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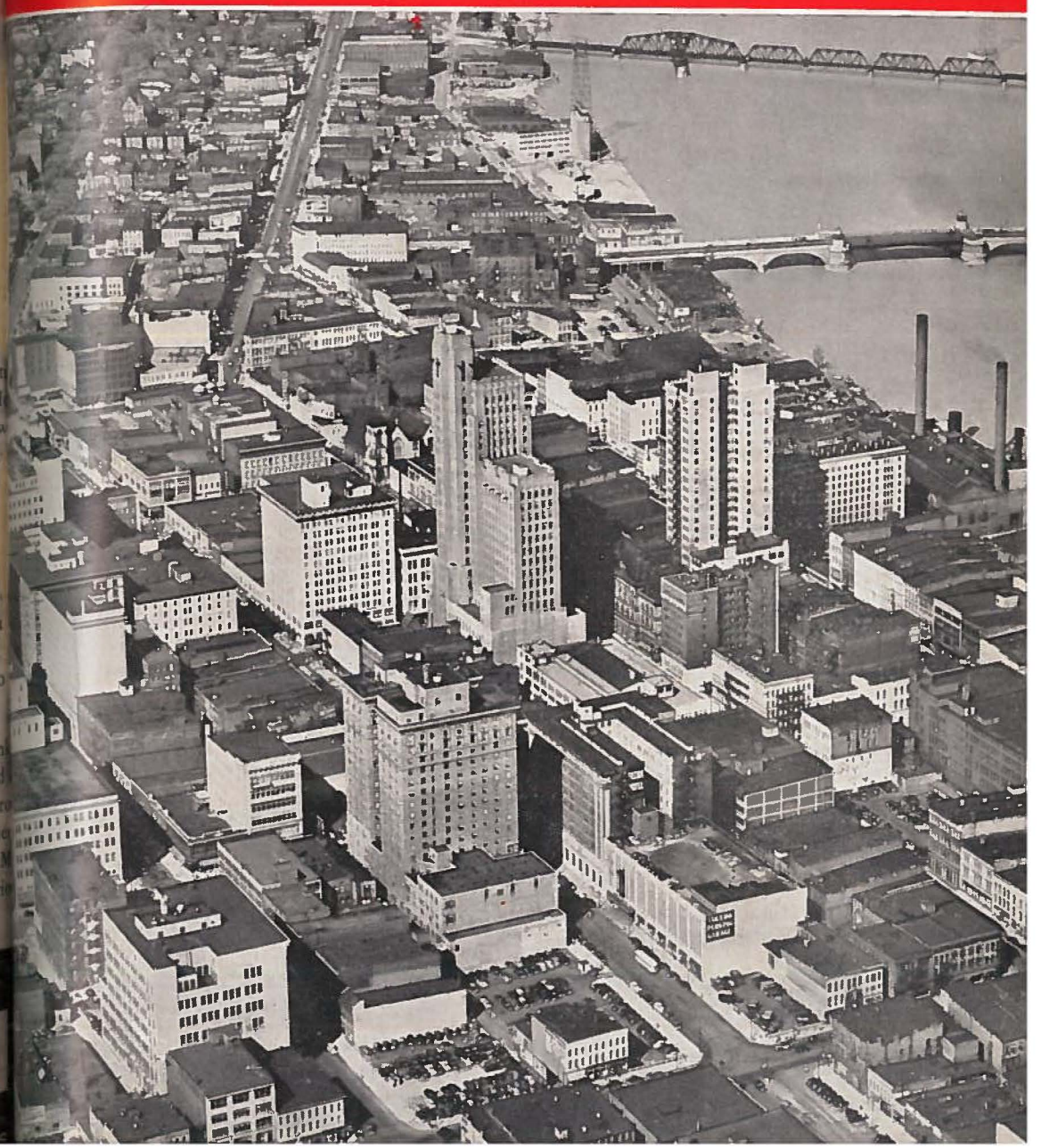


Tinsley Btu Meter*

To carry out efficient heating (or cooling) it is most important that the amount of heat taken out of (or given to) the system is known at anytime, and a record of a day's output taken. Without this vital information the useful work of the plant is not known, the loss of fuel due to inefficient firing or bad boiler control, etc., are not immediately discernible and do not enable correct control to be carried out at once.

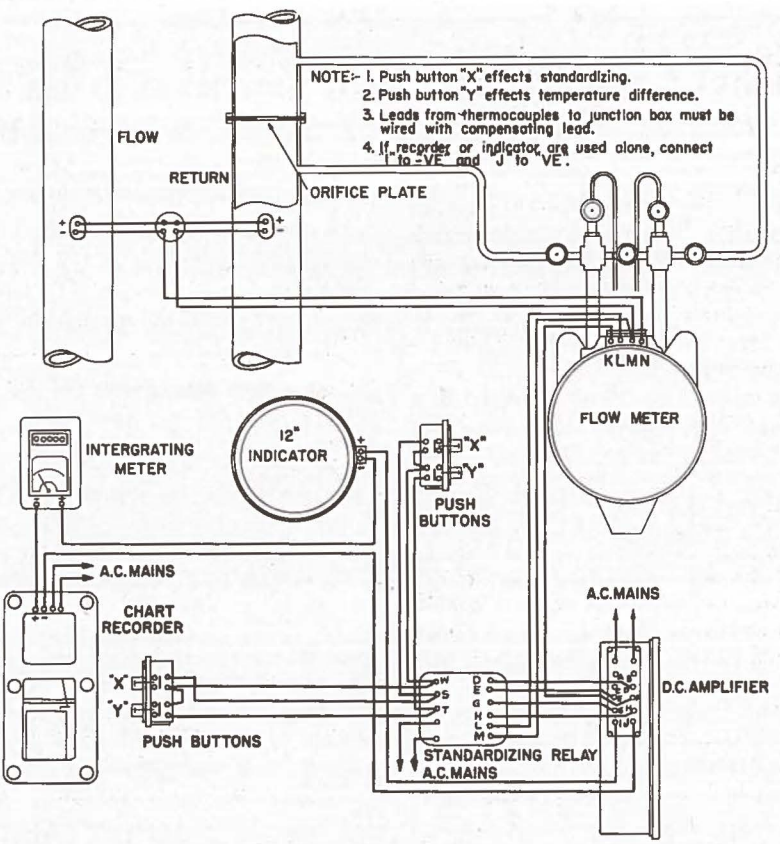
The Tinsley instruments give an immediate indication of the Btu per hr; also a record, which should be studied at the end of each day with the other records of the operation of the plant. The integrator gives the total output of the boiler house (or refrigeration plant) from which the over-all efficiency should be calculated.

Boiler House Efficiency Equals

$$\frac{\text{Btu Meter Reading} \times 100}{\text{Coal Consumption} \times \text{Calorific Value}}$$

Equals—%

The complete Btu meter comprises four main parts: (1) the primary detectors; i. e., the two thermocouples for measuring the flow and return temperatures and the orifice plate employed to produce the required pressure difference for the manometer; (2) the manometer including the transmitter which is employed to translate the temperatures and pressure differences into microvolts proportional to Btu or calories; (3) the Tinsley d-c amplifier employed to magnify the



*Manufactured by Tinsley (Industrial Instruments) Ltd., North Circular Road, West Twyford, London, N. W. 10, England.

microvolts into milliamps still proportional to Btu, but with approximately 1,000,000,000 times the power; (4) the electrical reading instruments; i. e., indicator, recorder and integrator.

The thermocouples are mounted one in the flow-pipe and the other in the return pipe. They are connected differentially with compensating lead to a junction box so that the resultant emf is proportional to units of temperature difference. This emf is applied across a potentiometer mounted in the manometer.

emf across potentiometer is equivalent to

$$(T_f - T_r)$$

No cold junction compensator is necessary as it is a temperature difference measurement and the thermocouple in the return pipe (the flow pipe in the case of refrigeration plants) acts as the cold junction. The orifice plate which is usually installed in the return pipe produces a difference in pressure across the manometer. The square root of the pressure difference being proportional to the velocity of the fluid, as the flow increases the difference in pressure increases and vice versa.

The manometer has this difference in pressure applied across it which causes the mercury to rise in the downstream limb and fall in the upstream limb. By means of a float and cam mechanism, this movement is transmitted to the brush of a potentiometer which is so wound that the position of the tapping point is directly proportional to the lb/hr of the fluid.

Therefore, emf tapped from potentiometer

is equivalent to W/hr $(T_f - T_r)$

taking into account the specific heat of the fluid.

emf is equivalent to Btu/hr

The Tinsley d-c amplifier has this emf applied to the input where it is amplified linearly to give a current sufficient to operate the reading instruments. The amplifier derives its power from a normal 230 volt 50 cycle supply, but the amplification is absolutely independent of fluctuations of the voltage and frequency. Also incorporated is a unique system for checking the accuracy of the reading instruments against a standard cell. A second range may be employed so that when a relay is operated the emf across the potentiometer is applied to the amplifier and a reading of temperature difference given on a second scale of the reading instruments.

The electrical reading instruments are of the direct current type operating from 0 to 25 milliamperes the current being supplied directly from the amplifier. The indicator and recorder have linear scales whose accuracy may be checked from time to time by means of the standard cell in the amplifier. Each instrument is provided with an easily accessible zero and range adjustment so that any slight error may be quickly corrected. The integrator is of the direct current disc type, the integration being continuous and performed at high speed so that readings may be taken at fifteen minute intervals or less if desired. The reading instruments may be mounted at any distance from the amplifier as the resistance of the connecting lead does not matter and no adjustment is necessary if the length is altered at any time.

DAY WARD DIES

Day Ward, of Portland, Oregon, member of NDHA for twenty-three years, and recently made a Life Member of the Association, died of a heart attack on September 24th after a brief illness. He was 63.

At the time of his death Mr. Ward was Superintendent of the Steam Heat Department of the Pacific Power & Light Company in Portland. He was that Company's representative in NDHA. He started as a steam fitter in 1914, after having come west to install the central steam heating system for the American District Steam Company of North Tonawanda, New York, the contract firm.

A career in professional baseball in the rough-and-ready leagues around Montana and western Canada earned Mr. Ward his colorful nickname of "Peggy." It was a corruption of "Piggy," the nickname of a fabulous hitter whose batting ability Mr. Ward emulated.

He is survived by his widow, Agnes R., a daughter, Alice W. Voss of Medford, Oregon, and two brothers.