IMPROVED ENGINE INDICATOR.

Every engineer who has had occasion to apply the indicator to engines running at a high speed has, doubtless, been made unpleasantly aware of the disturbing effect of the weight of the parts which move with the marking points; for notwithstanding the great improvements which have been effected over the first instruments in the way of reducing the disturbing momentum of these parts, there still remains much room for improvement in the same direction.

Some of the conditions necessary to the best steam economy are a high boiler pressure, prompt and free induction, a quick cut-off, reduced clearance, a high ratio of expansion, and a reasonably high piston speed. But it unfortunately happens that the above conditions are exactly those under which the momentum of the moving parts of the indicator produces its maximum of disturbance. Hence, since the introduction of improvements in automatic cut-off engines, through which engines of that class, owing to their not being subjected to the limitations of speed imposed by "releasing gear" cut-off mechanism, can now be made of any size, however small, and run at any speed, the need of a corresponding improvement in the indicator has become apparent; and to a desire to meet this requirement, the instrument illustrated herewith owes its origin.

Fig. 1 is a perspective view, from which it will be seen that the pencil is inserted directly in the end of the lever, A, the other end of which is pivoted to the vibrating bracket, B, which, being pivoted at C with freedom of movement, allows the path of the pencil to be controlled by the light link or radius bar, D, which is pivoted at one end to the standard, E, and at the other to the lever, A. These parts are so arranged with reference to each other that the curvature of the path of the end of the bar, D, exactly neutralizes the tendency of the pencil end of the lever, A, to move in a curve, and so that the latter is thus constrained to move in a straight line. The lever, A, having only the pencil to carry, is made only of sufficient strength to give the necessary pressure of the pencil to the paper; and the bar, D, having but a slight duty to perform, is also made extremely light. In fact the weight of the parts is claimed to be, by actual test, less than one third of that of the lightest system, hitherto produced, having a parallel movement.

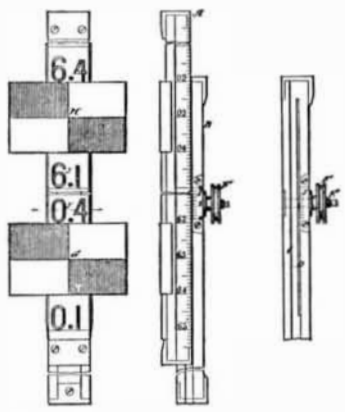
Fig. 2 is a vertical section of the cylinder, piston, and its connections. F is the piston, the stem, *f*, of which is short, but is supplemented by a hollow trunk, G, which is screwed on its end, and which, passing through the cap, H, steadies and guides it. The connection, I, which connects the piston with the lever, A, passes down the inside of the trunk and has a head or collar, *i*, the upper and lower surfaces of which are respectively convex and concave, and are concentric with each other. The concave surface rests on and fits the hemispherical end of an adjustable stud, which is screwed into the end of the piston stem, *f*, and the upper or convex surface fits and is secured by an internal collar in the trunk, G, the whole forming a universal compensating joint which allows both the lateral play required by the parallel movement, and the axial movement of the head, K (which carries the lever system), by which the pencil is brought in contact with and removed from the paper. The connection, I, is pivoted to the lever by a taper steel pin. The head, I′, which embraces the lever, is separate from the rod, which is screwed into it and secured by a lock nut, *i*′, which allows the length of the connection to be varied to suit variations in the length of the springs. It will be observed that this arrangement involves but two joints between the piston and the pencil, and these are of a substantial and durable character. The pivots at the ends of the brackets, B, are also taper steel pins.

Fig. 2 also shows a minor improvement in the arrangement of the spring in the paper barrel. The drum, L, which contains it, is covered by a milled edge cover, M, to a hub on which the inner end of the spring is attached, so that, by turning this cover, the tension of the spring may be adjusted as desired and secured by the thumb nut, N, the thread of which is cut right or left, according to the corresponding character of the instrument, so that the force of the spring will always tighten the nut.

A patent was granted through the Scientific American Patent Agency to J. W Thompson, August 31, 1875, and assigned to himself and the Buckeye Engine Company, of Salem, Ohio, to whom all inquiries should be addressed. The above company are also the sole manufacturers of Thompson's patent automatic cut-off engines, an illustrated description of which was published in the SCIENTIFIC AMERICAN of January 9, 1875.

IMPROVED LEVELING ROD.

We illustrate herewith an improved leveling rod, patented



through the Scientific American Patent Agency by Mr. G. L. Whitehouse, of Farmington, N. H. A represents one part of the rod, and B the other. A has a dovetail or undercut groove in the back, and B has a tongue, C, corresponding to the groove in form, and being fitted into it. Between the tongue, C, and the main part of B, is a long slit, D; and a screw stud, E, extends from the tongue out through the back part, and has a clamp nut, F, fitted on it to spring the parts together, and thus clamp them to the part of A between the tongue and the main parts, A and B, of the rod together at any point, making a simpler and better contrivance than the outside clamp commonly used. G and H represent two targets, which are applied to the part, A, of the rod, the same being in practice six feet apart from center to center, so that, by using the upper one for extra hights, and adding six feet to the reading of the scale, these hights are obtained without reversing the rod and shifting the target, as with the common rod. I is a vernier, together with a scale on the side of the rod, for the rodman to read. The scale, I, on the face of the rod is large, to allow it to be easily read by the leveler.

Velocity of Electric Waves.

A new method for measuring the speed of waves, and at the same time their exact contours, has lately been invented by Mr. Robert Sabine, and tried with excellent results upon lengths of the Red Sea cable at present in course of manufacture at Enderby's wharf, Greenwich, England. Mr. Sabine's method consists in sending currents into one end of the cable (the other end being to earth), and at regular intervals testing the potential of some given point in the conductor. This is done by means of a mica condenser, which is kept in connexion with the point in question until the right interval has elapsed, when it is discharged through a galvanometer. A rotating time apparatus is arranged to close the circuit of the battery at the end, and after a given interval to separate the conductor and discharge it. The interval may be varied from 0·001 to 2 seconds. A similar reading is taken for each interval from 0·001 second upwards until the maximum of the potential due to the position of the point tested is attained. This gives a curve of the exact contour of the wave. The speed is measured by sending two waves of opposite size into the cable, and noticing the intervals at which their neutral point passes two given points in the cable. The difference of the intervals and the distance between the points give the speed.

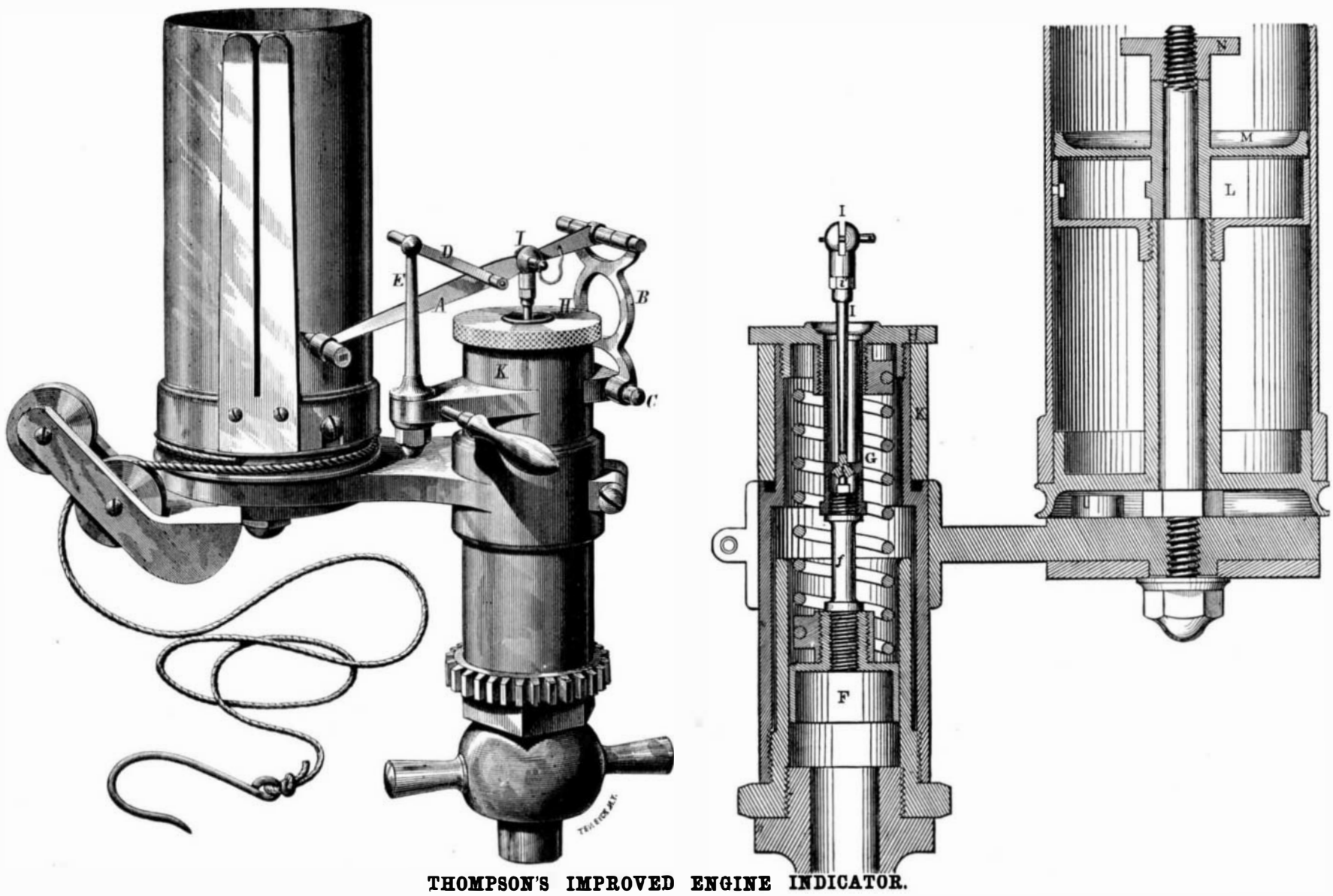
Acid-Proof Paint.

The following recipe may be of value to some of our readers: The application of water glass or soluble silicate of soda to wood or metal utensils, to protect them from the action of corrosive bodies, is sometimes desirable, and this material, a correspondent in the *Polytechnisches Journal* tells us, may be used with little difficulty if you go the proper way to work. The wood or metal must be perfectly dry to begin with, and free from rust or any kind of fatty matter. Any of the pure mineral colors may be used for mixing with the silicate. Powdered lime, amounting to twenty or twenty-five per cent by volume, is mixed with the pigment, and double as much water glass is then added. The mixture is then applied in the same way as ordinary paint.

A SWISS inventor envelopes the driving axle of locomotives in coils of insulated copper wire, and by the passage of an electric current converts the wheels into powerful magnets, with increased adhesion to the rails.

Fig. 1.

Fig. 2.



THOMPSON'S IMPROVED ENGINE INDICATOR.