Department of consumer and corporate affairs / Ministère de la consommation et des corporations

STANDARDS BRANCH - DIRECTION DES NORMES

NOTICE OF APPROVAL

G-56

OTTAWA June 9, 1970.

MERCURY INSTRUMENTS, INC., MODEL MERCOR III
VOLUME CORRECTING INTEGRATOR.

This approval will lapse not later than July 1, 1971 (see note below)

Apparatus

Static pressure ranges	
(i) Diaphragm element :	0-30 psig
(ii) Helical Bourdon elements:	0-50, 0-60, 0-100, 0-250 and 0-1,000 psig
Temperature ranges	$0^{\circ}F$ to + $100^{\circ}F$ and $-30^{\circ}F$ to + $120^{\circ}F$
Temperature measuring system	Case compensated, mercury filled with 5 foot armoured capillary.
Volume registers	
(i) Uncorrected (line conditions)	Clock-type register, available with 5, 10, 100 or 1,000 cu. ft. per rev. test dial.
(ii) Corrected counters	Plastic, Veeder - Root No.728137, 7 digit capacity.
Supercompressibility factor	Based on hydrocarbon gas at $50^{\circ}F$ and 0.6 Sp. Gr.

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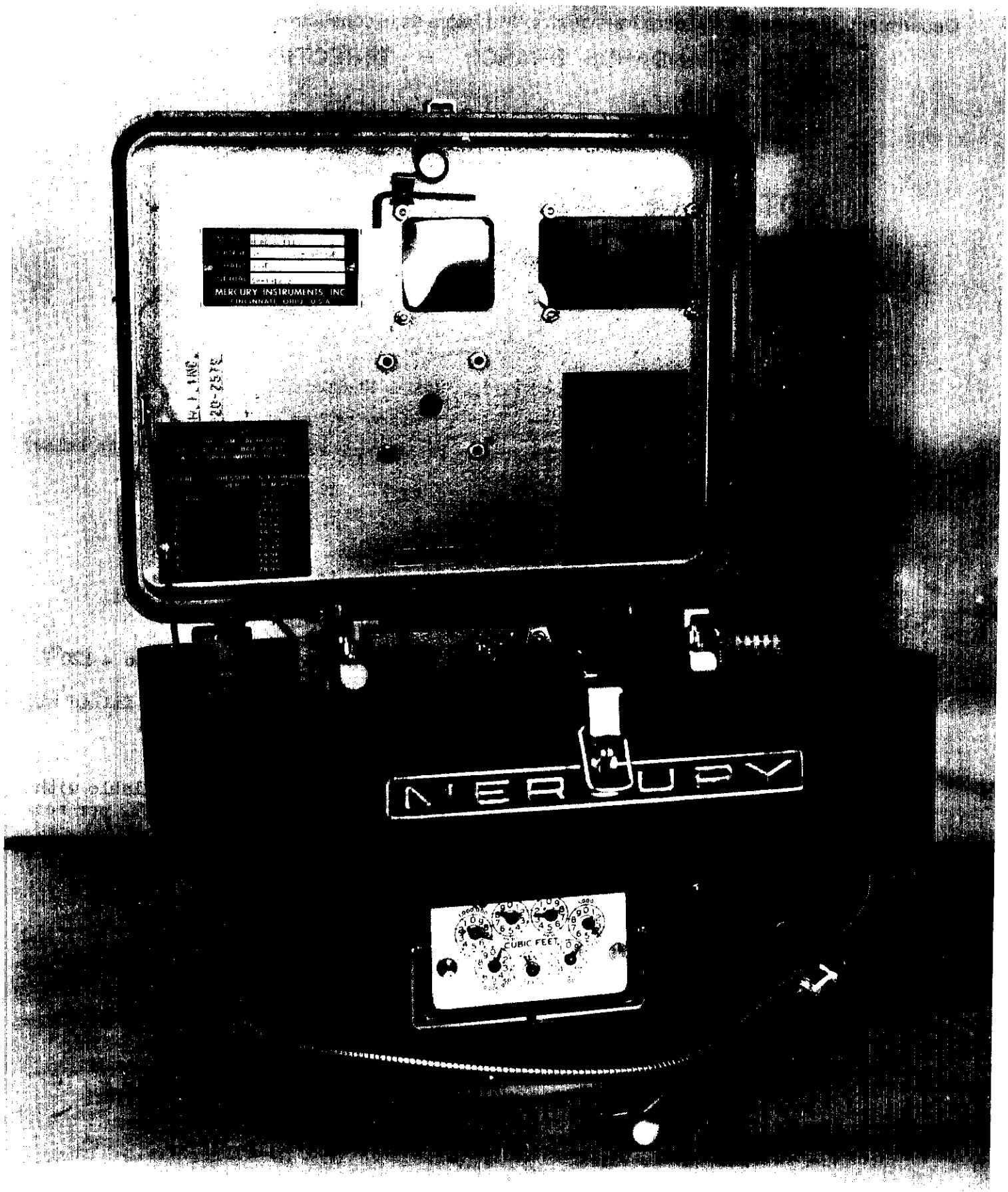

Description.

Mercor III is designed to sense and indicate the pressure and temperature of the metered gas, and automatically and continuously apply required momentary multipliers thus providing an integrated readout at specified base conditions. The device may also include the supercompressibility factor in the integrated readout.

Mercor III is driven directly from the meter to which it is attached in place of a standard register.

Mercor III uses two mechanical systems for correcting the gas volume. Each can be used separately or combined. The pressure system applies the pressure or combined pressure-supercompressibility factor to the metered gas volume, correcting it to a base pressure. The temperature system applies the temperature factor to the gas volume, correcting it to a base temperature. Each system uses a unique principle of torque and movement amplification: The pressure and temperature elements sense any change in metering conditions and reposition the compensating mechanisms.

The drive input from the meter causes the pressure drum to rotate at a speed proportional to the rate of gas flow. Part of the drum surface is raised and covered with a frictional material, the remainder of the surface is smooth. The shape of the raised surface is determined by the pressure correction factor to be applied. In theinstruments which include the supercompressibility correction the shape of the raised surface is determined by the product of the pressure and supercompressibility correction factors. When the pressure element senses a change, it repositions the beam assembly through the steering mechanism and the counter wheel, in turn, is positioned by the pusher block on the beam. The counter wheel rotates when it is in contact with the raised surface of the pressure drum anddrives the totalizing counter, providing the corrected volume readout.

The temperature drum is driven through gearing by the counter wheel shaft of the Pressure System. The shape of the drum surface is determined by the correction factor to be applied. When the temperature element senses a change, it repositions the beam assembly through the steering mechanism. The drum causes the steering wheel to rotate, and, depending on its position along the tapered surface of the drum, the wheel turns faster or slower in direct relationship to the correction factor to be applied. The totalizing counter, geared to the wheel, indicates the final count of gas volume, corrected to the base conditions of pressure and temperature.

The computation of the volume of a gas, at the contract temperature and pressure, which has been registered in cubic feet at line conditions is based on the ideal gas laws modified by a deviation factor available in the form of a Supercompressibility factor (Fpv), determined according to the A.G.A. Gas Measurement Committee Report No.3, Orifice Metering of Natural Gas.

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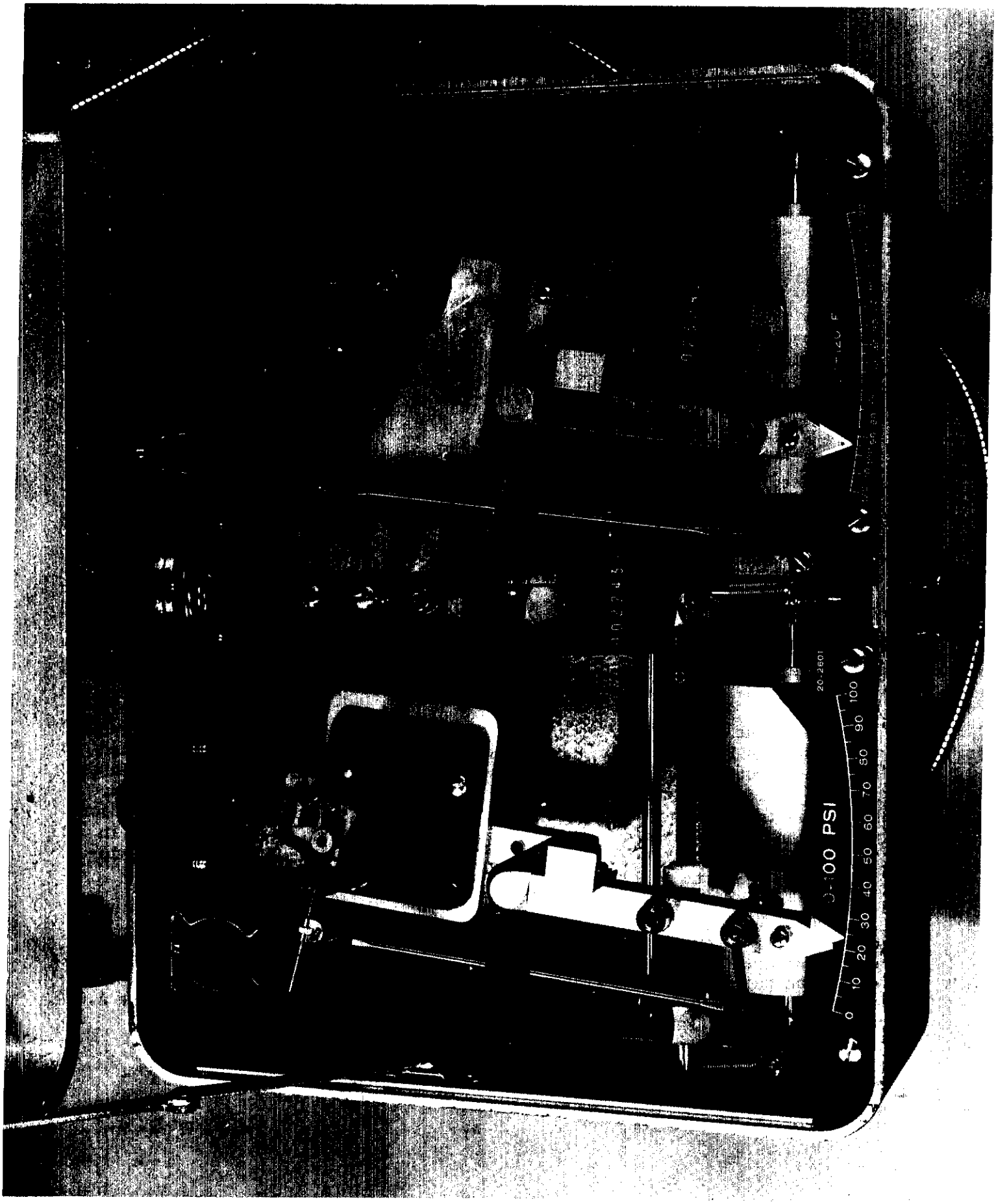

The general equation for converting the meter readings at line conditions to a contract base pressure and temperature is

$$Qs = Qd \quad Pm \quad Tm \quad (Fpv)^2$$

Qs = Quantity of gas at the contract base pressure and temperature, cu. ft.

Qd = Actual (displaced) volume of gas passed at existing meter conditions, cu.ft.

Pm = Pressure multiplier

$$= \frac{\text{Weighted average existing gauge pressure + barometric pressure}}{\text{Absolute pressure base}}$$

Tm = Temperature multiplier

$$= \frac{\text{Temperature base + 460}}{\text{Weighted average flowing gas temperature + 460}}$$

Fpv = Supercompressibility factor based upon the weighted average gas pressure and temperature and the normal composition of the gas. The composition is represented by its specific gravity, its content of nitrogen and carbon dioxide and its calorific value as used in the derivation of Fpv values.

The selection of the weighted average supercompressibility factor, Fpv, should be based on a record of the flowing gas volumes, pressures and temperatures. If no continuous record is available, the variations in pressure and temperature normally existing in the line must not introduce an error greater than ±0.5% in the selected $(Fpv)^2$ factor.

It must be emphasized that Mercor III in its present design cannot apply the supercompressibility correction which would take account of the varying temperature of the metered gas. In order to fulfil the requirements of the tolerance limit of ± 0.5% in the $(Fpv)^2$ factor, as declared above, it may be necessary to apply an additional factor at the extreme ends of the temperature range of these instruments.

Mercor III is equipped with a clock-type register which contains reversible gearing to match the drive output of the meter.

Improper levelling of this instrument may affect the accuracy of the integrated readout.

For installation and operation of the Mercor III, careful adherence must be made to the company's manual of instructions.

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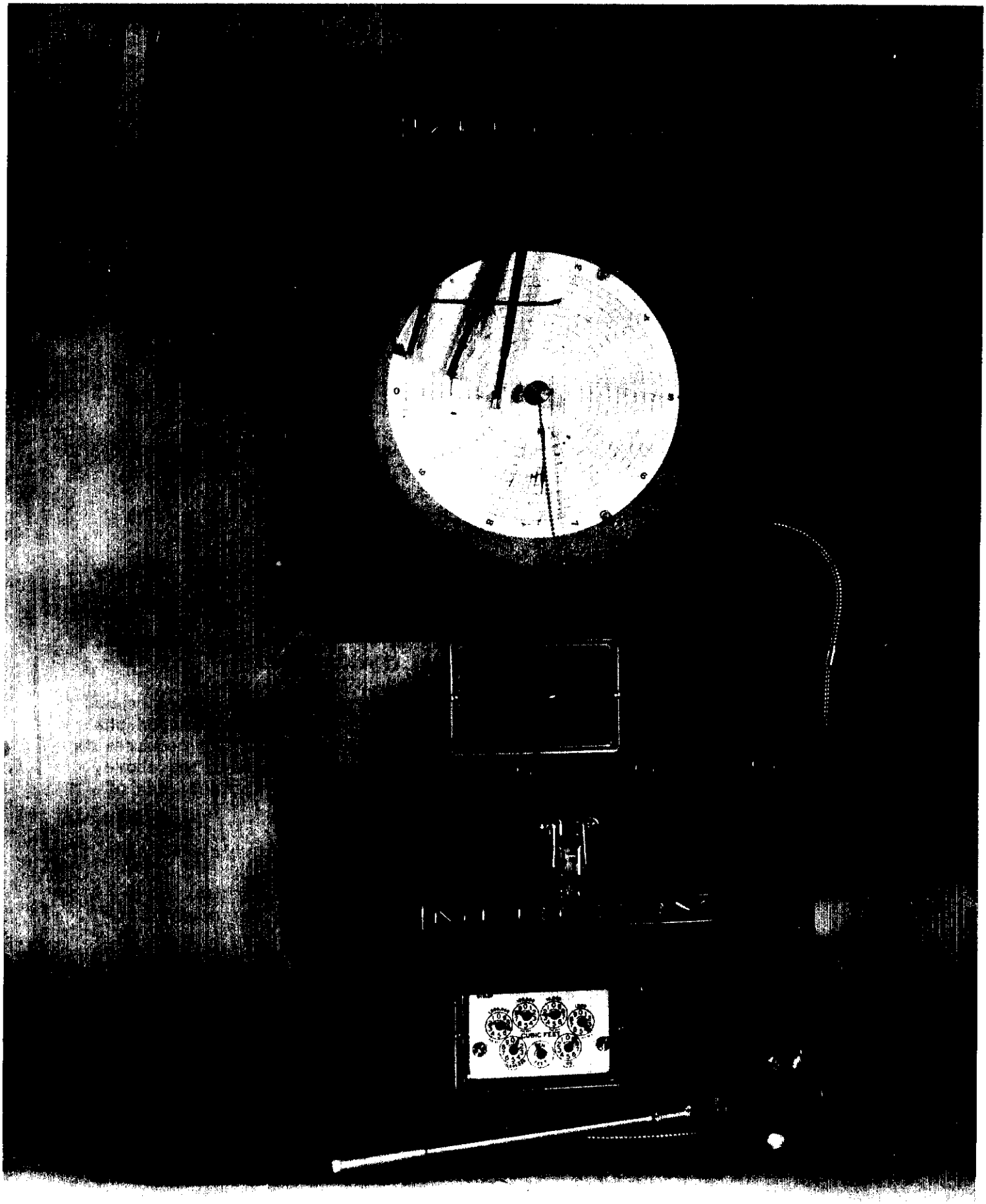

Each instrument shall have the following information marked on nameplates or other visible locations :

Manufacturer's name, Instruments Model designation, Pressure range, Temperature range, Base pressure, Atmospheric pressure, Base temperature, Data for supercompressibility correction, Applicable multipliers for indexes and Serial number of the instrument.

It is recommended that this Mercor III be operated only at ambient temperatures above freezing. Where this instrument and auxillary equipment are exposed to solar heating, the application of reflective paint is recommended.

The Mercor III is approved for use with approved diaphragm, rotary and turbine gas meters and it may be used in conjunction with Mercury Instruments, Inc., Recorders, approved under circulars G-54 and G-55.

Note: It should be particularly noted that the manufacturer has under development at the present time certain modifications to this device which are expected to improve its overall performance. When these modifications receive approval from the Standards Branch this present Circular will be amended and re-issued. Since the manufacturer wishes to provide to current purchasers of the device such benefits as may accrue from the modifications all such devices in operation in the field under this approval will be modified to conform to the amended approval. In order to keep the number of devices requiring change within reasonable bounds it has been mutually agreed that after June 1, 1971 only devices conforming to the proposed amended approval will be permitted to be sold or remain in service.

Approval granted to: Parkinson Cowan (Canada) Ltd.,
Chatham, Ontario.

J.S.T. Swanson,
Chief, Standards Laboratory,
Standards Branch.

(for) W.J.S. Fraser,
Chief, Electricity & Gas Divn.,
Standards Branch.

Ref: SL-100-84A.