

REGISTERING THERMOMETERS AND PRESSURE GAUGES.

We illustrate herewith two apparatus which have the one feature in common of inscribing their indications in ink and in a continuous manner upon a sheet of paper which is carried along by a clockwork movement.

These apparatus are very portable, and can be applied everywhere without the necessity of having recourse to special employees to attend to them. They are constructed after the same pattern, and consist of a glass case which contains the mechanism and permits the tracing pen, as well as the paper band, to be seen from the exterior. The system of registering is identical in the two apparatus, and this accounts for the moderate price of them. The registering apparatus consists of a movable, vertical drum containing wheel work. The top of this contains two apertures for the insertion of the keys for winding, and which are closed by slides, and the bottom is traversed by an axle which carries externally a toothed pinion that gears with a fixed wheel. This latter is keyed to a rod mounted on the base of the apparatus and serving as a rotary axis for the drum. The toothed pinion performs the role of a planet wheel for bringing about a general rotation of the drum. This registering mechanism, as a whole, is capable of being easily separated from the rest of the system, it being only necessary to unscrew a button in order to disengage the drum without touching the other parts. By merely varying the proportions of the radii of the two planet wheels which regulate the final motion, the constructor can readily modify the velocity and consequently the duration of the revolution.

The bands of ruled paper that cover the drum are pointed beforehand, and the spacing of their horizontal lines, which are formed by circumferences parallel with the base of the drum, is regulated according to the nature of the instrument. The vertical lines measure the time, and their spacing is regulated according to the velocity at which the clockwork runs.

In the majority of cases, the duration of one revolution of the cylinder is one week and a few hours, so as to permit the bands to be changed every eight days at a given hour. The generatrices traced upon the ruled paper are spaced two hours apart, and are distributed in groups that represent an entire day. The names of the days of the week and the numbers of the hours are inscribed at the upper part. An interval of two hours is represented by a spacing of 0.12 of an inch. One can easily see by the eye half the distance between two lines that corresponds to the odd hours, and even a quarter of such interval.

Apparatus are likewise made in which the band must be renewed every day.

Were the lines exactly rectilinear, it would be necessary to give the pen a very accurate vertical motion, which would involve the necessity of making the mechanism complicated, and, by creating passive resistances, destroy the sensitiveness. This is one of the principal difficulties in the construction of registering apparatus. The Messrs. Richard, who are the manufacturers of the instruments under consideration, suppress this inconvenience very happily. They so arrange the apparatus whose indications are to be registered that the vertical plane described by the long movable style shall be tangential to the cylinder, and they mount the pen of the style in such a way that it shall come exactly against the generatrix of contact of the cylinder and plane when the style is in its mean position of oscillation. Owing to this arrangement, and to the transverse flexibility of the style, the pen, in its vertical motion, does not leave the surface of the cylinder upon which it is tracing a slightly inflexed line. The error which might result from this inflexion is corrected by arranging the ruled lines according to the curve thus described upon the cylinder.

In practice these lines are confounded on the paper with successive portions of circumferences that have a constant radius equal to the length of the style. In fact, this arrangement, which is so simple, renders the transverse motion of

the style possible, and permits of receiving directly upon a rectangular tablet the tracings of all those registering apparatus whose indications are furnished by the motion of a needle over a dial.

Each sheet of ruled paper is fixed to the cylinder in the simplest manner, the overlapping edges being merely held by the pressure of a flat spring, and the

different types of these registering apparatus, and that is the arrangement of the pen. This latter is simply a small receptacle in the form of a triangular pyramid made of thin sheet metal. One of the faces of this is applied to the style, and fixed by a small socket. The opposite end grazes the paper, and the corresponding edge is split like the point of a pen, so as to bring about through capillarity a flow of ink. The ink used is made of aniline mixed with glycerine. A drop of this is placed in the reservoir of the pen. It is well to employ gelatinized paper in order to obtain sharp and fine lines, notwithstanding the prolonged contact of the pen upon the same points of the paper. The ink must be renewed every eight days, at the moment the paper is changed, and the clockwork wound up.

Fig. 1 represents a metallic thermometer whose operation is based upon the use of a bent Bourdon tube of copper having a flat section. This tube is filled with alcohol. It measures three-fourths of an inch in width and four inches in length. At first, it was, like the rest of the apparatus, covered with a metallic box.

An equilibrium of temperature between the interior of the latter and the atmosphere was established through two windows provided with wire gauze, and rapidly enough moreover to obtain diagrams representing exact thermometric means; but the curves produced by sudden variations in temperature were not rendered with all their instantaneousness. In order to obtain greater accuracy in the indications, the thermometer tube has been placed externally to the metallic box, so that it shall be in immediate contact with the atmosphere. This arrangement gives very satisfactory results as regards sharpness of the diagrams.

The dimensions of the levers are made such that a variation of one degree in the temperature shall be represented by a three-fifths inch displacement of the pen, this corresponding to the spacing of the divisions of the ruled paper.

These thermometers are very sensitive. The motive tube, by reason of its material, is an excellent conductor of heat. It has a large surface in contact with the air, and has but a slight capacity, thus permitting the alcohol to put itself quickly in equilibrium with the surrounding temperature.

Fig. 2 represents a registering pressure gauge, which is likewise formed of a Bourdon tube connected with a vessel containing steam. The motion of dilatation that results therefrom is transmitted directly to the needle that carries the pen charged with ink. There is constructed after the same type a gauge for measuring infinitesimal depressions, and in which the motor of the style consists of an extremely sensitive diaphragm. This instrument renders great services in the controlling of the pressure of gas or the draught chimneys, through diagrams.—*Revue Industrielle*.

HYDRAULIC ACCUMULATORS FOR LOADING AND UNLOADING CARS.

There are at present few persons who have not had an opportunity of seeing what a series of maneuvers

the loading and unloading of freight cars give rise to at the stations of large railways. The making up and breaking up of trains, and the loading and unloading of them, are so many operations that necessitate the shunting of cars from one track to another by means of switches and turntables. For all such maneuvers horses are employed. In ordinary weather a single animal will suffice to haul a car, but when the ground is slippery through rain or snow, it becomes necessary to employ two, three, and sometimes more. At large stations, where it becomes a question of shifting from 1,000 to 1,200 cars per day, it proves difficult, as may seem, to maneuver the number of men and horses necessitated by such work, without accident and loss of time, within a relatively contracted space. For this reason the

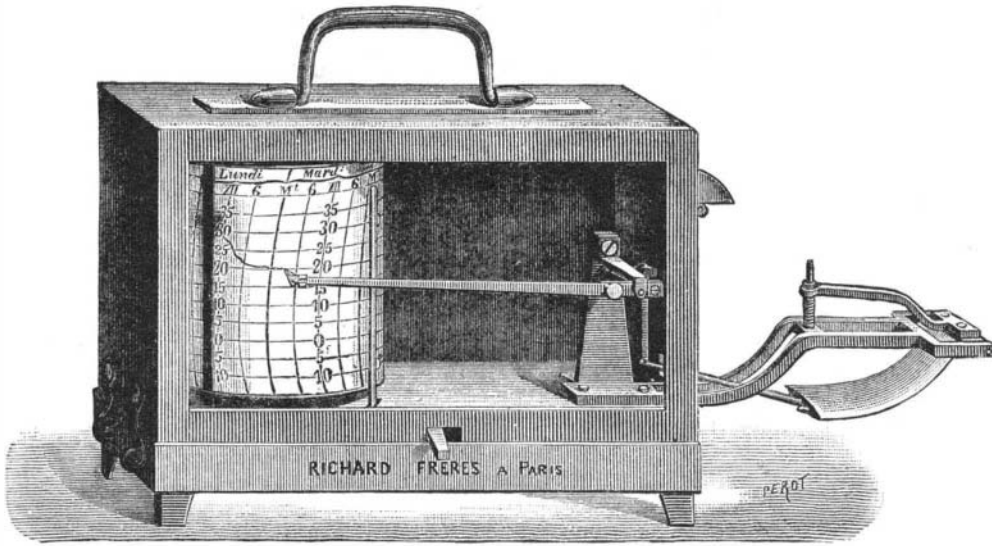


Fig. 1.—RICHARD'S REGISTERING THERMOMETER.

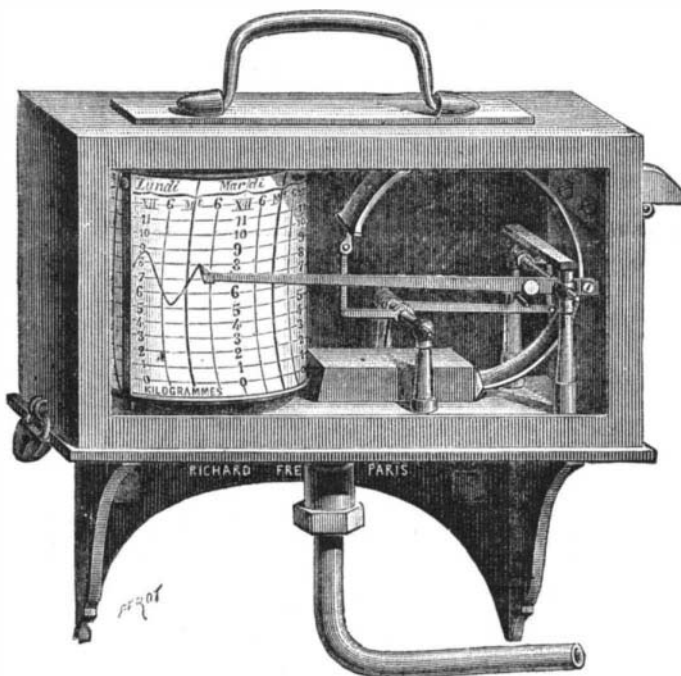


Fig. 2.—RICHARD'S REGISTERING PRESSURE GAUGE.

of bringing the point of the needle exactly opposite that division of the paper which corresponds to the hour at which one is operating. It suffices afterward to leave the apparatus to itself in order to have it begin the revolution, during which the divisions of the cylinder pass successively before the pen.

There is one arrangement which is common to the

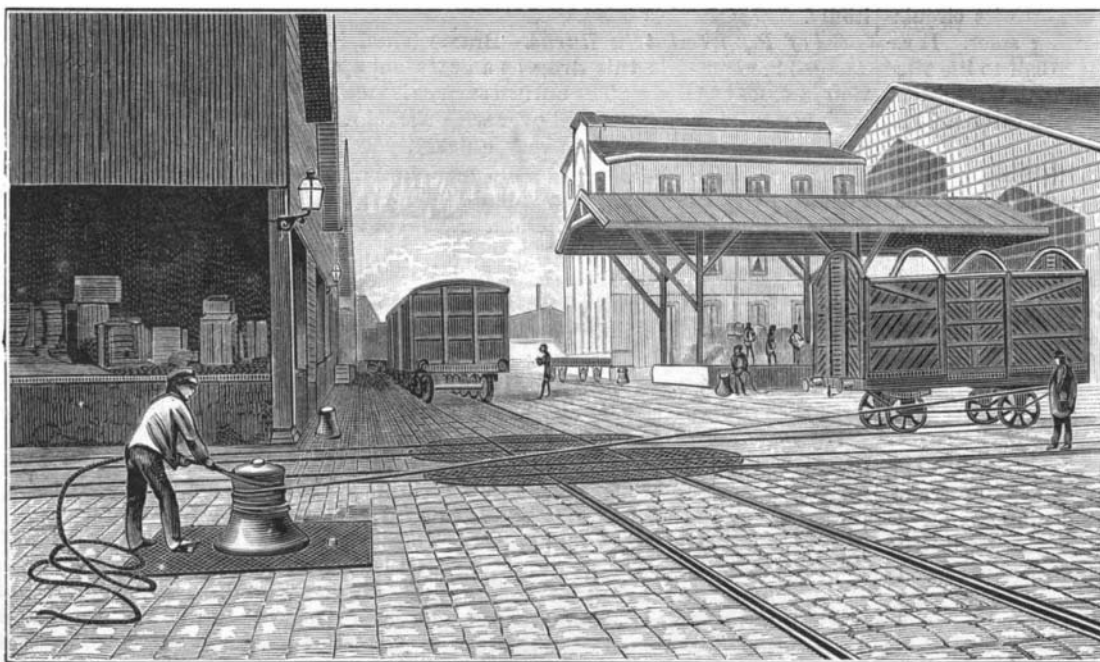


Fig. 1.—MANEUVER OF THE CAPSTAN.