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

STANDARDS BRANCH - DIRECTION DES NORMES

NOTICE OF APPROVAL

G-79

OTTAWA May 5, 1971

MERCURY INSTRUMENTS, INC., MERCOR III -T
TEMPERATURE COMPENSATING VOLUME INTEGRATOR

Apparatus

Temperature range	-30° to +120°F
Temperature measuring system	Mercury filled, case compensated, with 5 ft. length armoured capillary
Volume registers	7-digit cyclometer-type counters
(1) Uncompensated	last digit equals 1 cu. ft.
(11) Compensated	last digit equals 10 cu. ft.

Description

Mercor III-T is designed to sense and indicate the temperature of the metered gas, and automatically and continuously apply required multiplier thus providing an integrated readout at specified base temperature. The device does not include any corrections to account for volume variation due to pressure multiplier.

Mercor III-T comprises two basic assemblies, which are (1) the temperature drum, and (11) temperature beam and counter assembly.

The temperature drum is a cone-shaped cylinder driven through gearing by rotation of the meter output wriggler. A reversing gearing, located inside the case, permits adapting the device to meters with clock-wise and counter clock-wise output shaft rotations. Through suitable gearing, linked with the temperature drum driving shaft, the uncompensated register connects with the meter output shaft rotation. The rate of rotation of the temperature drum is proportional to the rate of flow of gas through the meter.

The temperature beam and counter assembly carries the temperature sensing element, the compensated register with its gearing and the steering wheel, and the steering linkage which connects to the sensing element. The element links with the remainder of the temperature measuring system through a fine, flexible capillary coil so that the pivoted beam assembly is free to move.

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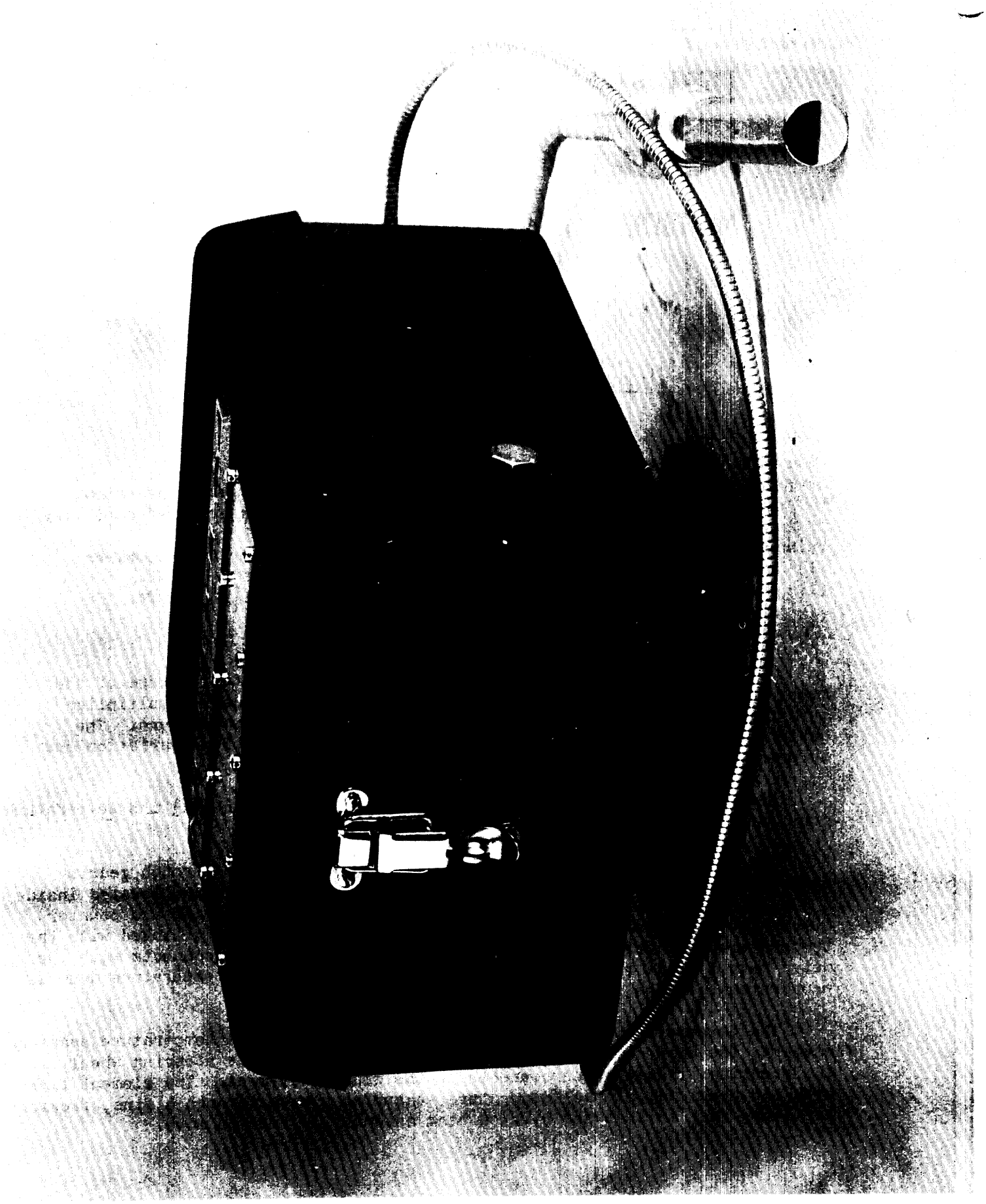

In operation the flow of gas through the meter causes the drum to rotate and the temperature sensing element actuates the steering mechanism. The steering wheel rolls on the surface of the drum, making continuous contact and attempting to align its axis parallel to the axis of the temperature drum. The movement of the beam in its arc of travel continues until the two axes are parallel. The steering wheel also acts as the counter wheel and, through gearing, drives the totalizing, compensated counter register, mounted on the temperature beam. A special idler gear between the steering wheel pinion and the counter permits the wheel to pivot freely without binding the gear train. The temperature beam also serves as an indicating pointer for the flowing gas temperature.

In general the computation of the volume of 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.

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 miltiplier

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

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 $\pm 0.5\%$ in the selected $(Fpv)^2$ factor.

It must be emphasized that Mercor III-T takes care of the temperature multiplier only, and pressure and supercompressibility factors must be applied separately in accordance with the above requirements.

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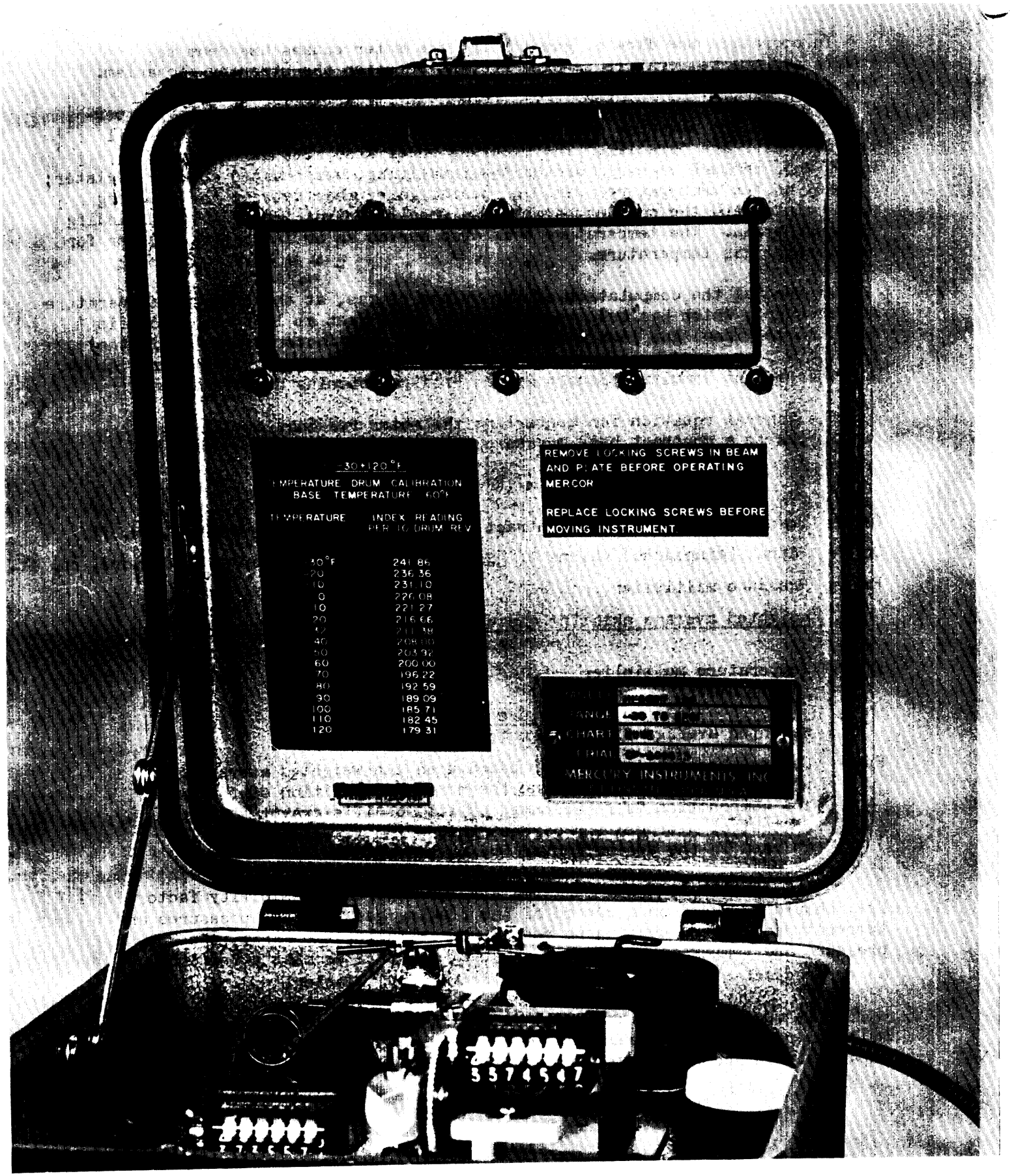

In or r that appropriate data can be collected to establish the . ghted aver age factors, Mercor III-T must be used in conjunction with an approved volume-pressure recorder and the Dual Instrument Drive Bracket, approved under circular G-80.

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

Manufacturer's name, Instruments Model designation, Temperature range, Base temperature, Applicable multipliers for indexes and Serial number of the instrument.

NOTE: Improper levelling of this instrument may affect the accuracy of the integrated volume registration.

Approval granted to:

Parkinson Cowan (Canada) Ltd.,
Chatham, Ontario.

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

W.J.S. Fraser,
Chief, Electricity and Gas Division,
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