

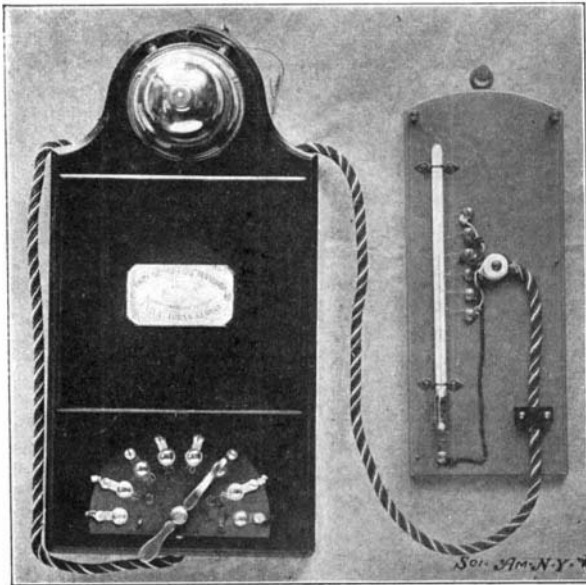
**ELECTRO-TELE THERMOMETER OF JUAN VILA FORNS.**

The International Congress for the consideration of all devices intended to prevent as well as to fight fires, which has just closed its sittings at London, has examined and adjudged as especially meritorious an instrument which, for want of a better name, may be called the "telethermometer," invented by Mr. Juan Vila Fornas, of Gerona, in Spain.

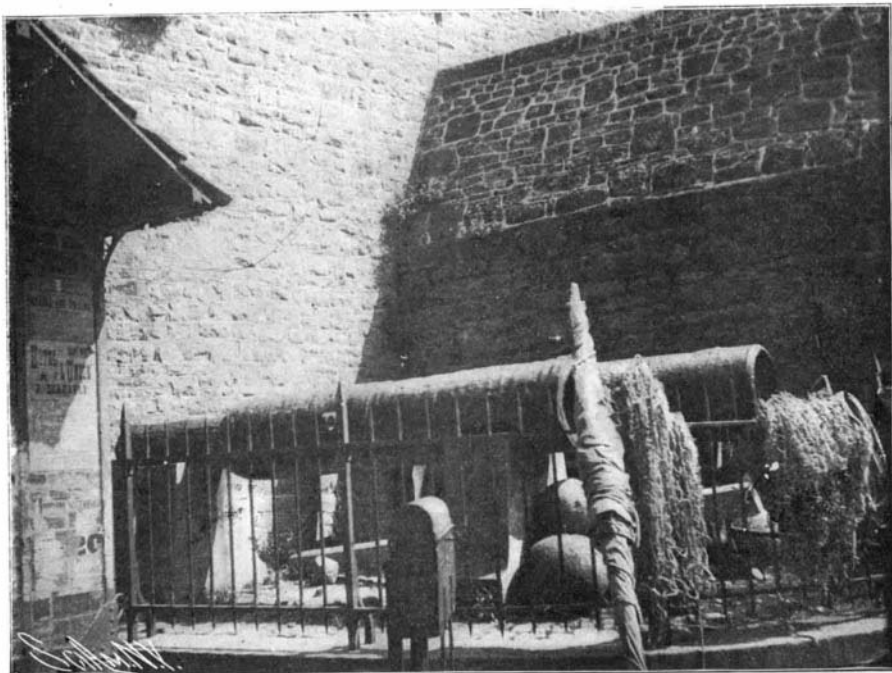
The avowed object of this instrument is to reveal automatically at any distance from the scene of activity any abnormal elevation of the temperature which may occur in its vicinity.

The apparatus is composed essentially of a mercury thermometer connected electrically with a bell or other form of alarm, and an indicating device.

In order to establish the desired communication, it is necessary to insert into the tube of a thermometer a number of platinum wires and to arrange them five degrees apart, their uncovered ends being so disposed that, whenever the mercury rises to the figures opposite

**ELECTRO-TELE THERMOMETER OF JUAN VILA FORNAS.**

to which they are located, the ends will form a contact with the mercury and close an electric circuit. All these insulated wires unite in a single cable after leaving the tube and are carried to and connected with an annunciator set up at any convenient place for observation. Each separate wire is connected with a metallic drop or button showing a number corresponding with the degree on the thermometer at which that individual wire is located. At the center of the annunciator, which closely resembles the half of a clock dial, is found a movable hand or switch point, which may be placed upon any one of the drops or buttons, being at the same time connected, through its fixed end, with an electric bell, also fastened upon the board, by means of a wire, one end of which is inserted into the mercury contained in the bulb of the thermometer. It is scarcely necessary to say that a battery of some kind must be included in the circuit. Now it is evident that the bell will sound the alarm every time the mercury in the thermometer tube reaches or passes the degree controlled by the wire and noted on the button under the switch point. For example, if the switch point rest upon button 115 then, just at the instant that the increase in the temperature in the room in which the thermometer is situated causes the mercury to indicate that number of degrees, contact with the wire will be established, the

**ENGLISH ARTILLERY TROPHIES AT MONT ST. MICHEL.**

electric circuit closed, and the alarm given at the observing station.—E. G.

**New Iron-Hardening Process.**

Phosphorus, as is well known, has the property of imparting a certain degree of surface hardening to iron, but not without producing brittleness. The iron is made to assume a coarse structure, in which the crystals are comparatively loosely bound together. This effect of phosphorus of loosening the coherence of the molecules of the iron greatly facilitates the absorption of carbon by the iron. The carbon rapidly penetrates the iron to a considerable depth, imparting great toughness to the core and nullifying the comparatively slight defect constituted by the inconsiderable brittleness of the surface. Two Prussian inventors apply this principle in their process for hardening iron by heating the same in a tempering powder consisting of organic nitrogenous substances containing a high percentage of fusible ash and employing phosphorus as the medium for the introduction of carbon into the iron. Without prejudicially affecting the welding properties of the iron, it imparts such a degree of hardness thereto that it can neither be cut nor chipped by the best steel used. In order to harden the surface of about 200 kilogrammes (441 pounds) of iron to a depth of 1 millimeter (0.0394 inch) by means of this process, the pieces should be imbedded in a retort, muffle, or the like, in bone dust, to which is added a mixture of 300 grains of yellow prussiate, 250 grains of cyanide of potassium, and 400 grains of phosphorus. The receptacle is well closed, luted with clay, etc., and raised to a clear red or white heat, whereupon the material treated is immersed in a glowing condition in a water or other bath.

**ENGLISH ARTILLERY TROPHIES AT MONT ST. MICHEL.**

In 1427, when the English in Normandy made their last assault on Mont St. Michel under Lord Scyles, they attacked it with "several powerful engines and certain machines of war," with which, says an old writer, "they trained a battery so furiously against the walls that they made a breach." Among these formidable weapons were two enormous wrought-iron guns, which they were compelled to leave behind on being obliged to raise the siege. They are still on exhibition with some of their projectiles in a railed inclosure just inside the main entrance to the town. As will be seen from the accompanying photograph taken on a recent visit, the local fishermen find this inclosure very useful for the stowage of their nets, sails, and other tackle.

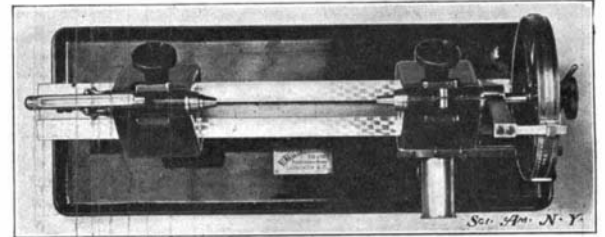
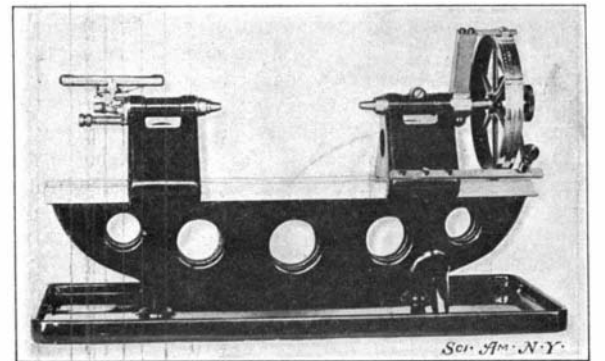
The guns are of the kind formerly called "bombards," and are of different sizes. The larger one has a caliber of 19 inches, 30 1/4 inches greatest external diameter, and 12 feet total length, of which about 3 feet 4 inches belongs to the smaller powder chamber in the rear. It weighs very nearly 6 tons. The other gun weighs about a couple of tons less, is of 15 inches caliber and 11 feet 9 inches long. These weapons are not cast but "built-up" guns, being formed of longitudinal bars about 3 inches wide arranged like the staves of a cask and bound round closely with wrought-iron hoops, just as are the "Dulle Griete" at Ghent and "Mons Meg" at Edinburgh Castle. In fact, all four date from about the same period and the "Michelets," as they are called, as well as the others, are most likely of Flemish workmanship. Their projectiles are made of hewn granite and those for the larger gun have been estimated to weigh 300 pounds apiece. The powder chamber is capable of holding about forty pounds of explosive.

The Iron Age states that extraordinary results have followed the establishment of the new drainage scheme at New Orleans, by means of which the level of the ground water has been lowered 4 feet. It is now possible to construct cellars and erect skyscrapers, which could not be done previously. The drainage canals are kept clear by constant pumping. A drawback is a plague of white ants, which are devouring the woodwork of the houses.

**A NOVEL MEASURING MACHINE.**

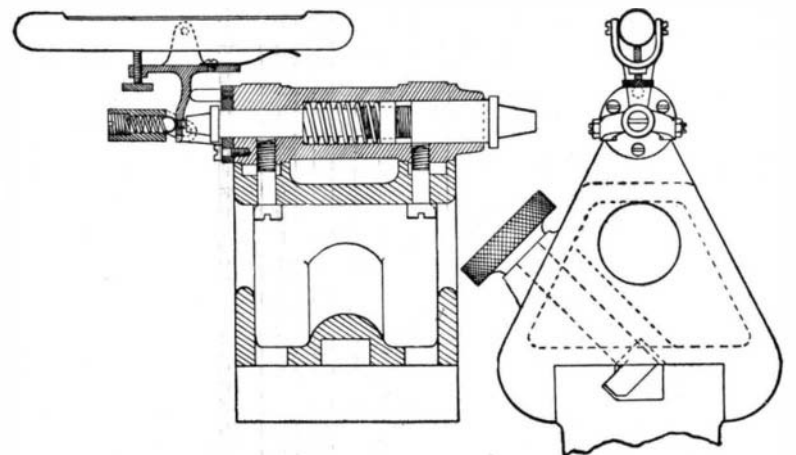
BY DR. A. GRADENWITZ.

Some time ago, while in London, I paid a visit to the works of the Newall Engineering Company, where I saw an interesting measuring machine just brought out by the firm. The chief novelty of the instrument is the spirit level, serving as a comparator,

**PLAN VIEW OF A NEW MEASURING MACHINE.****SIDE VIEW OF THE MEASURING MACHINE.**

that is seen on the tail stock; this attachment permits of magnifying the movement of the anvil to an almost unlimited extent, as the movement of the bubble depends upon the curvature to which the vial is ground, being equal to that of a lever of the same length as the radius of curvature.

A coarse screw is operated for quick movement by means of a knurled nut, whereas for fine movement a lever is clamped to the spindle by an eccentric move-

**TAIL STOCK ARRANGEMENT.**

ment on another set of levers, a thumb screw thrusting against a bar. A vernier bar is graduated into tenths of an inch, this being the pitch of the screw, and a second vernier is carried by the rim of a graduated wheel along the first vernier bar.

This graduated wheel is divided into 1-100ths on the right hand and 1-1000ths on the left, and the second vernier into 1-10,000ths. Readings can thus be taken in decimal rotation, the 1-10ths being the highest figure disclosed on the first vernier bar, the 1-100ths being the highest figure seen on the right-hand side of the graduated wheel past zero, the 1-1000ths the highest figure on the left side of the wheel past zero, whereas the 1-10,000ths are shown by the second vernier.

An anvil fits in a socket, in which is an adjustable spring controlling the amount of pressure put on the piece to be measured. The tail end of the anvil comes in contact with a rocking lever, pivoted in a bracket.

When pressure is applied to the anvil, a spirit level is displaced. The bubble on the level is first adjusted to remain at the left-hand end by means of the thumb screw. Sufficient pressure should be put on the piece being measured to bring the bubble up to a given graduation. The same course is adopted when adjusting the heads by means of end rods or with rule and microscope.

As the movement of the anvil is magnified by the level 4,000 times, if the anvil is moved one-thousandth inch, the bubble would move 4 inches. The rocking lever is kept in contact with the anvil by a spring, which may be adjusted in the boss of the bracket previously mentioned. When the pressure is removed from the anvil, the rocking lever rests against a stop. The head and tail stocks are clamped to a true flat face on the bed, as shown in the sketch.

They were designed to meet the requirements of the average tool room and are very easily handled.