THE ZEROGRAPH.

It seems to be de rigueur that a fantastic name should be given to new instruments destined to be brought to the attention of the general public. The zerograph does not merely write ciphers, but is capable of transmitting the same number of letters and symbols as any other type-printing telegraph. However, a fancy name seems essential in this case, for to call the instrument the Kamm type printer, when one of its most important claims to attention is the absence of clockwork, would have been a comical error.

The general appearance of the instrument is shown in Fig. 1. Its overall dimensions are approximately 18 inches by 20 inches by 17 inches high. The keys, 36 in all, are not arranged in alphabetical order, but those most often required, i. e., those letters placed near the center of a typewriter keyboard, are put at the extreme left, the figures and stops which are less frequently used being at the right hand side. The reason for this will be explained presently. The most interesting part of the instrument is, as usual, the synchronizing device, and its action will be gathered from the following description and a reference to Fig. 2. The keys, A, of which one is shown in the diagram, are connected to vertical pins, B, arranged in the arc of a circle at right angles to the plane of the paper. The center of this circle is the axis of an arm, D, termed by Mr. Kamm the synchronizing arm. Normally this arm is held at a fixed starting position to the left of the arc of pins by a catch, and when the catch is released the arm is capable of swinging through the arc of a circle just above the pins already referred to until it is stopped by one of these rising. The impulse is given to the arm by a dropping weight connected to it by a cord passing over a pulley. The instruments at the two ends have exactly similar weights and synchronizing arms, a screw adjustment being provided; by this means the space through which the impulse-giving weight drops can be varied, so that the speed of rotation at either end of the arm can be slightly altered if it is not in exact agreement with the other end. The weight acts on the spindle through a pawl, so that it only acts during the forward swing of the synchronizing arm. Two current impulses are sent to line, the first releasing the catch and starting the synchronizing arm, and the second stopping the arm when the letter comes in a position for printing. The types are mounted on flat springs in the arc of a circle corresponding to that of the pins and fixed to the same spindle as the synchronizing arm, and the printing is effected by a plunger pushed forward by the printing magnet, which presses the type against the paper tape. An ink ribbon is employed in the usual manner, this being continuous and passing over two ink pads on the circumference of two rollers.

The arm, D, carries two projections, F and G, moved by the magnet marked "synchronizing magnet" in Fig. 2. The projection, G, is arranged to engage with any pin, B, as soon as this is raised by depressing the corresponding key, A. The other projection, F, engages with a hook, C, attached to the armature of the "starting magnet," and this catch holds the synchronizing arm in its initial position until the magnet is energized. On depressing any key, A, a contact at H is made as the key moves down, closing the circuit of the starting magnet and allowing the synchronizing arm to start on its journey. The lever attached to the key also makes a contact between K and L, and the starting magnet closes a contact at J; it will be seen that these two contacts connect the line battery to line. The line current passes through the synchronizing magnet at the other end, the armature, M, is attracted, F is released, and the synchronizing arm at that end also starts. When the synchronizing arm at the sending end reaches the pin, B, of the letter required, it is stopped by the pin, and closes another local circuit energizing the "second contact magnet" and the printing magnet. The former of these lifts its armature,

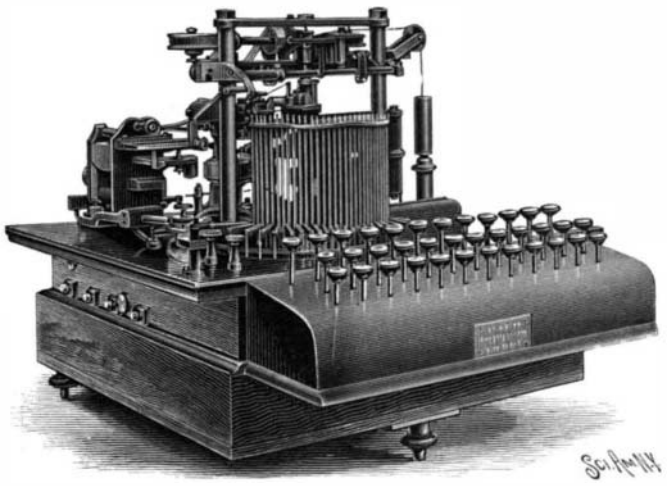


Fig. 1.—THE ZEROGRAPH.

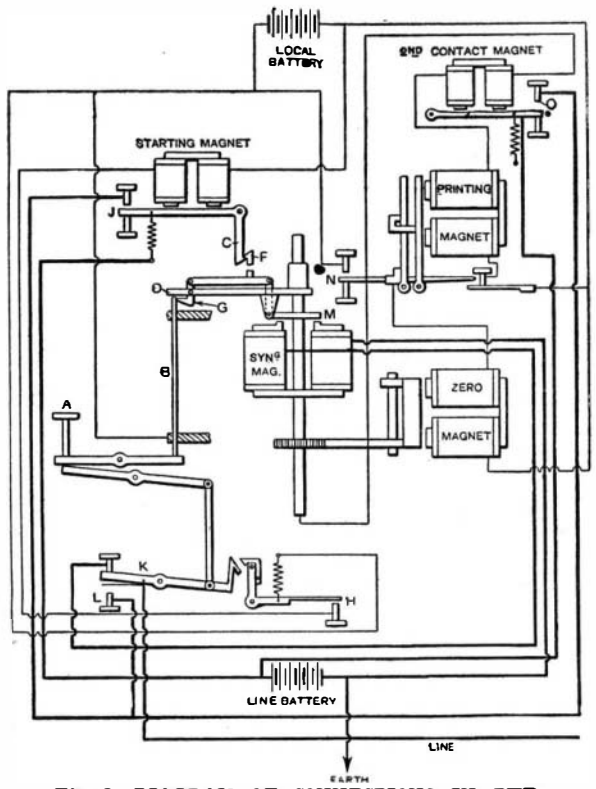


Fig. 2.—DIAGRAM OF CONNECTIONS IN THE ZEROGRAPH.

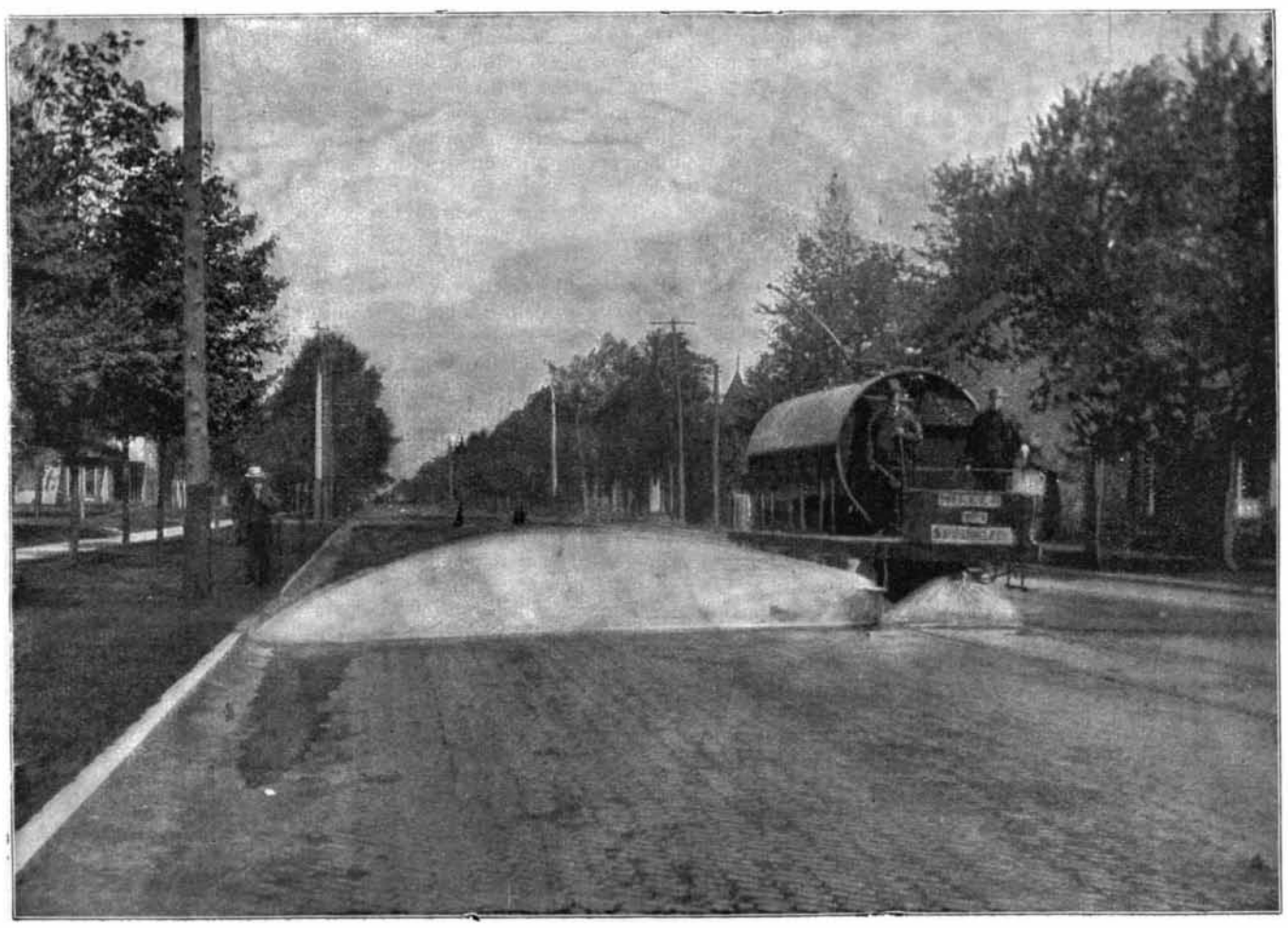
making a contact at O, and sending another current impulse to line. This second current again energizes the synchronizing magnet at the other end, the armature of which moves the projecting fang, G, so as to stop the synchronizing arm at the nearest spring-pin. This pin must correspond to that at the sending end of the line, if the two arms move with equal velocity. The same local circuit at each end is therefore closed, and the printing magnets press the type against the paper. At the same time the paper is fed by the usual mechanism, and the circuit of the "zero magnet" is closed at N, this magnet returning the synchronizing arm to its initial position. We believe that an arrangement of condensers and resistances are connected across the contacts in the local circuits, to diminish sparking.

In point of speed the zerograph, although not competing with the Hughes type printer, is, it is seen, far beyond instruments of the step-by-step type, of which latter the "telescriptor," described in the SCIENTIFIC AMERICAN of January 1, is an example. The synchronizing arm takes but half a second to swing to the limit of its travel and back, and as the letters most frequently used are placed to the left, at the first part of the range of the synchronizing arm the average time per letter is but a very small fraction of a second; in fact, it is claimed that the instrument can transmit 25 words a minute. As evident from the description, however, everything depends on the accuracy with which the speed of the two synchronizing arms agree; and although the spindles are mounted on jewels, and the instrument shows most careful and workmanlike finish, time only can decide whether in this important respect no trouble is likely to be experienced. We understand that experiments have been made on long artificial lines, but no actual trials on long telegraph lines. The synchronizing magnet is very sensitive, and a 12 milliampere current suffices to work it, but we should expect that on long lines with considerable distributed capacity some method of curbing will be found necessary to insure the first current impulse being completely wiped out before the second occurs. It is essential that each impulse should take the same time to reach the other end, but the time elapsing between successive impulses varies with each letter.

Mr. Kamm has also devised a "column printer," in which paper of a certain width is used instead of tape. To commence a new line a key is pressed which is not connected to any of the circle of pins, and the synchronizing arm swings right to the end of its travel, closing a contact there which completes the local circuit of an extra electromagnet. This magnet moves the paper forward, and at the same time brings it back to the commencement of the line. This type of instrument is, however, not beyond the experimental stage, so that a detailed description of it would be out of place now. For our engravings and the description we are indebted to The London Electrician.

AN ELECTRIC STREET RAILWAY SPRINKLER.

We present an engraving of an interesting trolley sprinkling car which is designed to sprinkle the streets from curb to curb. It is very essential in many of our wide streets and boulevards to sprinkle the entire width of the street at one operation, and the car which we illustrate does it very effectually. The sprinkling wagon of to-day is a great improvement over those formerly in use, on account of the ability of the driver to judge and determine instantly how much water to put on the pavement to sprinkle it properly and not flood it; but sprinkling with an ordinary horse tank wagon is expensive, owing to the fact that its capacity is small, requiring frequent fillings, and the cost of maintaining horses is very heavy. Many of our modern trolley lines are miles in length, and, with a car like that shown in the illustration, many miles of streets or roads may be sprinkled with economy and dispatch. The trolley sprinkler



THE MILLER ELECTRIC WIDE SPRAY SPRINKLING CAR.