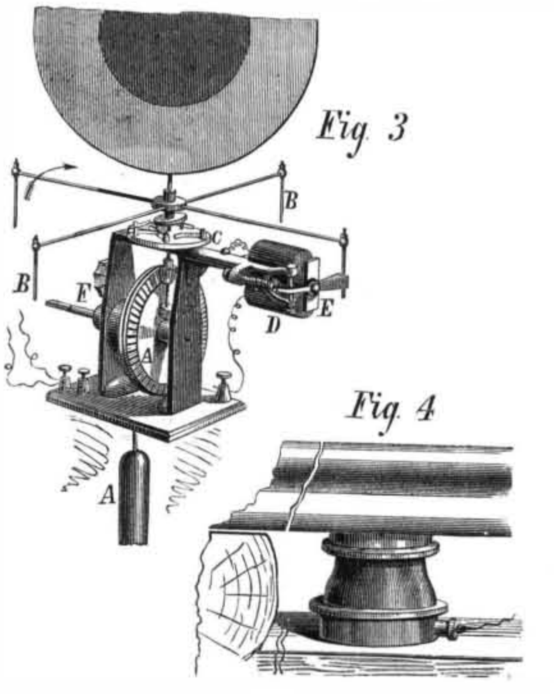
(*Continued from first page.*)

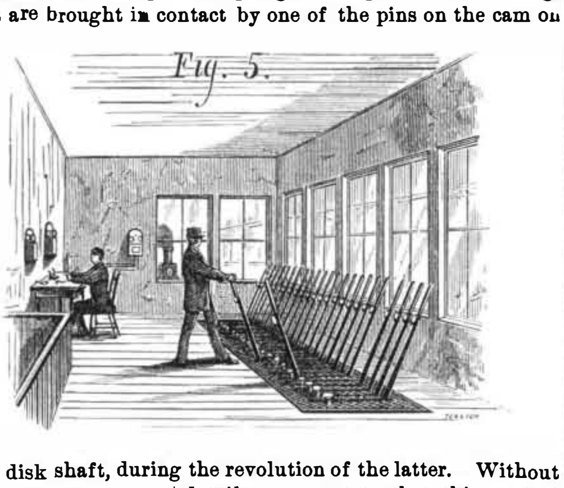
will thus have completed exactly one quarter revolution, changing for a given location from an edge view to full face, or *vice versâ*. The reader has doubtless ere this divined that the despatcher, in raising a danger signal to release the outgoing train, or in setting the flying switch signal, simply pressed a button which established an electric current, and thus charged the disks as was necessary. From the foregoing also it will be obvious how this signal is worked on the block plan from two different points. As soon, for example, as a train passes a given location, an operator there



posted, by the means described, sets the danger signal. When the train reaches another point a safe distance away, it may itself, by pressing on a simple and delicate circuit closer, arranged, as shown in Fig. 4, under the rails, again establish the current, which will free the disk arm a second time and turn the disk to safety for following trains. Or, as it is easy to see, by the use of two circuit closers properly disposed, the train might set its own danger signal and then reverse it when a suitable distance has been traversed.

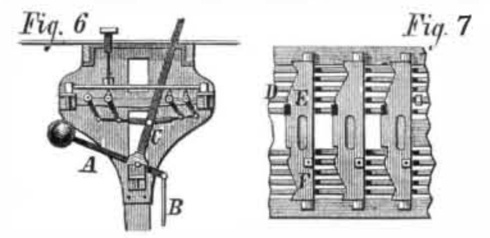
But it is not enough that the signals should be set. The people in charge of them must also be infallibly informed of that fact, as well as of any failure in the working. For this purpose the tell-tale shown in Fig. 2 is used. This is the machine which announced that the incoming train, in one example, was coming over the 53d street crossing; or more properly, it first showed that a block signal had there been set and afterwards reversed; for through that signal it was operated, as we now proceed to show.

By examining the circular stage, C, in Fig. 3, a pair of springs at the left hand side, placed so as to overlap, will be noticed. There are two pairs of these springs, arranged diametrically opposite to each other on the circle, and hence between the two similarly disposed single springs, through which the circuit, as before explained, is established. The members of each pair of springs overlap without touching, but are brought in contact by one of the pins on the cam on



the disk shaft, during the revolution of the latter. Without entering into further detail, we may state that this contact must necessarily be caused with one or the other pair of springs whenever the disk changes position, and the effect of such contact is to send a current to the electro-magnet in the indicator, Fig. 2. The armature of this magnet is connected with the index clapper, and the general construction is such that, whenever the magnet is excited, the clapper will be thrown over to a position opposite to that in which it happens to be. The relation between indicator and signal is so adjusted that whenever the signal shows "danger," the clapper, which has a weighted extremity to aid its motion and to strike a gong at each end of its course, and so to give warning, swings over to "block;" when the signal is reversed the arm swings back to "clear." During its travel it strikes a suspended ball, and this, vibrating, shows to ano perator, who may have several indicators before him, which one has just become reversed. By this arrangement, it will be evident that when the signal moves the indicator must show it, and *vice versâ*; so that the operator always has accurate knowledge of the state of the sections of line under his charge, no matter how far distant from him, or how widely separated the same may be. There are many ingenious points about the system, which lack of space forbids our describing. We may mention, however, the device partially shown at F, in Fig. 3, which consists of the winding stem for the signal weight, and also other mechanism, which compels the turning of the stem and the consequent winding of the cord, before the door of the case in which the signal is contained can be unlocked to admit of the insertion of the lamp at night. Another ingenious device is that used for drawbridges, which consists of a lock on the crank, which withdraws the locking pin of the bridge. It is impossible to do this until a button is pressed, which sets a danger signal for approaching trains, nor can that signal be reversed or tampered with until the bridge is again securely locked in place.

One of the most important localities where that system is necessary is at the crossing of several tracks, similar to that at 53d street; and here also is used the new switch apparatus, which forms the third and last portion of our subject. Fig. 5 shows the interior of the switch house with the working levers. Each lever is connected to a weighted arm, A, Fig. 6, and also, by suitable interposing connections, through the rod, B, to the locks, the signals, or switches. Attached to the shank of the lever, at C, are jointed rods, which are secured to a series of square shafts, D, Fig. 7. Just above the shafts are the locking plates, E. These are flat iron plates hung in journals at each end. In the edge of each are notches, which hold the levers and prevent them from moving from the ends of the slots in which they work when the latches lay flat, as shown. If, however, a latch be tipped by pressing on a foot piece in front of the lever, the rod of which bears against the point, F, Fig. 7, the lever will be freed from the notch. The interlocking arrangement is found in cams on the square shafts, D. These are so disposed as to be immediately under the edge of the latch plates. When a shaft is so turned that the cam presses on the plate from below up, then, obviously, the plate cannot be tipped by the foot piece, nor the lever disengaged; so that the latter is thus securely locked. It is impossible to set a signal at safety if the switch points are not properly placed and locked, nor can the latter be altered after the signal is set. Any combination of interlocking is possible: in other words, any lever can be made to lock any other lever, so that it becomes a simple problem to adjust the apparatus in conformity with the number of track requirements at any particular situation. The lock for the rails consists of a hollow cast iron sleeper placed under the ends of the switch rails, and having other two crescent-shaped pivoted latches connected by a rod. By moving the latter, the points of the latches are lowered beyond the bottom of the



rails, so that the same can be moved sideways, or raised so as to prevent any similar motion. The construction is such that, unless the rails are properly placed, it is impossible to raise the latch, which thus offers an additional means of safety. Taken as a whole, the ingenuity, simplicity, and utility of this perfect system of communication, and the contrivances invented to accomplish it, are truly wonderful. The mechanical appliances are the joint inventions of Mr. J. M. Toucey, the General Superintendent, and Mr. William Buchanan, Superintendent of Machinery, of the Hudson River Railroad.

The electro-magnetic signals are the invention of Mr. Daniel Rousseau of this city, and are the subjects of several very recent patents. The depot arrangements are the results of the combined skill of Superintendent Toucey and Depot Master Franklin. To all the above named gentlemen we are indebted for much courtesy in facilitating our obtaining the interesting facts here presented.

ACIDEMETRY APPLIED TO THE TESTING OF VINEGAR.

In order to determine the value of a vinegar, it is necessary to discover in what proportion acetic acid is present and to assure oneself that no foreign mineral acids are contained. The chemist executes these various operations with acidimetric liquors, reagents, and apparatus; but there has been for some time needed a simple and practical process available to those who may not have at their command the resources of a laboratory. MM. Reveil and Salleron have recently devised an acidimeter, the use of which is illustrated in the annexed engravings (taken from *La Nature*), and which can be readily understood and the directions for its manufacture and employment followed.

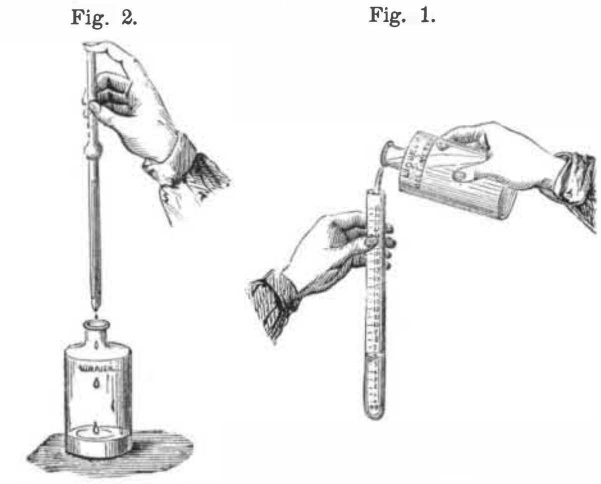
The necessary apparatus consists, first, in a tube of glass closed at one end as shown in Fig. 1; near said extremity, at the zero mark, the word "vinegar" is inscribed to indicate the amount of vinegar to be employed. Above the zero, the tube is divided off, and the divisions are marked 1, 2, 3, etc., so as to show the richness in acid, as will be described below. Second, there is a small sponge attached to a whalebone to be used to clean the tube after each experiment. Third, a pipette (Fig. 2), is marked to show a quantity of 0·25 cubic inch of liquid, so that the amount of vinegar for each test can be accurately measured. Lastly a flask of liquor, used as a standard acidimetric reagent, is added.

One fourth of an inch of vinegar is taken into the pipette and retained therein by the finger, as shown in Fig. 2. This is allowed to flow into the graduated tube and the acidimetric liquid, colored blue, is slowly poured in. The fluid soon becomes red when the tube is agitated by being turned over, the thumb stopping the opening. More of the test liquid is added, the mixture a second time shaken, and so on until the fluid in the tube becomes of the color of the red outer skin of an onion. The graduation on the tube, corresponding to the level of the liquid, is then read off, and this shows the centesimal proportion of acetic acid contained in the vinegar.

The reaction can easily be followed. The acidimetric liquor, prepared in advance, is a solution of borax and caustic soda. The proportion of these ingredients is calculated to correspond to a certain quantity of crystalizable acetic acid. The liquor is colored blue by litmus, and indicates by its change to violet red the moment when the saturation of the acid by the base is effected.

Vinegars are sometimes adulterated with sulphuric and other mineral acids, which may be detected as follows: The vinegar to be tested is boiled with a few fragments of starch.

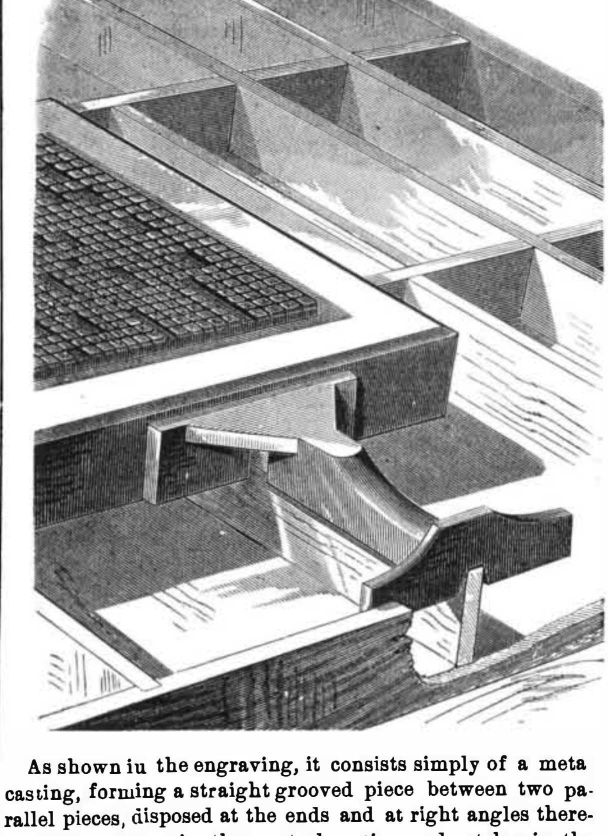
Fig. 2. Fig. 1.



It is then cooled, diluted, and a few drops of iodine tincture dropped in. With pure vinegar, the blue color of iodide of starch should show itself; if no coloration ensues, a foreign mineral acid is present. Wine vinegars are frequently falsified with wood vinegars (pyroligneous acid): this last product almost invariably contains small quantities of sulphate of soda, the presence of which may be detected by the addition of chloride of barium, which yields a white precipitate, sulphate of baryta.

KING'S IMPROVED SUPPORT FOR PRINTERS' GALLEYS.

The annexed engraving represents a simple little device designed to support a printer's galley when the same rests upon the case, during the process of making corrections in the type or during the transfer thereinto of type from the stick. Ordinarily the galley is rested against the ledge of the case or else placed diagonally across the latter, thus covering several letter boxes and necessitating its being moved whenever the types contained in such receptacles are required. The present device sustains the galley in such a position that none of the boxes are wholly closed, so that access into any one of them may easily be had.



As shown in the engraving, it consists simply of a metal casting, forming a straight grooved piece between two parallel pieces, disposed at the ends and at right angles thereto. The groove in the central portion and notches in the cross pieces fit over the transverse partitions of the case, and the galley rests against one crosspiece while the other presses against the longitudinal partition or edge. The invention is a handy convenience for compositors.

Patent now pending through the Scientific American Patent Agency. For further particulars address Messrs. Johnson & King, 100 11th street, Brooklyn (E. D.), N. Y.

THE hydraulic ram is especially useful where there is a small stream of water and only a slight fall. A fall of two feet, and a flow of 1½ cubic feet of water—93¾ lbs.—per minute, will deliver 0·010 of a cubic foot of water per minute at a hight of 38 feet.