A NEW LECTURE EXPERIMENT.

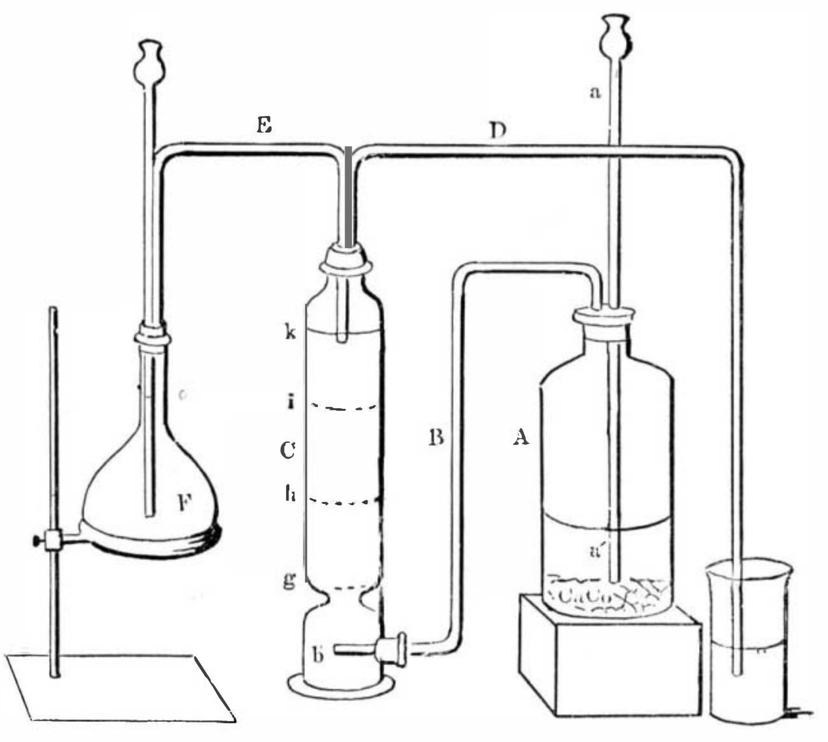
BY E. J. HALLOCK.

To illustrate the principle employed in the manufacture of soda ash by Solvay's ammonia soda process (see SCIENTIFIC AMERICAN of June 24, 1876), as also the method employed in carrying it into practice, the author employs the following simple apparatus, consisting of a wide mouth bottle, a flask, and a chloride of calcium drying tower, such as may be had of all dealers in chemical glassware, and which are to be found in most laboratories. The chloride of calcium tower, C, is nearly filled with a clear saturated solution of common salt. At *g* is placed a disk of wire gauze, and other disks may be placed at *h* and *i*, if convenient. In the bottle, A, is generated carbonic acid gas which passes down through B, and enters the tower, C, at *b*. In the flask F, ammoniacal gas is evolved, either by boiling strong *aqua ammoniæ*, or by heating together slaked lime and sal ammoniac. This gas enters the tower, C, through a tube, E, which dips but an inch or two beneath the surface of the liquid, *k*. The tube, D, may lead into a second tower similar to C, or merely dip into a beaker of water. The funnel tube, *a*, should be somewhat longer than the height of the tower, C, so that the pressure of the column of liquid, *a a'*, shall be equal to that of a column of brine equal to *bk*. It was found by experiment that in order to overcome a pressure of 12½ inches in C, and 1⅛ in D, the column, *a a'*, was 16 inches or more. The flask, F, should also have a long safety tube. In a few minutes after the gases begin to be evolved, the liquid in C becomes milky from the formation of bicarbonate of soda, which is kept in suspension by the motion of the gas. In half an hour the operation is interrupted, when the bicarbonate of soda will soon settle on the bottom of the tower and on the disks of wire gauze, although the liquid remains turbid for some time. The chemical reaction is as follows:

$$NH_3 + H_2O + NaCl + CO_2 = NH_4Cl + NaHCO_3.$$

The chloride of ammonia remains in solution and may be drawn off at *b* without disturbing the bicarbonate of soda. The conversion of the bicarbonate into the carbonate of soda by heat is too simple to need illustration.

Columbia College Laboratory, New York city.



THE AMMONIA SODA PROCESS.

THE SECRETS OF THE MYSTERIOUS CLOCKS.

We have frequently placed before our readers descriptions of wonderful clocks, consisting usually of a mere plate of glass on which two hands, apparently destitute of any mechanism, mark the hours, and which return to their proper position, even if moved therefrom. No detailed account of the mechanical construction of these curious devices has appeared until recently, when a committee of the French Society for the Encouragement of National Industry undertook an investigation, the result of which is an excellent illustrated report which we find in the "Bulletin" of that association.

The inventor of the principal forms of mysterious clock now extant is M. Henri Robert, a French chronometer maker. The principle on which the machinery is based is not wholly new, as some half a century ago single-hand clocks, marking hours only, were made on the same plan. The single hand was mounted on a horizontal pivot, and carried, at the extremity opposite to the indicating point, an enlargement like a watch case, which seemed placed there simply for purposes of ornamentation. In this case, however, was concealed a watch train, which once in twelve hours caused the revolution of a little platinum weight around the inner periphery of the box. If we refer this weight and the remainder of the hand to their respective centers of gravity, the center of gravity of the entire arrangement will be found by dividing the distance which separates the two points according to the inverse ratio of the two masses. With relation to the center of gravity of the hand alone, the center of gravity of the combined hand and box will then describe a curve similar to that traversed by the platinum weight, which is a circle. But the system obviously cannot remain in equilibrium in any position unless the center of gravity be directly over the pivot. Therefore, as the center of gravity describes a circle, the hand must likewise move in a circular path in the opposite direction to that of the weight in the box; and as the weight accomplishes its rotation in just twelve hours, the hand will do likewise. It will further be seen that, as the moving of the hand from its proper place does not affect the operation of the clockwork in the box, the hand will always return to the only position in which it can be in equilibrium with the weight.

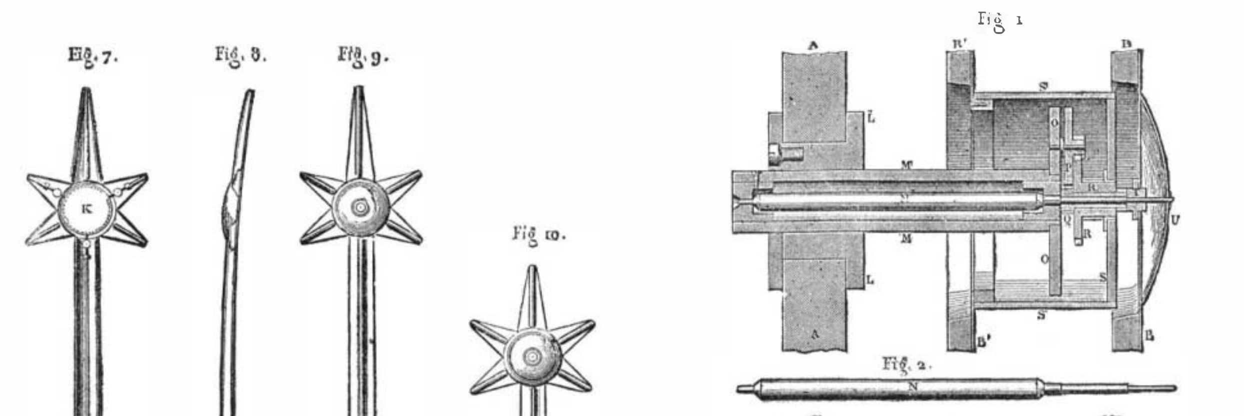
M. Robert has devised two clocks. In one, the hands communicate. One hand is operated as above described, but its weight travels twelve times faster, so that the hand completes its circuit in one hour, and therefore marks minutes. By a simple concealed train it is connected with an hour hand and transmits motion to it. If the minute hand be whirled around by the finger, on being released it will of course return to its proper place. The hour hand, however, will not, unless the number of rotations imparted to the minute hand happens to be a multiple of twelve.

In his second invention M. Robert uses independent hands. Instead of there being a train uniting them, each hand has its own motive apparatus. One accomplishes its rotation in 12 hours, the other in 1 hour. Hence, either or both hands may be disturbed, and both will return to mark the exact time.

Figs. 1 to 10 in the annexed illustrations relate to the clock of the first-mentioned type. Fig. 1 is a partial vertical section, passing through the axis of the hands. Figs. 2, 3, 4, 5, and 6 represent details. Fig. 7 shows the rear face of the minute hand, the under cover of the movement case being taken off. Fig. 8 is a profile view of the same hand, the case being closed. Fig. 9 shows the front face also of the same hand, the box cover off; and Fig. 10 is an elevation of the same. A is a circular dial composed of a simple plate of glass on which the hours are marked. B is the minute hand. C is the movement box, and D the watch train within. E is a small dial divided into intervals of 5 minutes each (Fig. 9). F is a pin and also a hand which moves on the dial, E. The winding stem is shown at G, and at H is the usual watch-regulating device. I (Fig. 7) is the platinum weight, of flat segmental form. This is supported by the arm, J, Fig. 7, which is fixed on one of the ends of the axis which carries at its other end the pin, F, Fig. 9. In order to regulate the movement, it is necessary to place the hand, F, on the same minute mark on E as the hand, B, indicates on the dial, A. At the opposite end from that to which the case is affixed, the minute hand, B, terminates in a star, below the center of which is a counterweight, K (Fig. 7), held by three adjusting screws. By the latter the weight, K, may be so moved as to balance the hand accurately.

The hour hand, B', Figs. 1 and 10, is of the same shape as the minute hand: but its case, placed on the end simply for symmetry, contains no movement. The operation of this hand is governed by the following mechanism: L is a plate fixed on the front face of the dial, A, Fig. 1. It is held in place by another plate, with screws disposed on the other side. M is a tube passing through plate, L, and inclosing the axis, N, of the minute hand. This axis is concentric with the tube, M, and the conical ends of its enlarged central portion bind on corks in said tube. Fig. 2 shows this axis separately. Riveted on the front portion of tube, M, is a disk, O. P is a minute wheel, carrying at the center a pinion, and mounted loose on an axis fixed to the disk, O (see detail in Fig. 3). Q is a pinion, with a sleeve adjusted for friction on the outer enlargement of the axis, N, and engaging with the wheel, P, Figs. 1 and 4. R is an hour wheel mounted on the sleeve of pinion, Q (Figs. 1 and 6), and engaging with the pinion of the minute wheel, P. S is a light case attached to the sleeve of wheel, R. It covers disk, O, and all the train, and is attached by a screw to the hour hand, B', Fig. 1. T is a barrel mounted for friction on the prolonged end of axis, N, and turning therewith. To this barrel the minute hand, B, is secured. At U is a fastening disk and pin. The minute hand, B, is moved by the travel of the weight in the case attached to its extremity. In turn, it causes motion of the axis, N, which (through the pinion, Q, of the wheel, P, the pinion of the wheel, R, and the box, S) operates the hour hand, B'.

Fig. 11 is a vertical section of the mechanism of the clock with independent hands; *a* is a dial analogous to that in Fig. 1; *b* is a plate disposed similarly to plate, L, already described; *c* is a cork mounted for gentle friction in the central tube of plate, *b*; *d* is the axis of the hands; *e* is a tube carrying the hour hand and turning freely on axis, *d*; *f* is the barrel which carries the minute hand. A small steel disk is placed between barrels, *e* and *f*, to each of which the hands are connected by sleeves. The hands are balanced by counterweights to their ends, as previously described.



ROBERT'S MYSTERIOUS CLOCKS.

The Iron Industry in Greece.

The Athens correspondent of the *Deutsche Industrie Zeitung* writes that the manufacture of iron, which was begun a few years ago by a metallurgical association in Athens, has been abandoned because of the scarcity of stone coal, although brown coal is abundant in Greece. The writer suggests that German iron makers could purchase iron ore in the island of Seriphos at very low prices. These ores are brown hematite, red hematite, and specular ore, which can and will yield 25 to 30 per cent of metallic iron. These beautiful ores can be bought for 10 francs ($2) per ton. One deposit of these ores is calculated at 500,000 tons, and the island thus rich in iron ore has been named "Sidera Nesos," or Iron Island.