NEW REGISTERING THERMOMETER.

The annexed engraving, extracted from *La Nature*, represents M. Hervé Mangon's new registering thermometer. The instrument is composed of two parts, (1) the thermometer and the balance which serves to weigh the differences of weight which are the consequence of variations in temperature, and (2) the registering apparatus.

The thermometer, the mercurial column in which is amplified in diameter in our engraving in order to show it more clear, is composed of a very fine tube, R, so as to present large surface while really containing but a small volume of mercury. This tube, R, is sustained by an iron standard and enters the bell glass, V. Its extremity, drawn out very small, enters a small cup, *g'*, which contains mercury, and is placed on one of the pans of the scales, B. The latter is an ordinary accurate balance. Above the beam it carries a small disk which causes contact at C whenever equilibrium is broken owing to augmentation of temperature. The second scale pan also carries a cup, *g*, in which is glycerin. A glass tube, T T, connected with the registering device, plunges into this liquid and also connects with another and larger cup, G. The bell, V, covers the balance and protects it from the air. To adjust the instrument it is necessary simply to see that the end of the mercury tube enters the cup, *g'*, and then to equilibrate the balance by placing weights on the other scale pan. The registering apparatus consists of two clockworks, M and M', which travel in opposite directions and which rotate very delicate fly wheels with great rapidity. They are interconnected by a differential train, the axle of which carries a double-scored pulley, A. Between the two wheels a needle oscillates, one of the extremities of which serves alternately to stop one of the wheels. At the other end of the needle, *a*, is a small piece of soft iron on which the electro-magnet, E, acts whenever a contact of the balance occurs at C. The needle is mounted on an axis which allows it to oscillate in either direction according as it obeys the electro-magnet or an antagonistic spring.

The double scored pulley carries two wires, one attached to the pencil holder, K, and terminated by a stretching weight, Q, the other carrying a small cylinder which plunges in the cup, G, which contains glycerin, and which is, as already explained, connected with the cup, *g*. A cylinder, H, operated by a clock train, carries the paper on which a second pencil, K, serves to trace a mark by which the movement of the train, L, is regulated.

The operation is as follows: Suppose the temperature to augment, the weight of mercury in *g'* will increase, equilibrium will be broken, and the contact, C, will be established. The electro-magnet, E, will then attract the end, *a*, of the needle, and the wheel at M' will be free. The pulley, A, will then turn to the left, the cylinder will then sink in the cup, G, and the pencil will be directed toward K'. The float in G, descending, elevates the level of the liquid in that vessel and in cup, *g*, and hence will augment the weight in the scale pan on which said cup, *g*, is disposed, and thus up to the time when equilibrium is re-established and the contact, C, broken. The end, *a*, of the needle, now being no longer attracted by the electro-magnet, would be moved by the spring and would disengage the other fly wheel at M, when the pulley, A, turning to the right and drawing the pencil, K', towards K, causes the rising of the float in the cup, G, and hence diminishes the weight in cup, *g*. This loss of weight again destroys the equilibrium of the balance, contact at C is re-established, and the parts resume their primitive positions. In this way a zigzag line is produced on suitably ruled and marked paper, from which the variations and changes of temperature may be noted.

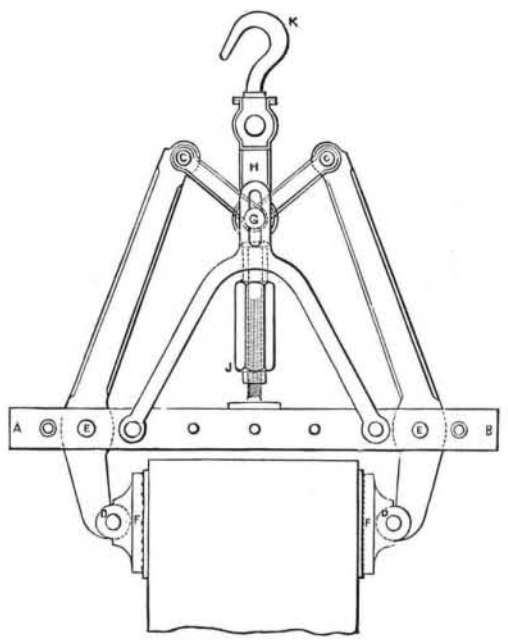
A New Explosive Bullet.

Captain C. S. O'Hara, of New Orleans, La., lately made some experiments at the Crescent City Rifle Park with his new explosive and igneous bullet. A large chest made to represent the caisson of field artillery, was charged with powder and set on tressels. At a distance of one hundred yards a bullet was fired into the chest, which was blown up. Shavings and wood, in which there was no powder, were set on fire by being fired into. A post was rigged as a ship's mast, with a yard or sail furled. This was shot at and partially burned, the canvas readily igniting by the explosion of the bullet.

The inventor claims that shells or bullets of any size may be made on the same principle, and that the material with which they are charged may be handled with as much safety as gunpowder, and that time and climate will have no deteriorating effect upon it.

NEW HOISTING CLAMP FOR BUILDING STONE.

We extract from the *Bulletin de la Société d'Encouragement pour l'Industrie Nationale* the annexed engraving of a new apparatus for hoisting building stones while the same are being hoisted into position. In principle the weight of the



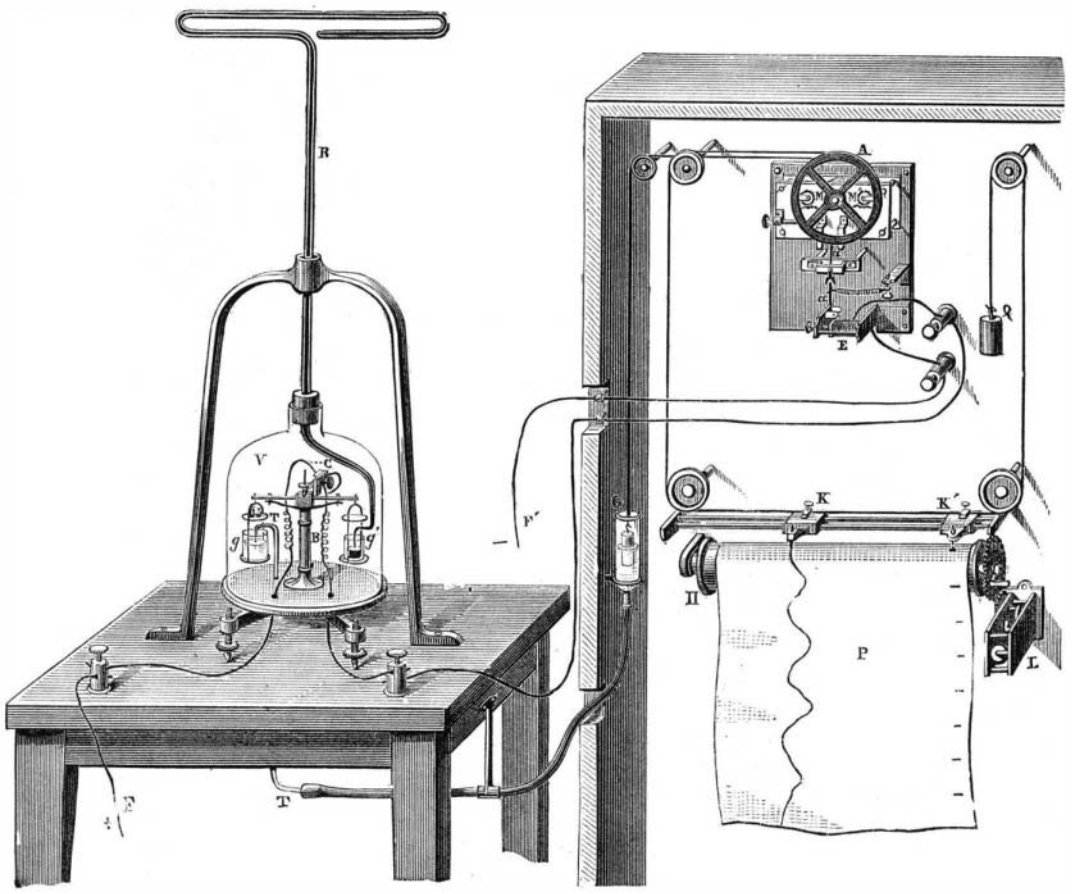
stone itself is used to act upon levers so that the block is tightly grasped as it were in pincers. C D and C' D' are arms pivoted at E in the piece, A B. To the lower ends of these arms are attached the clamps, F, and to the upper extremities are pivoted short arms which form a V at the point, G, in the vertical piece, H. To the latter is secured the hook, K. J is a screw which serves to elevate the point, G.

In using the apparatus the clamps are placed on the sides of the stone, as shown, and the screw, J, is elevated. By this means the outer ends of the arms, C D and C' D', are forced apart and the clamps pressed against the block. When the whole is lifted by the hook the tendency of the V arms, C G and C' G, is to open, when the weight of the stone itself causes the clamps to be forced the more tightly against it. The holes in the piece, A B, serve to adjust the pivot points, E, of the large arms to any size of stone.

How to Test Boiler Steel.

In a paper in the September number of the *Metallurgical Review* Mr. William Metcalf, a Pittsburgh steel manufacturer, says: "Perhaps the greatest development of steel for structural purposes up to this time may be found on railroads. The question of steel rails may be regarded as settled; also of steel tires, crank pins, guide bars, connecting rods, etc. In case of axles and boilers there seems to be some discussion, but no close observer can doubt the ultimate result. In boiler steel the only danger to be apprehended is that there may be enough carbon in the steel to cause hardening in use, although the sheets may have been annealed so as to endure all the cold bending, twisting, punching, and flanging tests successfully. That such annealed sheets will harden very hard in use is well known. A very simple preventive may not be so generally known.

"Let a piece from each sheet be heated white hot and quenched in cold water or brine. If, after this treatment, it will double over cold, punch, twist, flange, etc., it will never harden in use, simply because it has not enough carbon to cause it to harden under any circumstances. There are instances of boilers that have been in active service for nearly ten years, when only 20 per cent of a large number have required any repairs, and all are reported in good working condition. It is evident that the life of a boiler must be very long under fair treatment, after it has run for about nine years subject to ordinary wear and has not required any repairs whatever."



MANGON'S NEW REGISTERING THERMOMETER.

SCIENCE AT THE BRITISH ASSOCIATION.

The papers read at the recent session of the British Association at Plymouth, England, are quite rich in new scientific ideas. Their lengths precludes our touching on more than their salient points—but these will suffice to exhibit the wide and interesting range of the subjects discussed.

LIFE FROM OTHER WORLDS.

Sir William Thomson revived that curious paradox of the possibility of life coming upon our earth directly from other worlds—the vehicle being a meteorite. Biologists at present are not in accord as to what temperature is fatal to germ life; and it is believed that some germs come safely through extremes of temperature that are fatal to the species in a more advanced stage. On this rather doubtful foundation, Sir William bases his idea that a germ might hide away in a crevice of a meteorite, so that the intense heat of the exterior might not reach it, and hence it might remain alive after the wandering mass had come to rest on the earth. One objection at least to this theory will suggest itself to the readers of Mrs. Ingram's interesting essay—read before the American Association, at Nashville, Tenn.—and that is, if that fair scientist is right about concussion being fatal to germ existence, then the shock of the meteorite striking the earth, if not due to its contact with the atmosphere, would be quite sufficient to destroy the traveling organisms.

THE INDUSTRIAL VALUE OF SCIENTIFIC RESEARCH.

Professor Abel made a capital review of the operation of purely scientific research in developing important branches of industry. He instanced Perkins' researches in the coal tar colors, and more especially referred to the recent improvements in the steel manufacture. He pointed out that the success which has attended the addition of silicon in combination with iron and manganese to the steel before casting in the preventing the formation of blow-holes, and in contributing at the same time to the production of the particular character of steel required, bids fair to be of special importance in connection with the application of steel to the production of projectiles for use against armor plates and of castings which will compete successfully with carefully forged metal, or even with the Whitworth compressed steel. He also alluded to the advantages of steel armor over iron, and stated that promising results have recently been obtained at Shoeburyness with a new system of applying steel in conjunction with malleable iron, by which a perfect union of the two materials at one of their surfaces is obtained by the aid of heat. Reference was also made to the late investigations into the physical nature of gunpowder, which among other things have demonstrated that modifications in composition, not unimportant from an economical point of view in dealing with the very large charges now employed, may materially contribute to render the storing of the maximum of work in the projectile, when propelled from a gun, compatible with a subjection of the gun to comparatively very moderate and uniform strains.

WAVE ENERGY.

Professor Osborne Reynolds demonstrated mathematically that, in waves on deep water, the rate at which the energy is carried forward is one half the energy of disturbance per unit of length multiplied by the rate of propagation. When the waves enter shallow water the motion of the particles becomes elliptical, the eccentricity depending on the shallowness of the water: and it may be shown that under these circumstances the rate at which energy is transmitted is increased, until when the elliptic paths approach to straight lines the whole energy is transmitted, and consequently it follows that the rate of speed of the groups to the speed of the waves will increase as the water becomes shallower until they are sensibly the same.

It is claimed, though the fact does not rest on sufficient authority, that the organ is the invention of Archimedes, about 200 years B.C. The invention is also attributed to a barber of Alexandria, named Ctesibus, about 150 years B.C.