THE IMPROVED GRUHN TELAUTOGRAPH.

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In a previous issue of the SCIENTIFIC AMERICAN a description of the Gruhn telautograph was published, an apparatus which is nothing more or less than a facsimile telegraph. This apparatus has been so greatly improved since the publication of that article as to bear little resemblance to the original apparatus. A description of the improvements may therefore not be amiss.

It is claimed for the new instrument that anybody, in fact any child knowing how to write, can use it without any training or skill.

The operative principle is illustrated in the diagram: An ordinary lead pencil, *t*, is connected with a very delicately mounted lever, *a*, so mounted that the writing end of the pencil can move over the writing paper in any direction without disturbing the writer. The other end of the lever is fixed within the casing to a shaft, *p*, which can be displaced on the line, *A B*, so that the pencil can move in any direction. The motion performed by the pencil will impart to the lever a rotary in addition to a reciprocating movement.

A stationary resistance is represented by *r*, a movable resistance by *s*, rigidly connected with the lever, *a*, by the rods shown in the diagram. The two resistances are connected with a battery of eight dry cells. A small current collector, *b*, is fixed to the movable rods and insulated from them, while *c* is a fixed current collector bar. The two current collectors are fixed to the transmission wires, *d* and *e*. Now, each of the collectors will throw into the transmission lines a part of the battery current; the amount, so far from being constant, will obviously undergo alterations with any variation in the position of the writing pencil. To each point of the writing board will thus correspond two given current intensities in the two lines respectively, so that the writing movement can be said to be converted into current variations.

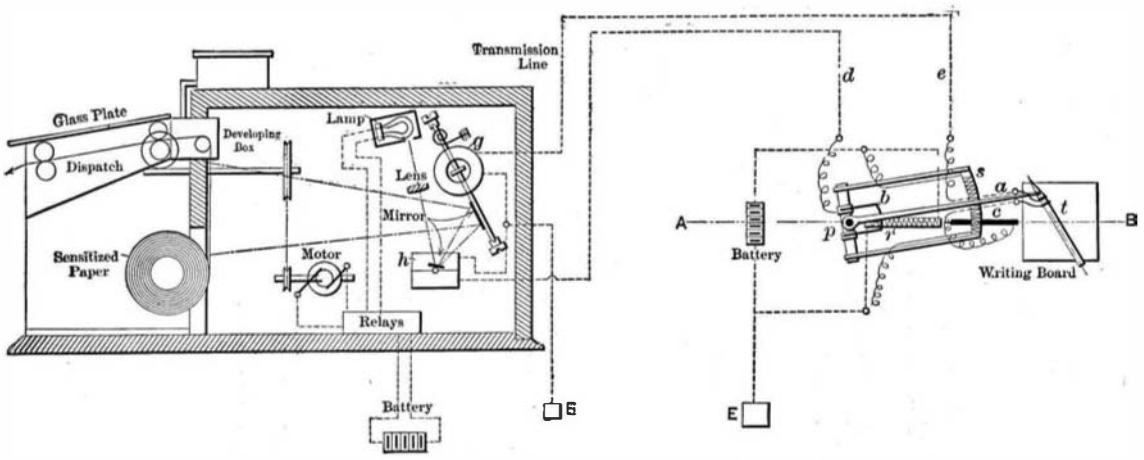
Now, the spiral lines represent flexible conductor strings. The transmitted current returns either through the ground or through a third conductor. In the receiving station the currents are received by an apparatus including a small electric lamp which projects a thin beam of light on a very small mirror, whence the beam is reflected to a second mirror, which again reflects it to a sheet of sensitive photographic paper. On this paper the beam of light is sharply focused by a lens. The two small mirrors, so far from being stationary, are moved under the influence of the currents transmitted from the sending station. In fact, they are mounted on small rotary shafts, to which are fixed magnetic rods, set vibrating by the arriving current through the medium of the coils of copper wire, *g* and *h*. Now, one of the mirrors will vibrate from above downward, and the other from the right to the left, according to the movement of the writing pencil in the sender. The reflected beam will accordingly perform the two component movements, which are combined into what may be called a resulting motion.

From the foregoing it will readily be understood that the beam of light can be controlled by means of the two mirrors, so as to perform the same movements as the writing pencil in the transmitting apparatus; in fact, the movements of the latter are translated in the transmitter into a vertical and a horizontal component; these are combined in the receiver again to reproduce the original motion. The beam of light thus acts as a luminous writing pencil, moving over the paper simultaneously with the graphite pencil and at the same speed, so that a photographic record is obtained on the receiving paper.

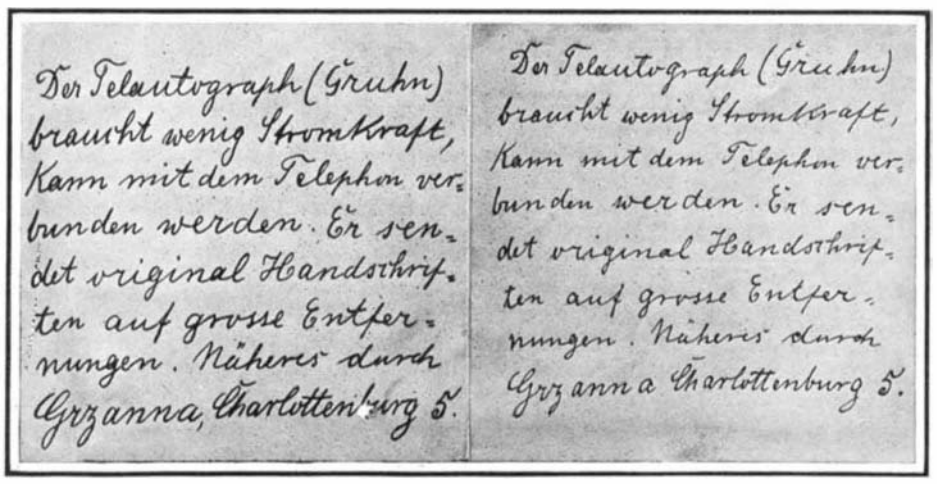
A special feature is that the photographic record is developed automatically by the apparatus. A small electromotor withdraws the message automatically from the receiver box, the whole developing process lasting only ten seconds. That is to say, that ten seconds after the operator has put down his writing pencil, the dispatch is received in the original writing at the other station, and the receiver has only to read his photographic telegram. Every apparatus being designed both for the receiving and sending of telegrams is a double apparatus, constituting a complete station outfit. The most obvious advantage of the apparatus is that it generally requires no special wiring, but is simply connected with existing telephone circuits. In fact, the telautograph necessitating two main lines and one return, any one of the reserve lines that are always available can be used as return. Since this reserve line can be used simultaneously by a number of telautographs, connected with the same conductor, there will in most cases be no necessity for installing special lines for the telautograph. The returns need not, by the way, be led through the switchboard of the telephone exchange, but can be kept connected with one another permanently, which will greatly facilitate the introduction of the apparatus. Moreover, a recent improvement enables the apparatus to work on two lines only.

Trials made by the German postal department have shown the possibility of telephoning and writing simultaneously on the same wire, without the two apparatus interfering with each other. As, moreover, the telautograph has been found to work successfully over great distances (trials have for instance been made between Berlin and Dresden, over 124 miles distance) it will doubtless prove a valuable complement to telephone service, especially in cases where the latter would not be sufficiently efficient.

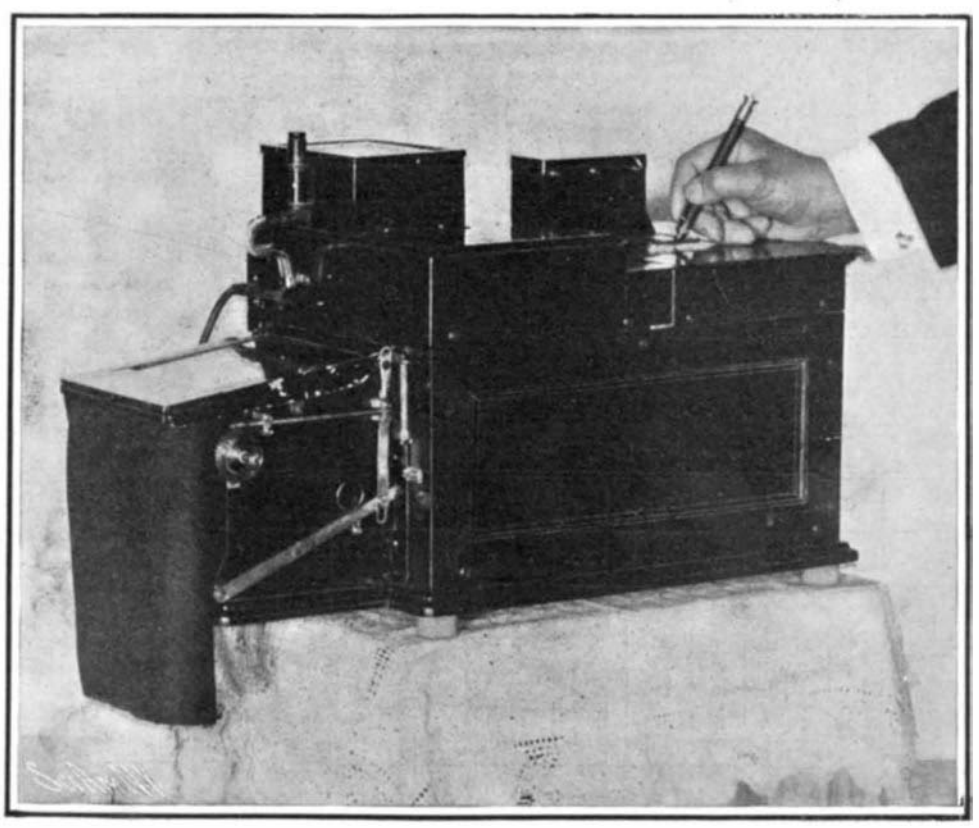
It should be mentioned that the telautograph shows a low consumption of current, eight dry elements being sufficient to supply the apparatus for a long period, the battery being connected only just the time the apparatus is used for writing. As the telautograph and telephone are normally connected simultaneously and permanently with the same circuit, no switching is required from the telautograph to the telephone, or *vice versa*, and telephoning and telautographing can go on either simultaneously or alternately. The writer is indebted to Mr. Gustav Grzanna for courtesies extended in the preparation of this article.



The Combined Transmitter and Receiver of the Gruhn Telautograph.



Original and Transmitted Messages, One-Fourth Natural Size.



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Tubes in Cement.

The tubes or piping of cement which is now manufactured appears in numerous forms of section. Besides the round piping we also meet with piping of an oval section. The circular piping is generally used for diameters which are below 20 inches, while for the large sections the oval form is preferred. To give it a greater steadiness upon the bottom where the piping is laid, the exterior contour is often given a flat base instead of being circular like the internal bore. Such piping can be readily placed upon a flat surface and will keep well in place. As at present constructed, the cement piping is formed of an agglomerate mixture consisting of cement and an inert element, sand or gravel. A mortar is made by mixing these two constituents. For the cement we can take Portland, Roman cement, or others. The mixture is quite variable in the proportions which are used, and should be made according to the following rules: First, to have a compact beton, the gravel should be double the amount of sand. Second, the solidity is lessened when we only use cement and gravel, excluding the sand. Third, by diminishing the quantity of gravel too much the expense is increased. The best proportion for average use seems to be 1 part cement, 1.8 sand, and 4.4 gravel. After deciding the proportion to be used, we next carry out the mixing of the materials. A kind of mixing crusher can be employed, in which narrow rollers work in a vat containing the mixture. We can also use mixers composed of a hollow, cylindrical vessel in which turns a shaft provided with paddles. Such an apparatus takes some 7 horsepower, and it forms 24 cubic yards of beton per hour. Once the mass is mixed it is put in an iron mold of appropriate form, consisting of the outer form and an inner core corresponding to the diameter of the piping. The mixture is put in the free space and is packed down with a tamping rod. The process somewhat resembles the manufacture of gas retorts. The forms are placed vertically or laid down. For some time it has been desired to substitute a mechanical process for the hand method, which is expensive, but machines which have given good results are scarce as yet. They have somewhat the same form as the molds just described. Beton is run into the inner space. The core is set revolving, while the mass is compressed by a screw-press. The tube is then taken out of the mold and at the end of three or four hours is treated with a fluosilicate containing magnesia. To protect the tubes from corrosion by acids it is a good plan to coat the inside with a mixture of tar and asphalt.

There are 200 companies who make machines for molding of concrete blocks.