument the pen of the Recorder is replaced by a pointer mechanism which magnifies the movement of the Bourdon spiral. The scale on the 8-inch dial is uniformly divided and covers approximately three-quarters of a six-inch circle, that is, a length of approximately $14\frac{1}{2}$ inches (36 cm.). The scale on the thirteen-inch dial covers approximately three-quarters of a twelve-inch circle, *i.e.*, a length of approximately 28 inches (71 cm.). The figuring is bold and easily read.

ALARM ATTACHMENT. An Electric Alarm Attachment can be fitted to any H. & M. Thermograph or Index Thermometer (see page 18, and Fig. 9, page 14).

H. & M. Thermograph.

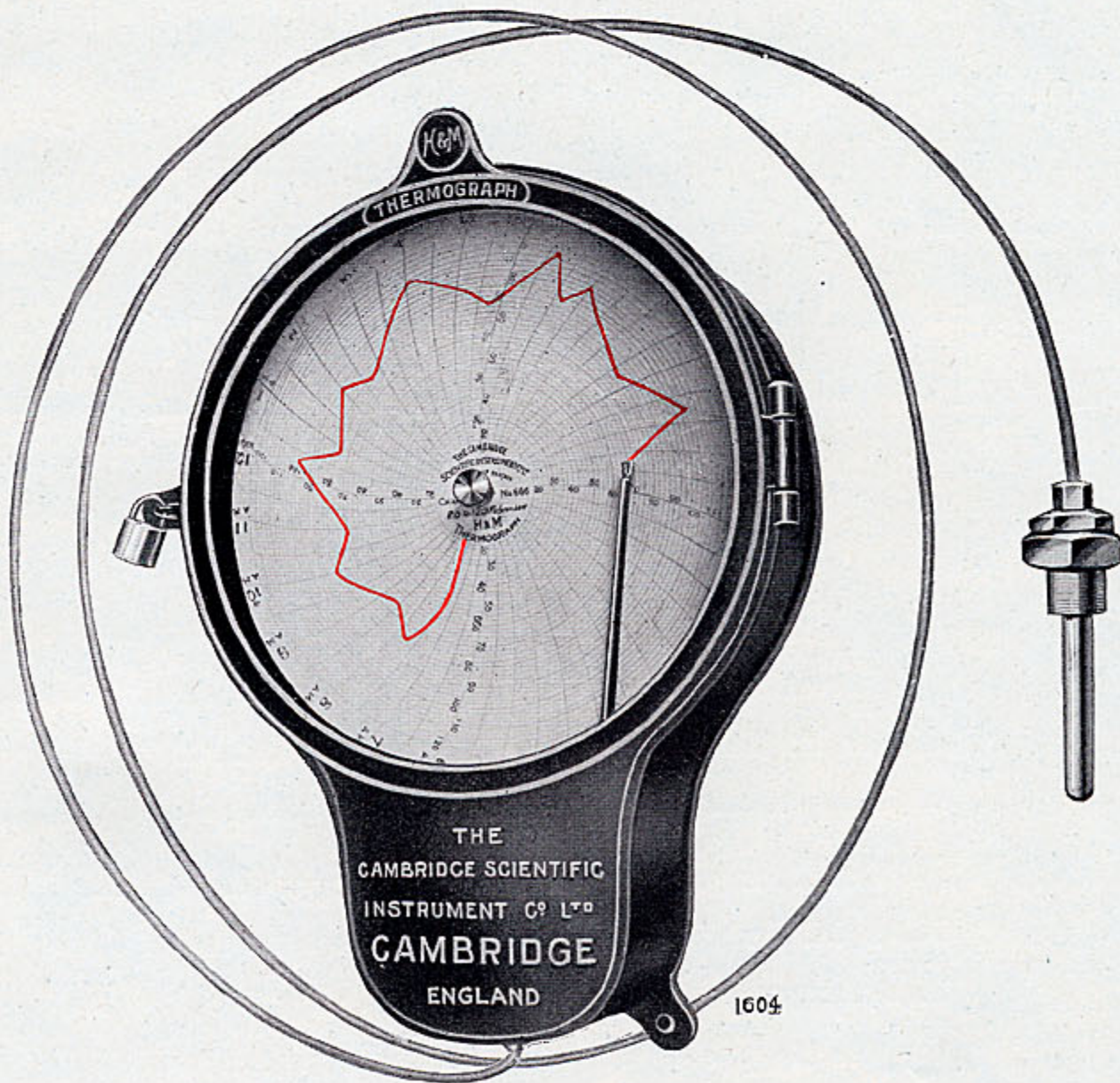


FIG. 2.

The above illustration shows the appearance of the H. & M. Thermograph, connected by flexible steel capillary tubing to a Type 2 bulb-connection.

This instrument can be supplied fitted with any of the Bulbs, types 1 to 4, described in the following pages, and with any length of capillary tubing up to 75 feet.

STANDARD CHART RANGES—see page 12.

A full-size reproduction of a chart with record is inserted between pages 12 and 13.

H. & M. Thermograph (Contd.).

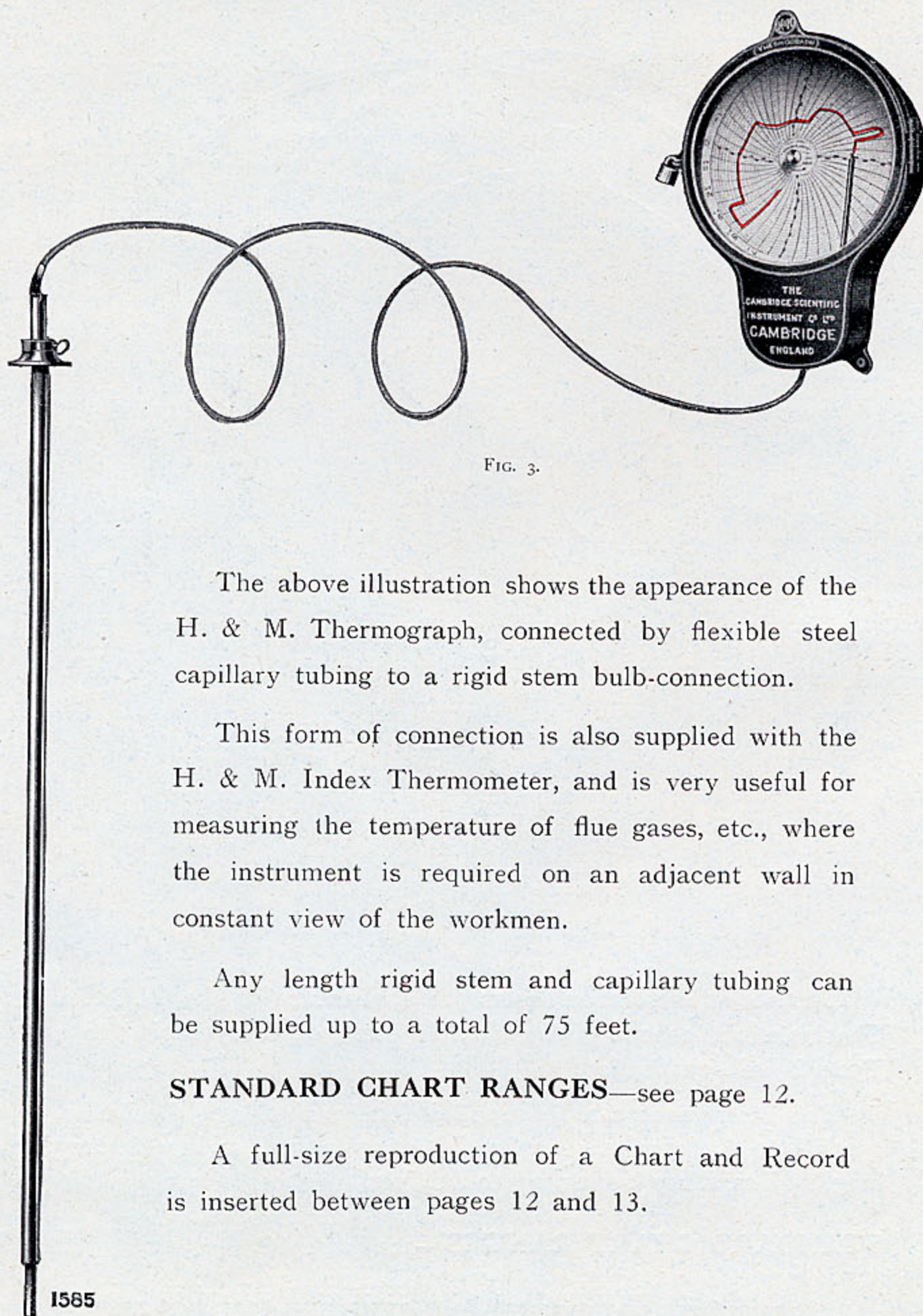


FIG. 3.

The above illustration shows the appearance of the H. & M. Thermograph, connected by flexible steel capillary tubing to a rigid stem bulb-connection.

This form of connection is also supplied with the H. & M. Index Thermometer, and is very useful for measuring the temperature of flue gases, etc., where the instrument is required on an adjacent wall in constant view of the workmen.

Any length rigid stem and capillary tubing can be supplied up to a total of 75 feet.

STANDARD CHART RANGES—see page 12.

A full-size reproduction of a Chart and Record is inserted between pages 12 and 13.

H. & M. Thermograph (Contd.).

Double Recorder.

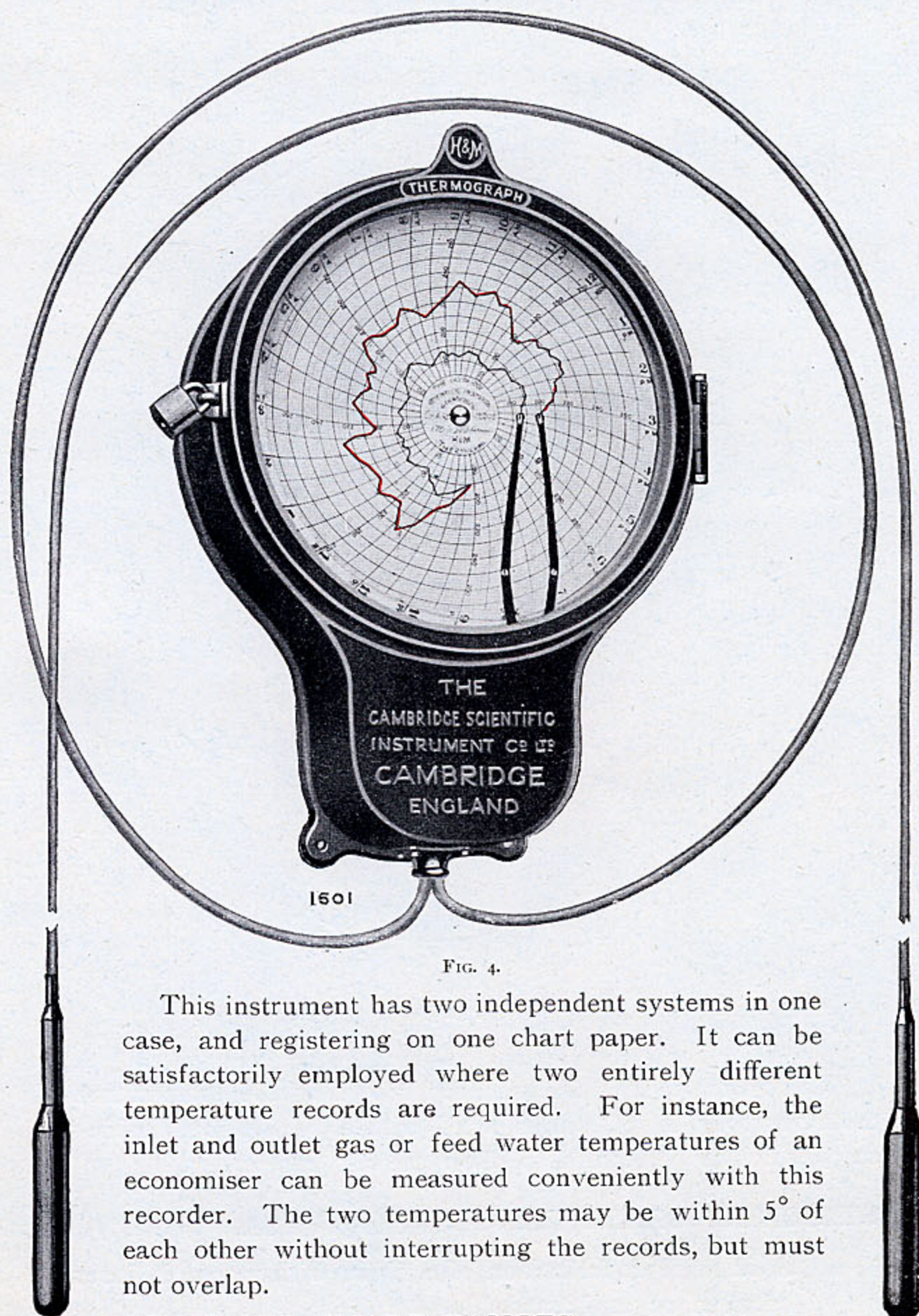


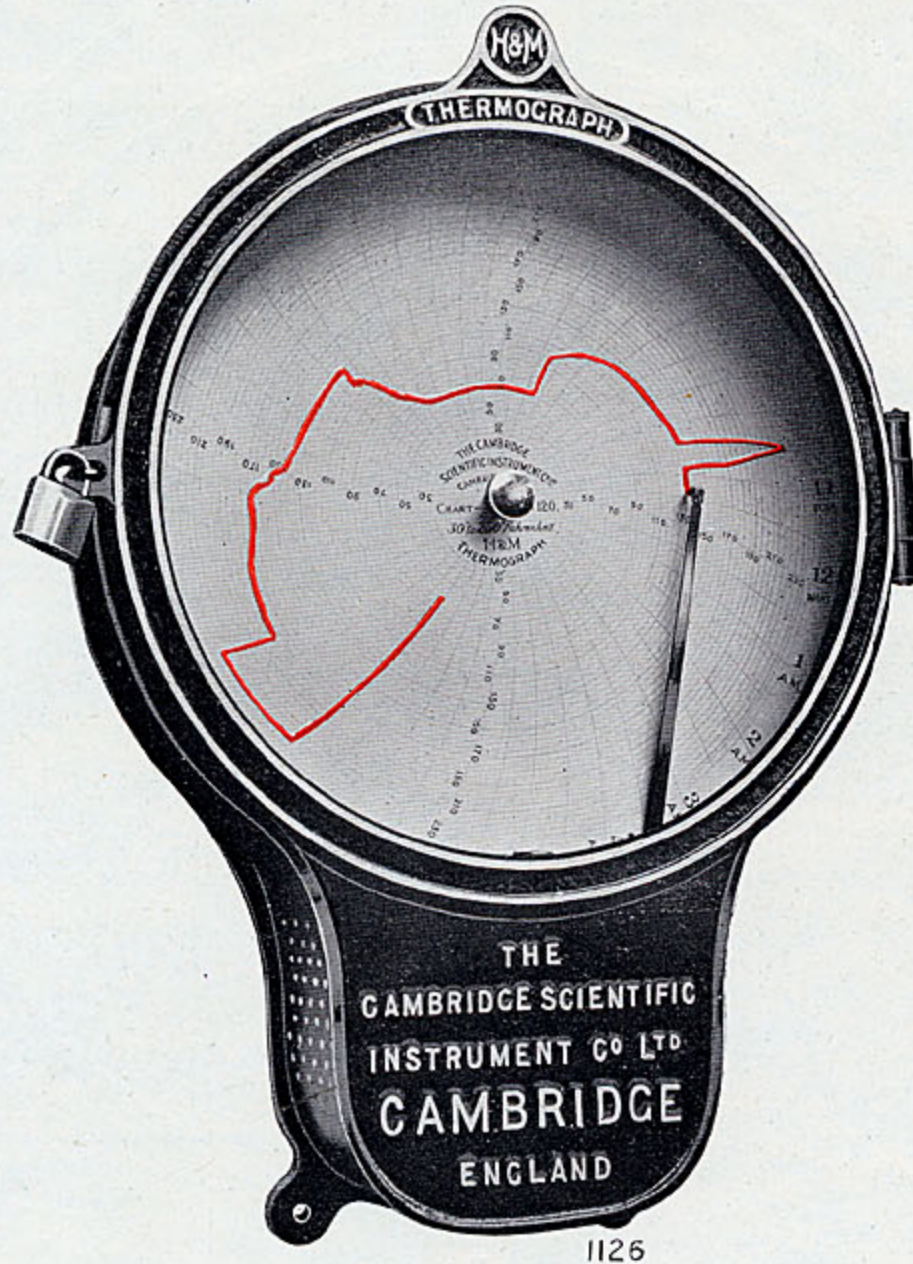
FIG. 4.

This instrument has two independent systems in one case, and registering on one chart paper. It can be satisfactorily employed where two entirely different temperature records are required. For instance, the inlet and outlet gas or feed water temperatures of an economiser can be measured conveniently with this recorder. The two temperatures may be within 5° of each other without interrupting the records, but must not overlap.

STANDARD CHART RANGES—see page 12.

H. & M. Thermograph.

Self-Contained Form.



1126

FIG. 5.

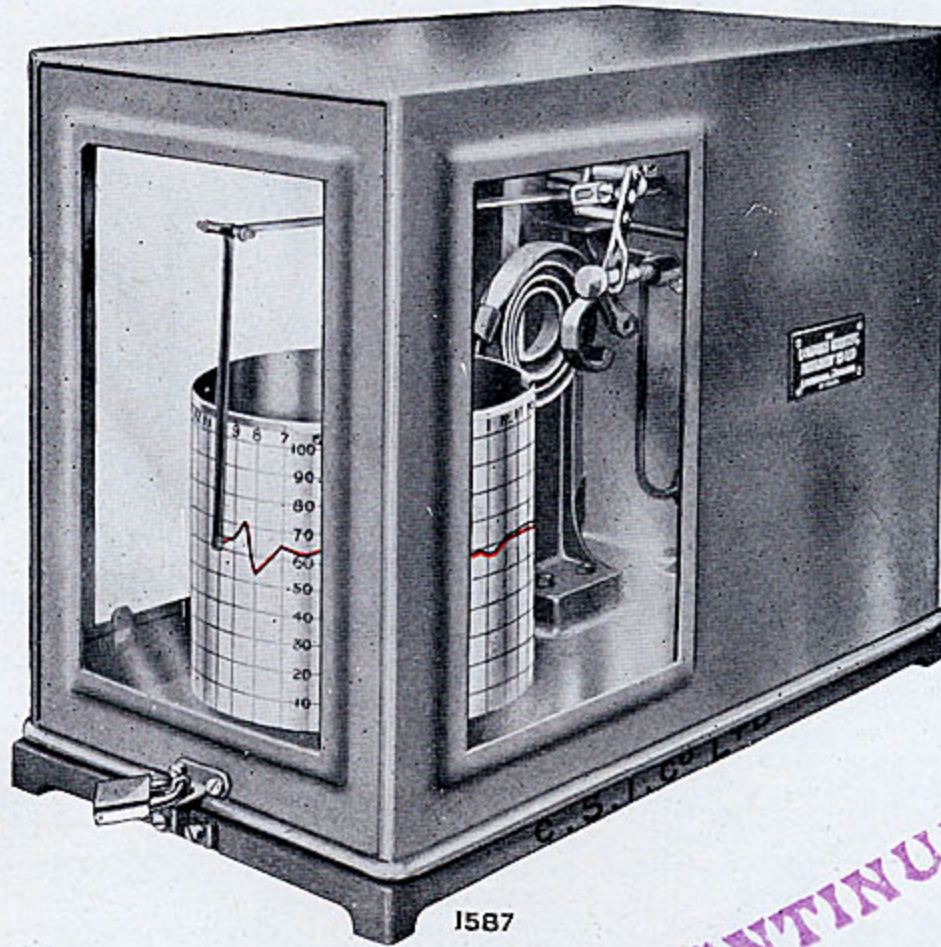
This instrument is designed for recording the temperature of the air surrounding it, and is fitted with a bulb placed inside the case, which is perforated to allow the air free access.

STANDARD CHART RANGES—see page 12.

A full-size reproduction of a chart with record is inserted between pages 12 and 13.

H. & M. Thermograph (Contd.).

Drum Type.



1587

FIG. 6.

DISCONTINUED

The above illustration shows the appearance of the H. & M. Thermograph, mounted in a copper case and fitted with a 24-hour or 7-day Drum Clock. The record is 4 inches high by 15 inches long.

Any length of steel Capillary Tubing up to 75 feet can be supplied with this instrument.

STANDARD CHART RANGES—on application.

H. & M. Thermograph (Contd.)

STANDARD CHARTS.

24-Hour Charts.		
Range.*	Value of Scale Division.	No. of Chart.
- 30° to + 50°	2 degrees	5001
- 20° to + 120°	2 degrees	119
0° to 100°	2 degrees	5923
0° to 110°	2 degrees	5002
0° to 120°	2 degrees	5927
0° to 150°	2 degrees	5900
0° to 250°	5 degrees	5905
0° to 500°	10 degrees	5901
20° to 60°	1 degree	5009
20° to 70°	1 degree	5922
30° to 150°	2 degrees	5906
30° to 230°	5 degrees	120
40° to 120°F	2 degrees	5902
50° to 100°	1 degree	5913
50° to 450°	8 degrees	5915
80° to 320°	4 degrees	5912
90° to 390°	4 degrees	5917
90° to 540°	5 degrees	5004
100° to 160°	1 degree	5921
100° to 260°	5 degrees	5903
100° to 350°	5 degrees	5918
100° to 1000°F	15 degrees	5924
150° to 250°	2 degrees	5503
150° to 350°	5 degrees	5926
170° to 270°	2 degrees	5505
200° to 500°	5 degrees	5920
200° to 700°F	10 degrees	5508
200° to 1000°F	20 degrees	5003
350° to 500°F	2 degrees	5914
350° to 600°F	5 degrees	5909
400° to 800°F	10 degrees	5904

7-Day Charts.		
Range.*	Value of Scale Division.	No. of Chart.
- 40° to + 120°F	2 degrees	5806
- 30° to + 50°	2 degrees	5301
0° to 50°	1 degree	5907
0° to 100°	2 degrees	5908
0° to 150°	3 degrees	5911
0° to 250°	5 degrees	5910
30° to 230°	5 degrees	5802
100° to 300°	4 degrees	5929
200° to 1000°F	16 degrees	5919

* All the Charts specified, with the exception of those marked F, can be supplied in the Fahrenheit or Centigrade Scale. Special Charts made to order.

H. & M. Index Thermometer.

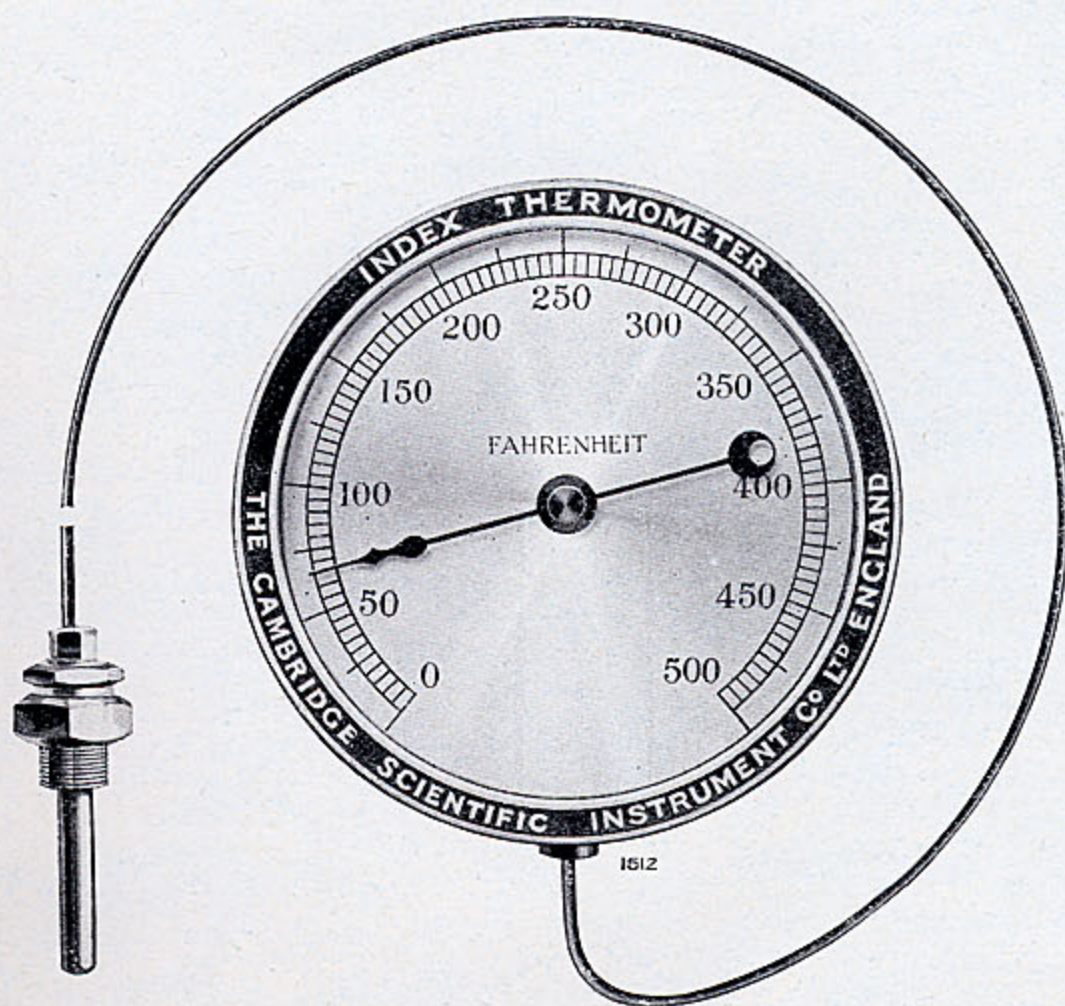


FIG. 7.

The above illustration shows the appearance of the H. & M. Index Thermometer connected by flexible steel capillary tubing to a Type 2 Bulb-Connection. This instrument can be fitted with any of the bulbs described in the following pages.

The outside diameter of the dial is 8 inches, and the graduations are made on a 6-inch circle, with a length of approximately $14\frac{1}{2}$ inches (36 cm.). A larger model can also be supplied with 13-inch dial, the graduations being made on three-quarters of a 12-inch circle.

The figures are bold and clear, and the standard instruments have black figures on a white background. If desired the figures can be silvered, and on a bronzed background.

Any length of steel capillary tubing up to 75 feet (22.9 metres) can be supplied with this thermometer.

SCALE RANGES.—These instruments can be supplied for practically any range to $1,000^{\circ}$ F.

H. & M. Index Thermometers (Contd.).

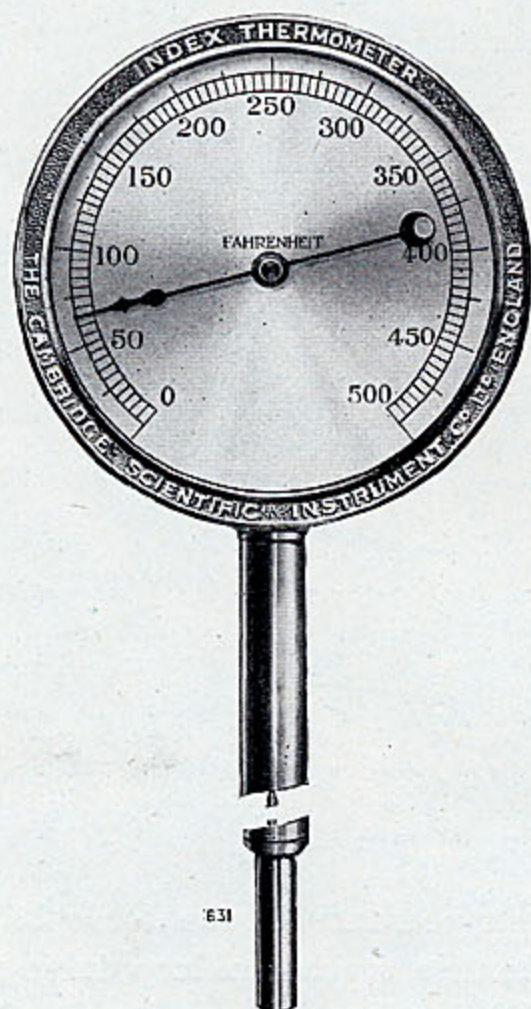


FIG. 8.

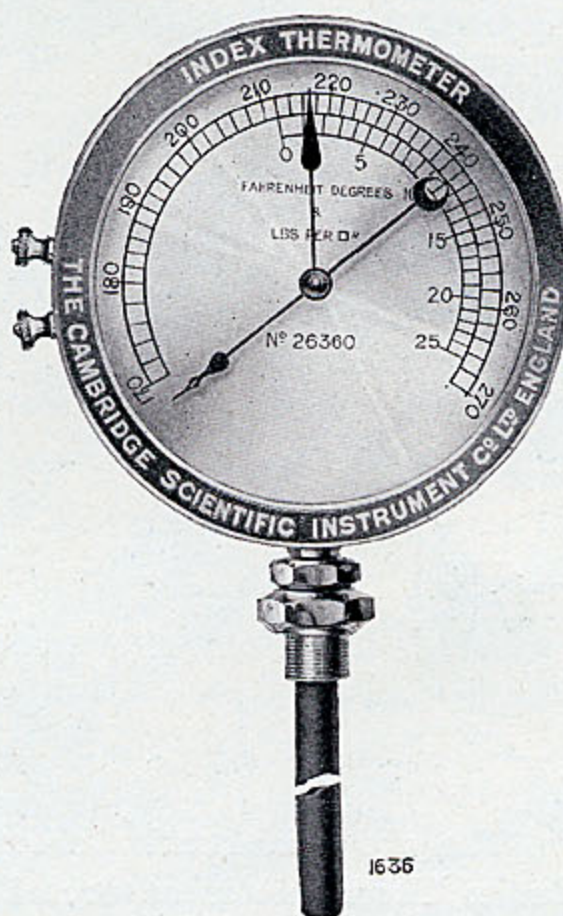


FIG. 9.

The illustrations on this and the following page show the appearance of the H. & M. Index Thermometers fitted with rigid stem connections, which have been found of service in industrial practice.

We shall be pleased to send details of other types with rigid connections that we have manufactured, or if prospective

H. & M.

Index Thermometers (Contd.)

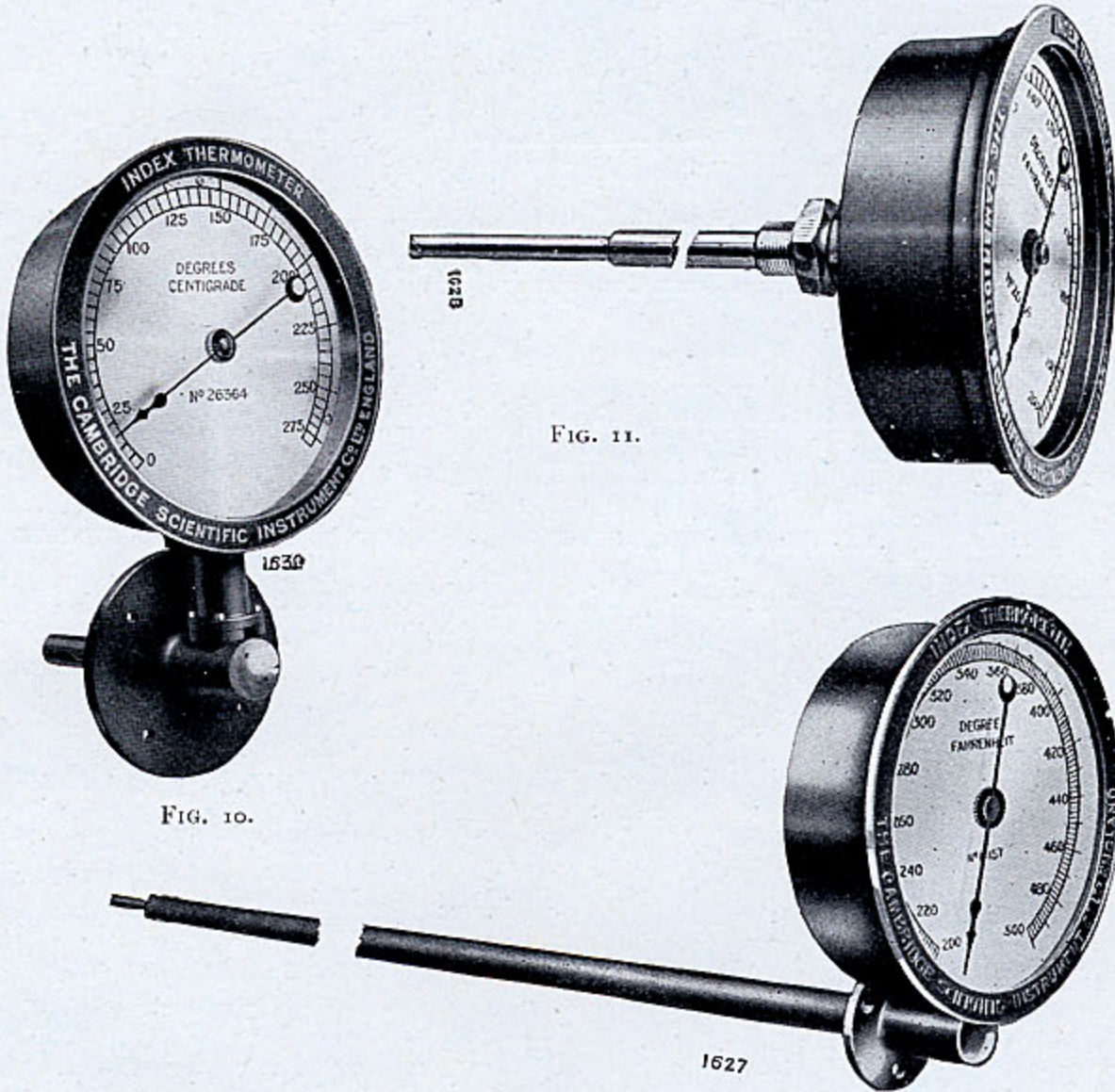


FIG. 10.

FIG. 11.

FIG. 12.

customers will send a few details of their plant and requirements, we will submit particulars of a thermometer stem best suited to their conditions.

Any of these thermometers can be fitted with 13-inch dials at a small extra cost, but in the absence of other instructions our standard 8-inch dial will be supplied.

Standard Bulb Connections.

Type 1



FIG. 13.
PLAIN BULB CONNECTION.

The size of the bulb depends upon the range of the instrument to which it is connected. The exact size for any particular range will be forwarded on request. If desired a rigid extension piece can be fitted between bulb and tube. (See Fig. 3.)

Type 2.

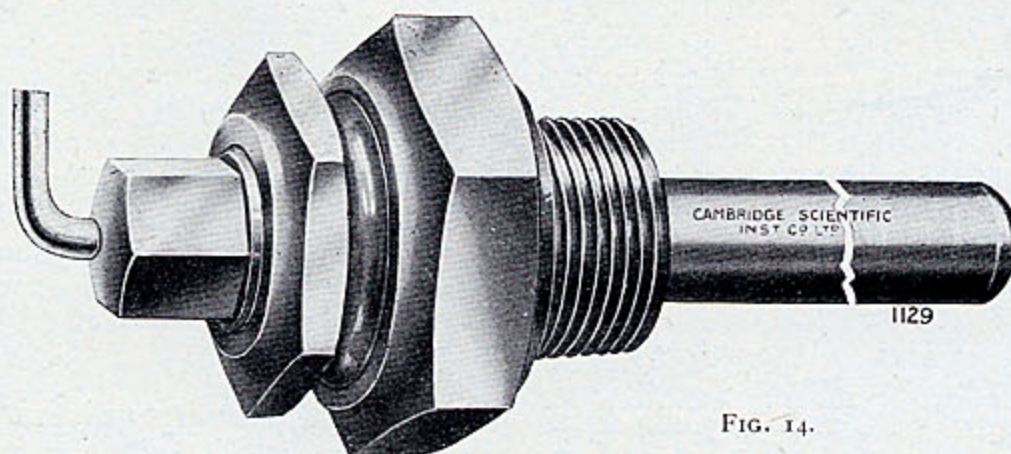


FIG. 14.
SCREWED BULB CONNECTION.

This bulb connection is generally supplied screwed $\frac{3}{4}$ -inch gas thread, but if desired can be screwed 1-inch gas thread.

Standard Bulb Connections (Contd.)

Type 3.

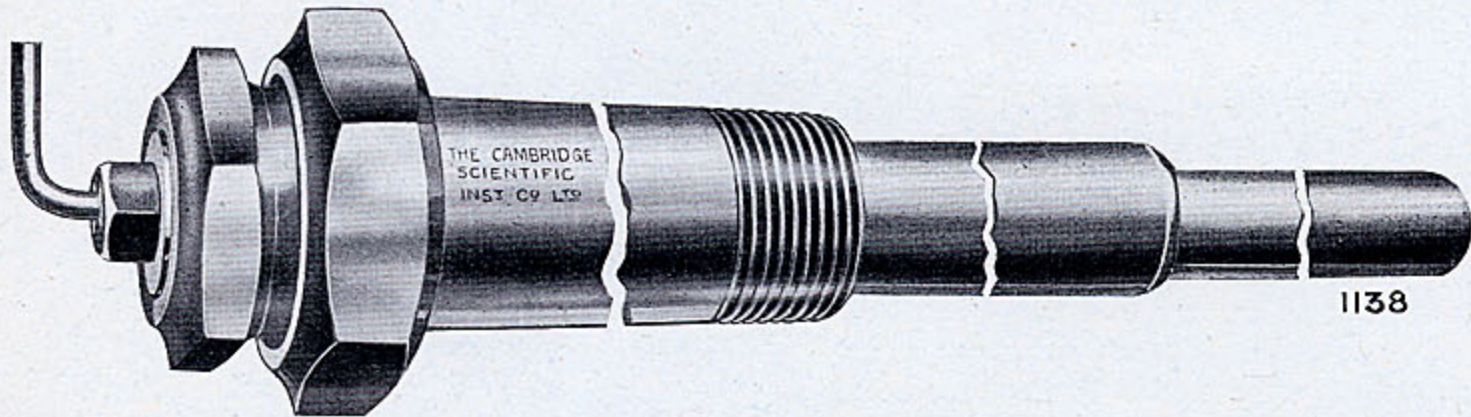


FIG. 15.

BULB CONNECTION WITH EXTENSIONS BETWEEN HEXAGON HEAD AND THREAD AND THREAD AND BULB.

This type (unless otherwise ordered) is supplied with a 12-inch (305 mm.) extension between hexagon head and thread, and with a 6-inch (152 mm.) stem (including bulb). Threaded $\frac{3}{4}$ -inch Whitworth gas thread.

Type 4.

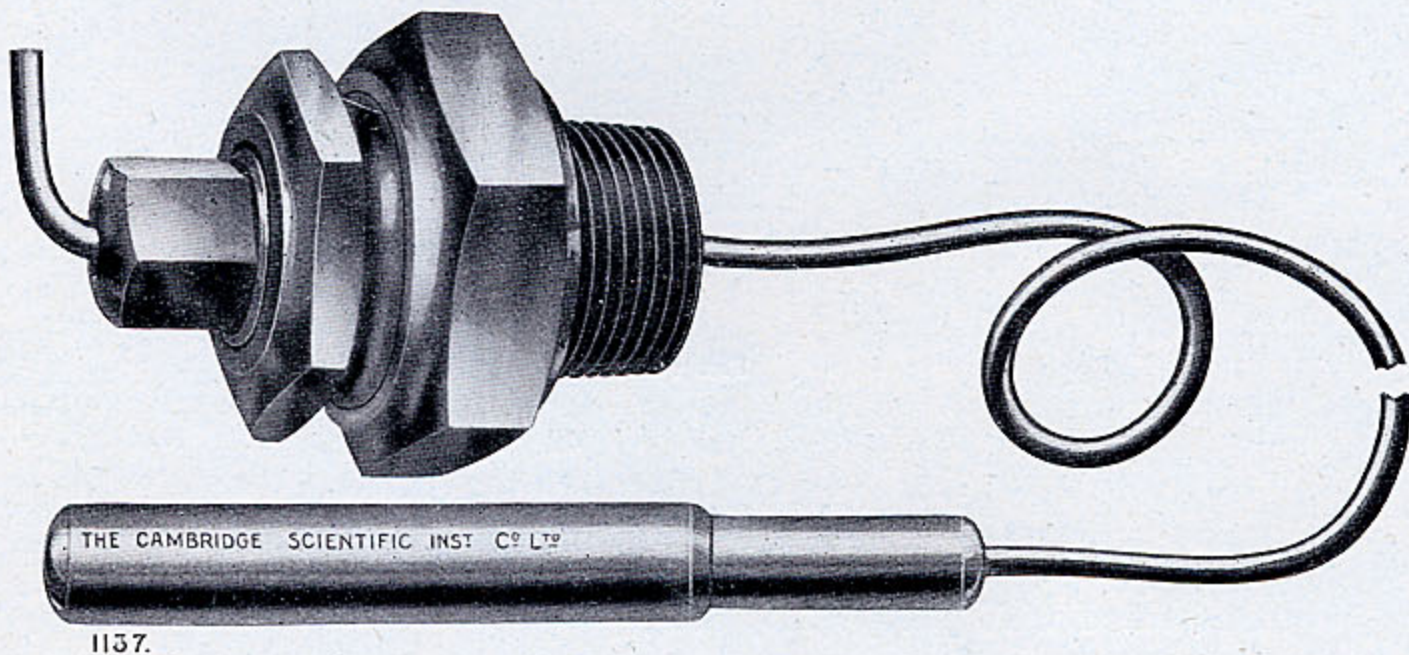


FIG. 16.

BULB CONNECTION WITH FLEXIBLE EXTENSION.

This bulb is threaded $\frac{3}{4}$ -inch Whitworth gas thread. Unless otherwise ordered the length of flexible extension supplied will be 12 inches (30.5 cm.) including bulb stem. This form of bulb can be supplied with 5-inch (12.7 cm.) flanged union in place of the threaded fitting, when the instrument is to be connected to a wall or metal plate.

Accessories.

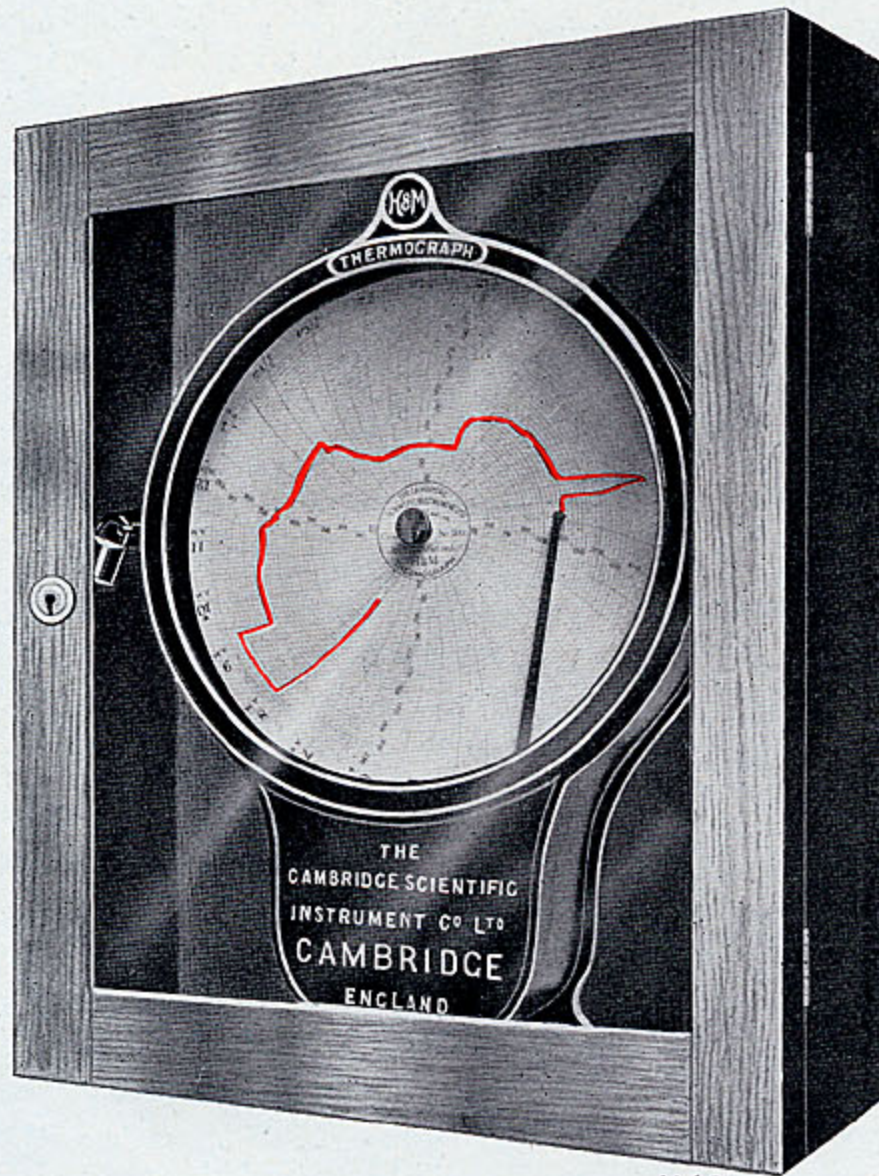


FIG. 17.

Wooden dustproof protecting case for the H. & H. Thermograph, fitted with heavy glass door.

An Electric Alarm Attachment (see Fig. 9) can be fitted to any H. & M. Thermograph or Index Thermometer, and made adjustable for any temperature covered by the instrument. If desired a double attachment arranged for giving warning at both minimum and maximum temperatures can be supplied.

Accessories (Contd.).

Adjustable Clamps.

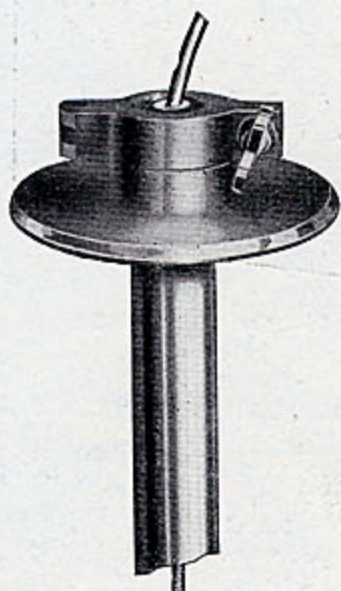


FIG. 18.

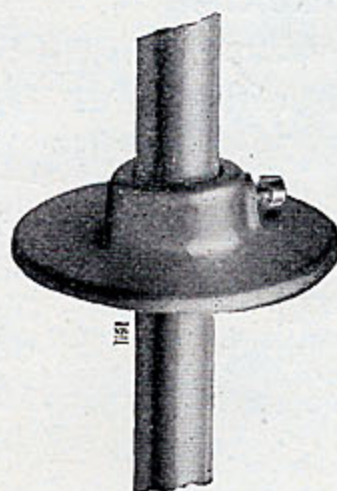


FIG. 19.



FIG. 22.

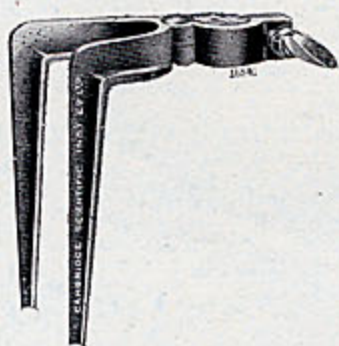


FIG. 20.

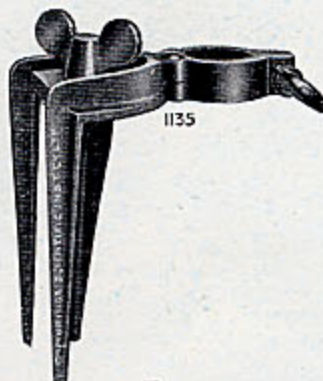


FIG. 21.

- Fig. 18. Shows the "Standard" Adjustable Clamp fixed by means of a wing nut. With this Clamp no damage can be done to the stem connection.
- Fig. 19. Illustrates a simple form of stop flange which is fixed to the stem by means of a screw.
- Fig. 20. Shows the Double Hook Clamp frequently used on thermometers for jam and sugar boiling vessels.
- Fig. 21. The Three-Prong Clamp is used for holding the stem of the thermometer rigidly to a tank, the centre prong being adjustable for rims up to $\frac{7}{8}$ -inch (22 mm.) wide.
- Fig. 22. The Rocking Cup Clamp is useful when the stem is used for stirring.

The Bi-Meter CO₂ Recorder.

This instrument consists essentially of two meters which measure the volume of gas before and after it has passed through an absorption chamber containing slaked lime.

The CO₂ is absorbed by the lime, and the difference in the volume of gas which results is recorded on a revolving drum, the pen mechanism being actuated by the two meters.

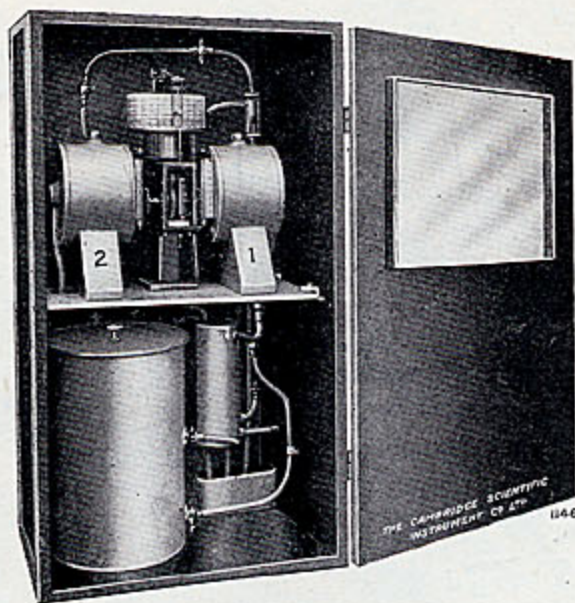


FIG. 23. *The Bi-meter CO₂ Recorder.*

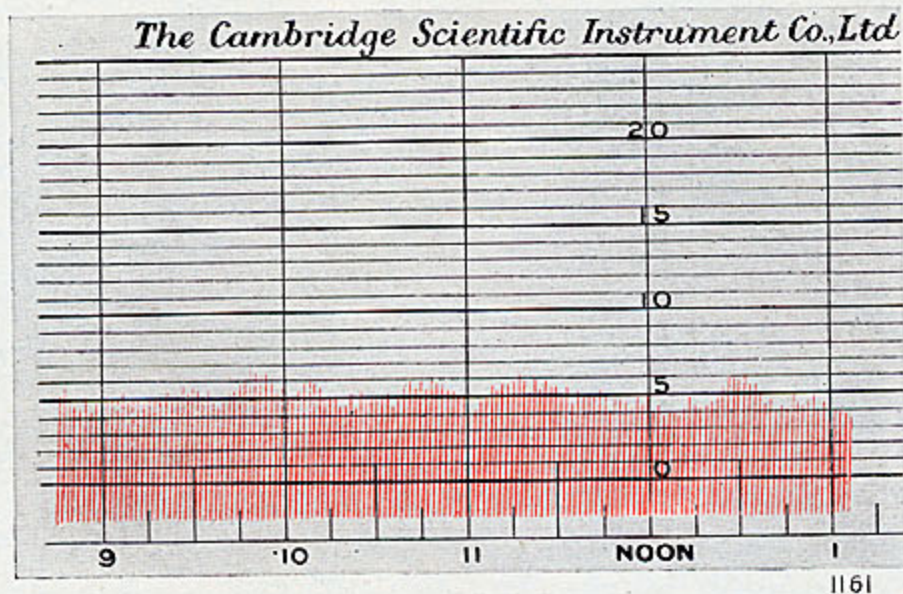
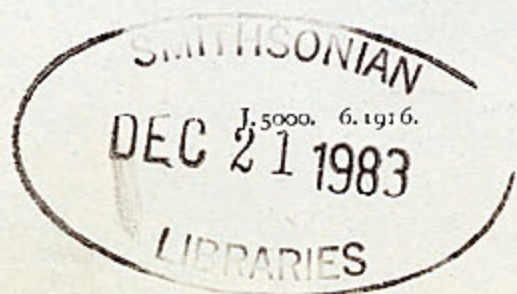


FIG. 24. *Full-size reproduction of a portion of an actual Record.*

The Gas is drawn through the instrument by means of a water aspirator, and, as the gas is passed through a temperature equaliser, errors due to temperature variations are practically negligible.

Write for Leaflet No. 141, which fully describes this instrument.

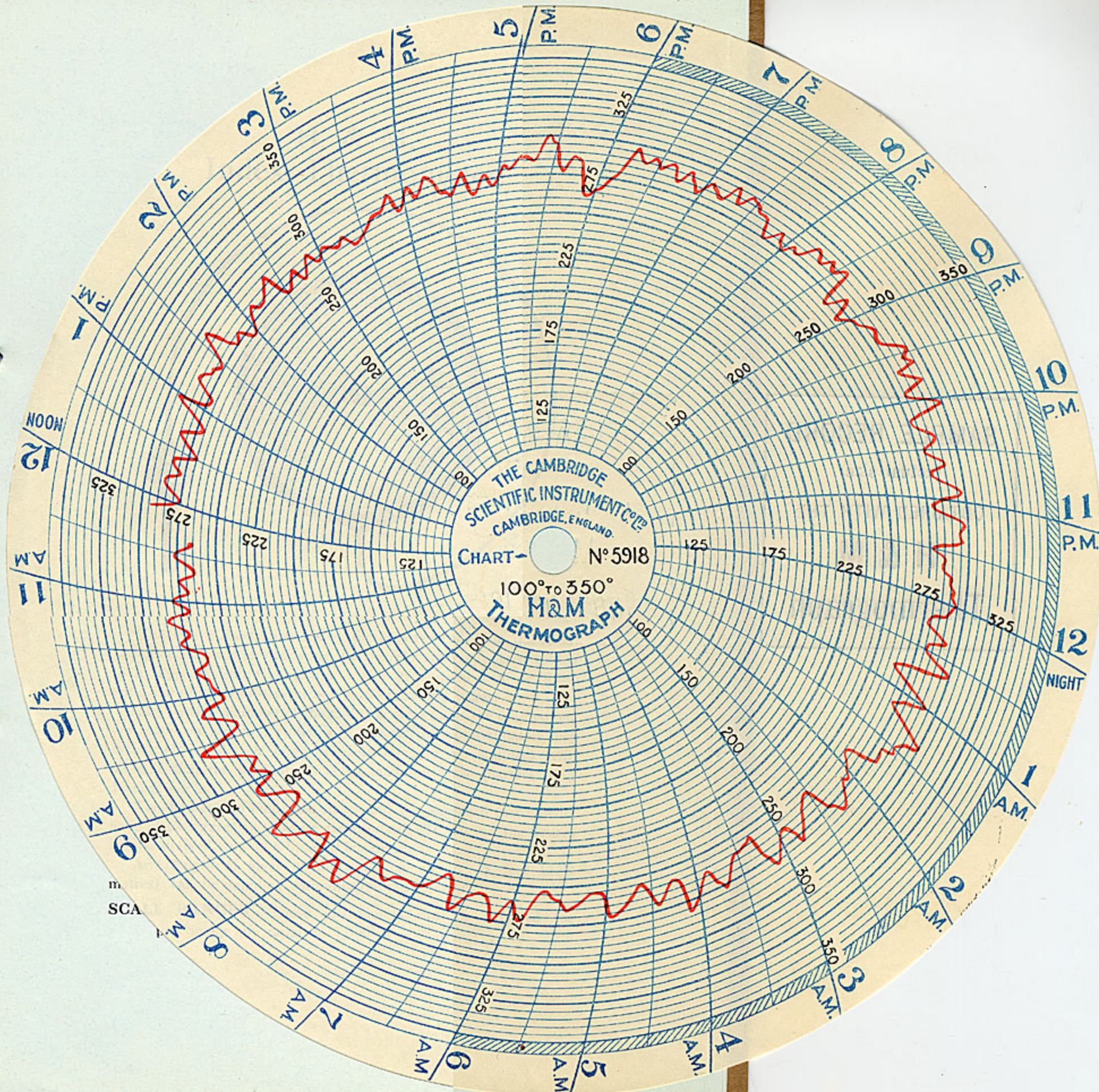
We also manufacture Féry Radiation Pyrometers, Optical Thermo-electric and Resistance Pyrometers, H. and M. Temperature Regulators, The Rosenhain Fuel Calorimeter, and many Mechanical, Physical and Electrical Instruments.







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Ltd.



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