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PROGRESS IN THE DESIGN AND MANUFACTURE OF METEOROLOGICAL INSTRUMENTS IN THE INDIA METEOROLOGICAL DEPARTMENT WORKSHOP AT POONA

S. P. VENKITESHWARAN.

With the objective of manufacturing as many as possible of the meteorological instruments needed in India, in the workshops of the India Meteorological Department, the Instruments Branch at Poona has been developing instrument manufacture. A review of the progress made in the last two years is given below :

1. *SURFACE METEOROLOGICAL INSTRUMENTS*

(*a*) *Indicating type.*

The cup counter anemometer and windvane designed by J. M. Sil, and in use at over 300 stations in India, have been manufactured in the Poona workshops for a long time. Recently the present writer in collaboration with A. Kesavamurthy, has designed and constructed an *electronic distant indicating wind instrument* for use at aerodromes. A full description of this instrument appears separately in this issue of the Journal.

Ordinary raingauges and measure-glasses are being obtained from local manufacturers, who are asked to conform strictly to standard departmental specifications. A *snow-raingauge* with wind shield and tower has been recently designed in connection with the various river valley schemes initiated by the Government of India, and constructed by the Department for use at observatories on the Himalayan range.

The Meteorological Department has recently undertaken the construction of *Kew Pattern barometers* for use both at land stations and on ships. It is expected that the technique for both their manufacture and calibration will be completed before long.

Almost all the departmental requirements of thermometers were being met by indent from abroad. With the development of the technique for their manufacture in the Mathematical Instrument Office of the Government of India at Calcutta, it is expected that our requirements will be met locally in future. A large number of *Whirling psychrometers* using thermometers obtained from abroad, are also constructed in Poona. A *marine bucket* for use on ships for the measurement of sea surface temperature, has been designed by Miss A. Mani and nearly forty of these have been supplied to ships registered in this country.

(*b*) *Recording Instruments.*

The Hygrograph.—The hair hygrograph is of the standard type, employing two cams to obtain a linear scale. The base is of aluminium and the hair is fixed on a separated plate mounted on the side. The instrument is finished in battleship grey enamel—plain or wrinkle finish.

The Wet and Dry Bulb Thermograph.—The temperature sensitive elements are iron-invar bimetallic coils. The usual difficulty experienced in using these instruments is

that the wet bulb element is acted on by the water and rust. This has been prevented by gilding them. Attempts are also being made to replace the bimetal coils with bourdon elements of beryllium copper.

The Self-recording Raingauge.—The Casella natural siphon rainfall recorder has been in extensive use in India for a very long time. This instrument is now being manufactured in the workshops of the India Meteorological Department at Poona. A simple arrangement for locking the cover has been provided to prevent damage to the instrument by unauthorised persons.

Distant Indicating Raingauge.—Fig. 1 shows a distant indicating raingauge manufactured in the Poona workshops. It employs the principle of the tipping bucket. A mercury switch makes a momentary contact during the tipping of the bucket. The indicating mechanism is on the principle of the "Synchronome" electric secondary clock.

The Barograph.—The open scale barograph manufactured by the Department employs Sylphon bellows as the pressure sensitive element. The sylphon tubing and clock-work are obtained from abroad. These instruments have been tested for sensitivity, hysterisis and temperature compensation and their performance has been found to be satisfactory.

Sunshine Recorders.—Campbell-Stokes sunshine recorders, 'Tropical' pattern, have been in use in this country from a very long time. The technique of manufacturing the glass sphere has not yet been developed in this country and the spheres have to be imported. The mounting and base are constructed in Poona. Special patterns had to be made and the technique of constructing the bowl to hold the charts had also to be developed.

The Dines Anemograph.—A beginning has been made in manufacturing the Dines anemographs. All the templets, patterns, etc., required for the recording mechanism have been made and a few recorders are nearing completion. The work on the construction of the head and vane is on hand and it is expected that it will be completed before long.

Charts for recording instruments.—Each autographic instrument requires a different chart. The charts for all these instruments are now being printed at the Photozinco Office of the Government of Bombay at Poona.

(*c*) *Other Meteorological Instruments.*

In addition to the meteorological instruments described above which are required for routine meteorological observations, the design and construction of instruments required for special investigations have also been undertaken. A tilting bucket raingauge which operates without any attention for six months and records the rainfall on a red-base-waxed paper tape is one of these. They are expected to be useful in obtaining rainfall data in regions which are inaccessible during the monsoon. Very little information is available in this country regarding the intensity of rainfall and simple instruments to record rates of rainfall have been designed and are under construction. It is hoped to publish fuller details regarding these instruments in this Journal in due course.

(*d*) *Seismological Instruments.*

The present writer took up the construction of Wood-Anderson seismographs. This led also to the construction of accurate clocks for use with the seismographs, providing electric contact of definite duration every minute and hour. These clocks employ invar pendulums and, therefore, maintain accurate ratings. They are usually weight driven; automatic winding clocks using an

A. C. D. C. motor, a mercury switch and a suitable spring have, however, been constructed. The technique for the manufacture of Milne-Shaw types of seismographs has also been recently developed and a number of instruments are nearing completion.

The Wood-Anderson seismograph and the quick run recording drum employing a governor controlled weight drive as designed by A. N. Tandon are shown in Figs. 2 and 3.

(*e*) *Testing and Calibration.*

The Instruments Division at Poona has a fairly well equipped laboratory for the test and calibration of all the meteorological instruments manufactured in Poona or obtained from abroad. The calibration equipment constructed recently include those for calibrating thermometers and thermographs.

2. *UPPER AIR SOUNDING INSTRUMENT—RADIOSONDE.*

The Fan-type radiosonde, developed in Poona, is in regular use at seven stations in India (including Port Blair). The meteorographs, and the signallers used with them, the receiver and recorder and the calibration equipment were designed by the officers of the Department at Poona and manufactured in the workshops attached to that office. Attempts are continuously being made to increase the accuracy and the performance of the instruments. The instrument and its ground equipment are cheaper and simpler in construction than most other available radiosonde instruments. A simple portable indicating ground equipment has also been constructed. Fuller details regarding these are available in the Scientific Notes Nos. 113, 133 and 134 issued by the India Meteorological Department.

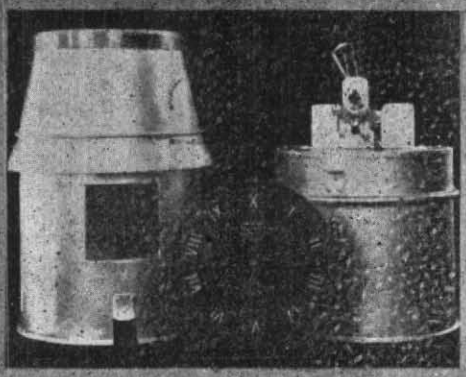

Fig. 1.

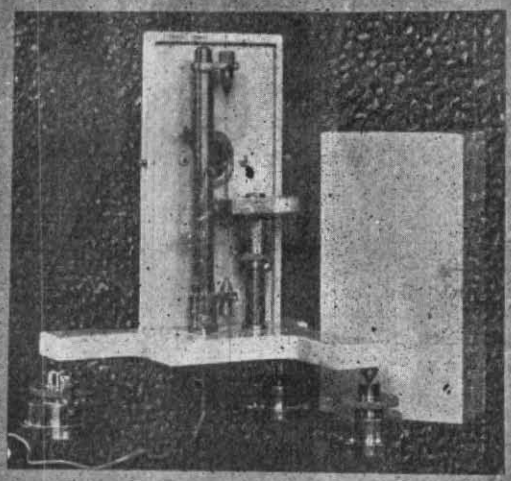

Fig. 2.

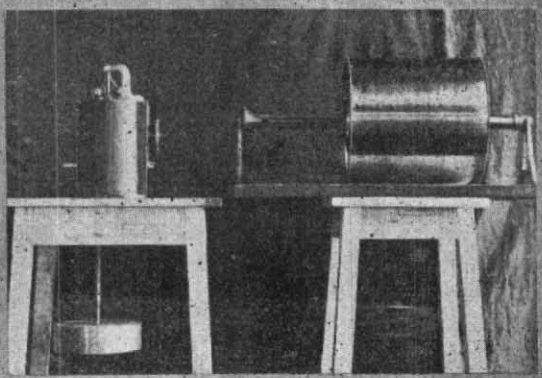

Fig. 3.