(No Model.)

4 Sheets—Sheet 1.

G. A. CASSAGNES.

PRINTING TELEGRAPH.

No. 313,175. Patented Mar. 3, 1885.

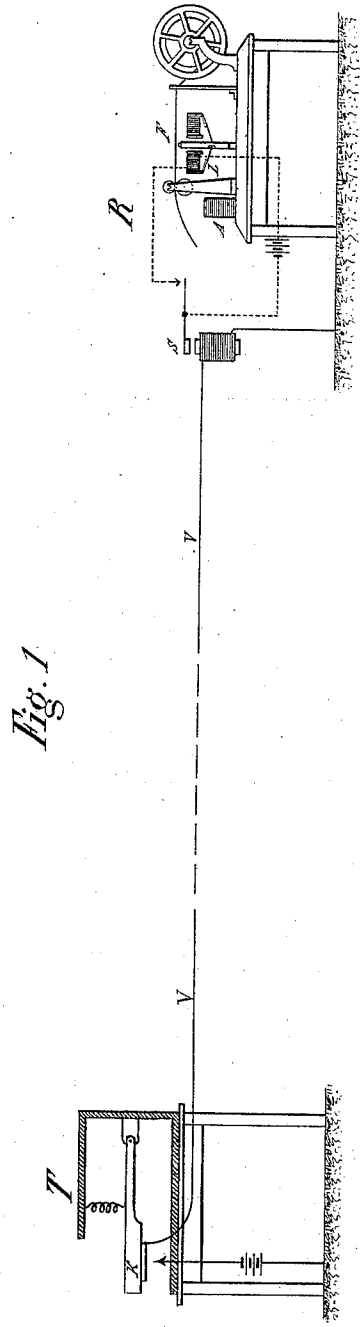


Fig. 1

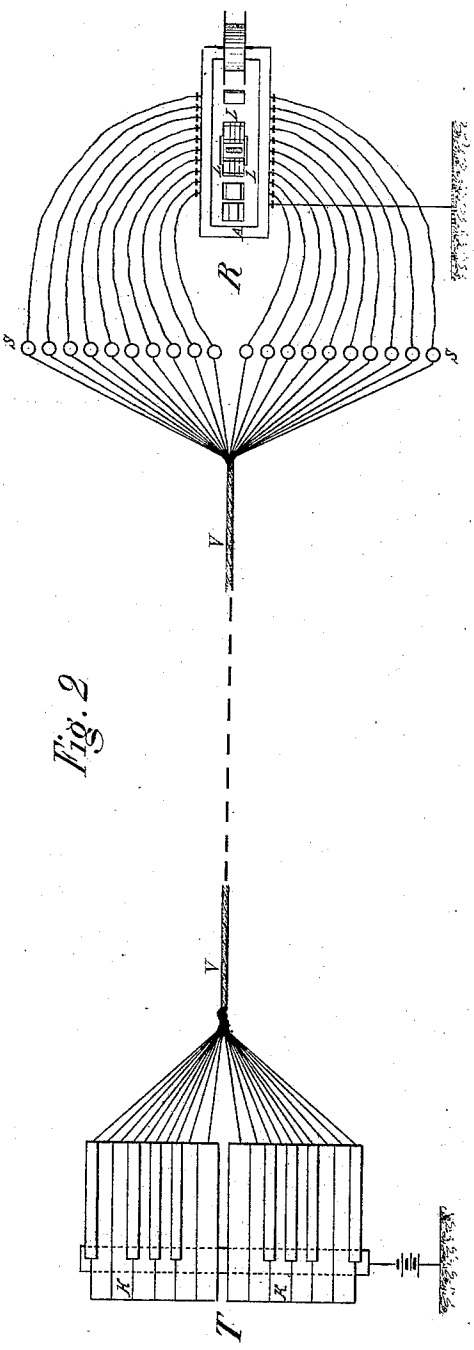


Fig. 2

Witnesses:
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Gustav Schnekpé.

Inventor.
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(No Model.)

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PRINTING TELEGRAPH.

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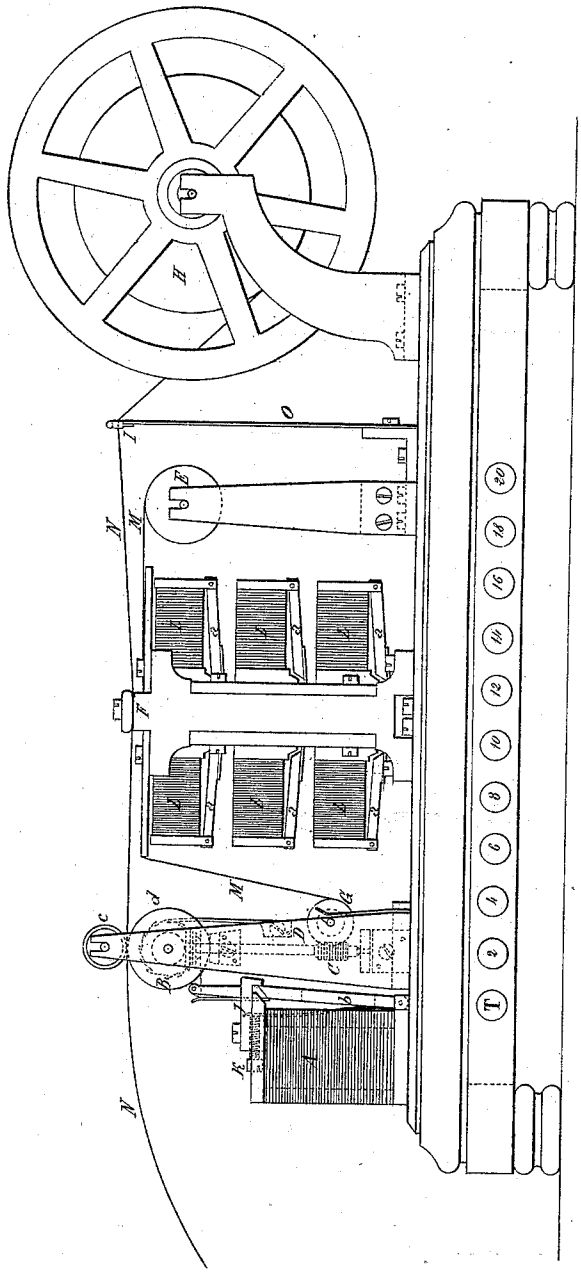


Fig. 3

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Inventor:
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N. PETERS. Photo-Lithographer. Washington, D. C.

(No Model.)

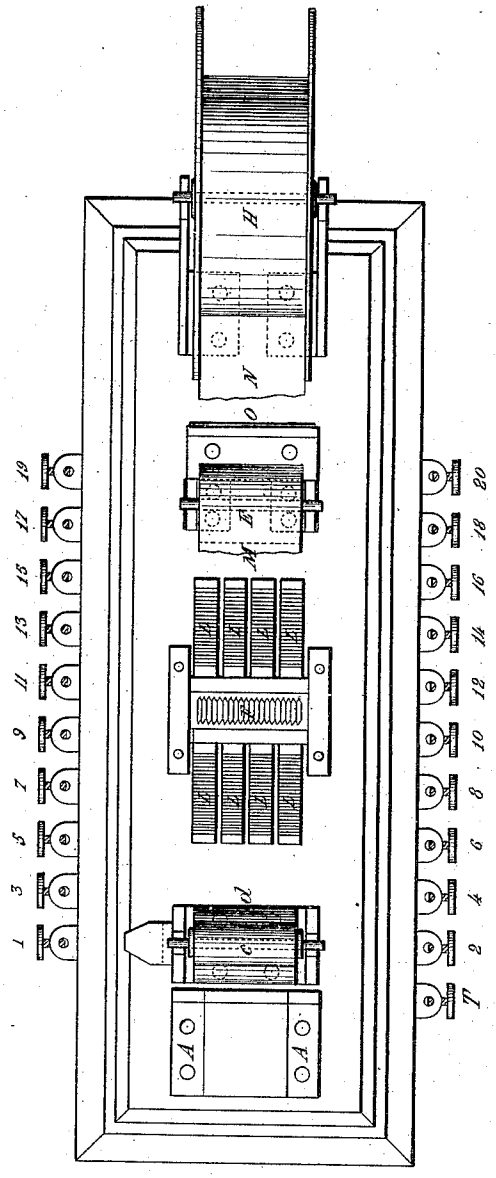
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G. A. CASSAGNES.

PRINTING TELEGRAPH.

No. 313,175. Patented Mar. 3, 1885.

Fig. 4



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(No Model.) 4 Sheets—Sheet 4.

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PRINTING TELEGRAPH.

No. 313,175. Patented Mar. 3, 1885.

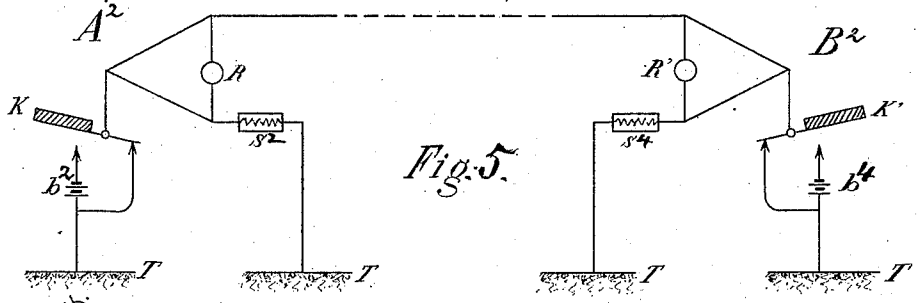


Fig. 5.

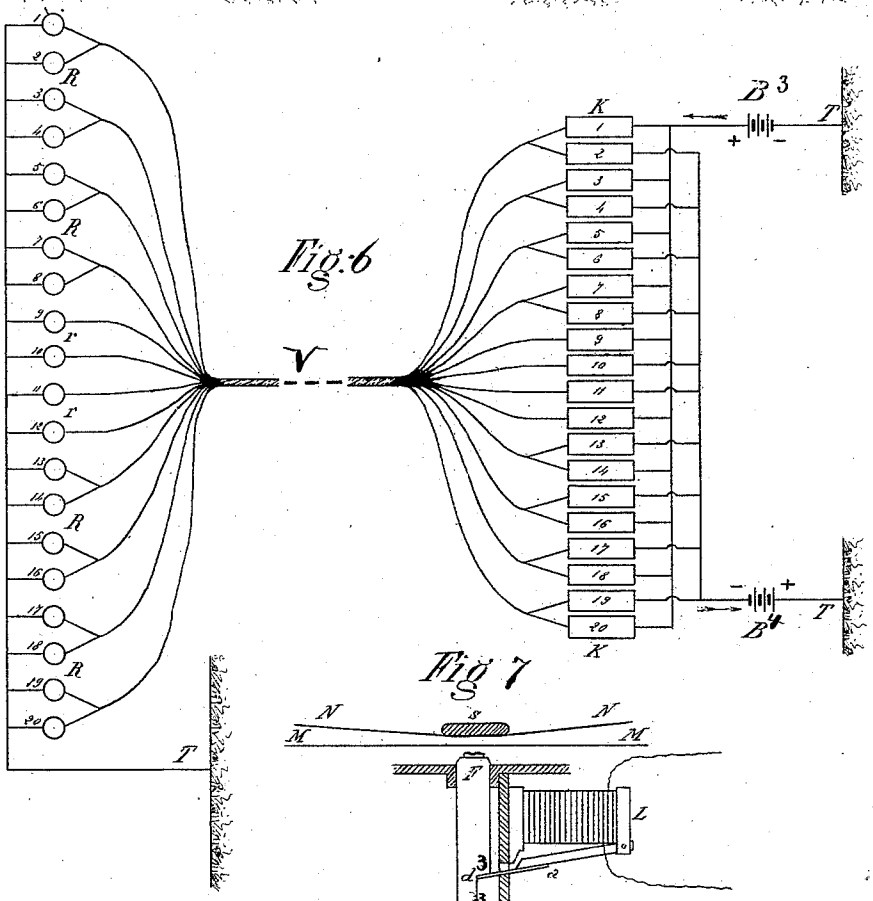


Fig. 6

Fig. 7

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UNITED STATES PATENT OFFICE.

GILBERT A. CASSAGNES, OF PARIS, FRANCE.

PRINTING-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 313,175, dated March 3, 1885.

Application filed May 9, 1884. (No model.) Patented in France April 5, 1884, No. 161,385.

To all whom it may concern:

Be it known that I, GILBERT ALFRED CASSAGNES, a citizen of the Republic of France, residing at Paris, France, civil engineer, have invented a new Apparatus for Steno-Telegraphy, (for which I have obtained Letters Patent in France for fifteen years, dated April 5, 1884, and numbered 161,385;) and I do hereby declare that the following is a full, clear, and exact description of the invention, reference being had to the accompanying drawings.

In an application for a patent which was filed by me on the 25th day of October, 1883, and which is known by Serial No. 109,934, I described an invention under the name of "steno-telegraphy," which consists in a new apparatus by means of which I can apply to the uses of telegraphy various systems of mechanical stenography, and more especially the system known and patented under the name of "Michela's System."

The present invention may be considered as an improvement of the mechanism shown in my former application.

The arrangement, which I have fully described in my preceding application, applies to two sets of apparatus, which, by means of certain commutators, switches, or current-breakers, are mutually reversible—*i. e.*, can at will be used either as transmitters at the sending-station, or as receivers at the receiving-station.

Although my previous application gives a complete and correct solution of the aim I pursued in my invention, it might, however, be found advisable in some cases to change or modify its disposition. The complete separation of the receiver and transmitter would realize a simplification in the electrical connections, which would become similar to those actually in use in the present systems of electrical telegraphy. This arrangement would also facilitate the application to my apparatus of the duplex and quadruplex methods of signaling. This is, I think, a powerful recommendation for my new disposition, as it would increase much more easily the capacity of a line to twice or four times its actual working power. Lastly, the apparatus thus disposed could be rendered much more sensitive and much less liable to get out of order. It is evident that in that case, as shown in Figs. 1 and 2, I keep as a transmitter the same key-board as previously; but I separate it entirely from the printing apparatus, to which it is only electrically connected—*i. e.*, the two essential parts of the machine are placed, one at the transmitting-station T and the other at the receiving-station R. Each key *k* of the transmitting key-board closes, when depressed, a circuit which transmits through the cable or line V a signal received and printed at the receiving-station by the style F corresponding to the depressed key. This letter or sign is put in motion by an electro-magnet, L, acted upon either directly by the line-circuit, or by means of a local circuit controlled by a relay, S, arranged according to the well-known dispositions of these apparatus. The motion forward of the slip of paper to be printed upon can also be produced by means of a special electro-magnet, A, placed in a local circuit, which is closed by the action of any one of the printing electro-magnets. My transmitting key-board consisting of twenty keys, the line or cable will also be composed of twenty insulated wires or conductors with the current returning through the earth, or twenty-one insulated wires or conductors, making use of the twenty-first as return-wire. I naturally intend to keep the right of still further decreasing the number of wires or conductors by means of proper appliances, such as are involved in the principles of duplex or multiplex telegraphy. Thus, in Fig. 5 is shown a diagram of an ordinary duplex connection. The diagram is of course well known, and I do not mean to claim it; but I give it in order to make clearer the way in which it can be applied to my apparatus, and I wish to keep the right of using it, if found convenient.

Fig. 5 shows only a single key at each end. It stands to reason, however, that it can equally be applied, without any important change, to the twenty keys of my key-board or manipulator.

In Fig. 5, A^2 and B^2 are the two end stations, connected by means of the line-wire; *k* and *k'*, the two keys for the transmission of signals; b^2 and b^4, the electric batteries or generators of electricity; s^2 and s^4, the artificial

resistances used to balance the line; R and R', the receivers, which in the present case can be either the electro-magnets of my printing apparatus or relays closing local circuits which act on the said electro-magnets. I need not lay any further stress on this disposition, as the principles of duplex telegraphy are so well known.

It would be equally easy to give a simple sketch of quadruplex, showing its adaptability to my apparatus.

As for the multiplex, several forms of it are well known, and can be applied to my instruments with but little modification. I need only refer to such systems as employ synchronously-rotating tables of contacts. It will be seen at once that such an arrangement could be applied with the enormous advantage of necessitating only one conducting-wire instead of the cable of wires I have employed to this day. Also, I shall here remark that as, according to the code of signals which form my alphabet, a certain number of keys of my keyboard are never depressed at the same time, I can avail myself of this fact in order to reduce in proportion the number of the conducting-wires otherwise needed for the line or cable connecting one station to another. For by the use of polarized relays acted upon only by currents flowing in a definite direction, and by a proper arrangement of the connections of the transmitting battery or batteries, I can send positive currents through some of the keys, and negative currents through the others. If, therefore, two keys between which there does not exist any possible combination send the first positive currents, and the second negative currents, I can employ the same wire or conductor for the purpose of transmitting signals thus formed, provided, however, that I have at the receiving-station polarized relays acted upon, the first by the positive current and the other by the negative current. It is evident that these relays in their turn can be so disposed as to close the local circuit of the electro-magnet acting upon the letter or sign corresponding to the key depressed at the sending-station. By means of such an arrangement, and by availing myself of the Michela stenographic alphabet, I can reduce to twelve instead of twenty the number of wires or conductors of the line or cable. Thirteen wires would be necessary if it is wanted to have one of them as return-wire.

Fig. 6 shows a method of having only twelve line-wires instead of twenty. *k k k* (numbered 1 2 3 ----- 19 20) are the twenty keys of the manipulator, provided with electrical contact-pieces, so as to close the circuits on which they are placed when they are depressed. B^3 B^4 are two batteries, connected with these keys (ten keys each) by their opposite poles. V is the line-cable connecting both stations. R R R are polarized relays, worked only by currents flowing in definite directions. *r r r* are ordinary relays. According to Michela's alphabet, keys 1 and 2 are never depressed simultaneously; likewise keys 3 and 4, 5 and 6, 7 and 8, 13 and 14, 15 and 16, 17 and 18, 19 and 20. Therefore, if key No. 1 is connected to battery B^3, and key No. 2 to battery B^4, the first will send positive and the second negative currents through the line. They can, therefore, have only one line-wire or conductor for both of them between the two stations. At the receiving-station the polarized relay R (1) will be acted upon if the current is positive, and the polarized relay R (2) if the current is negative. The action of the other relays will be similar. It is easily understood how the polarized relays R R R on one hand and the ordinary relays, *r r r*, on the other can in their turn close local circuits corresponding to the twenty printing-styles without its being necessary to show the arrangement on the diagram. This mode of making the connections has also the further advantage of preventing the transmission of erroneous signals. For if keys No. 1 and No. 2, for instance, were erroneously depressed at the same time, (a thing which should never occur,) key No. 1 would tend to transmit a positive current and key No. 2 a negative current through the same wire. These two actions would mutually destroy one another, and no current would flow through the line corresponding to these two keys 1 and 2. The other keys would not, either, send any current at this instant, as the two batteries B^3 and B^4 would, *ipso facto*, be short-circuited, and therefore no erroneous or incomplete signal could be transmitted. This reduction of the line-wires to twelve instead of twenty is not, however, a minimum. By means of the synchronously-rotating disks or tables of contacts, as already alluded to, only one wire need be used. These instruments are too well known in multiplex telegraphy to need description.

Figs. 1 and 2 represent, in elevation and plan, the general view of the transmission and reception system, and Figs. 3 and 4 show, in elevation and plan, my improved apparatus.

In the arrangement shown in Figs. 3 and 4 the electro-magnets L L act directly upon the printing styles or letters (see also detail view, Fig. 7) by a notch, b^3 d^3, into which enters the extremity of the armature *a a* of these electro-magnets. The current, after it has traveled through the electro-magnets whose corresponding keys have been depressed, flows thence in the electro-magnet, producing the forward motion of the paper, (shown at A, Fig. 3.) Its armature *b*, being then attracted, acts upon a ratchet-wheel, B, which puts in motion the paper band N, and makes it advance through the required distance. This motion, properly reduced in amplitude by means of a worm, C, and wheel D, also acts upon the inking-ribbon M and pulls it forward, but through a much smaller distance than the paper. This inking-ribbon, therefore, slowly unrolls from cylinder E, between the paper roll H and the printing electro-magnet L L, passes just above the styles F, which, when they rise, project it against the paper, and

goes from there to the pulling-cylinder G, which, acted upon as it has just been described, attracts it and rolls it up.

As the styles or letters, twenty in number, are put as near as possible to one another, so as to reduce the width of the paper, I have arranged the electro-magnets which act upon them on each side of their axis, and I have also placed each set of these electro-magnets in layers one above the other, and each one breaking joint with those immediately above or underneath, so as to reduce as much as possible the bulk of the apparatus. The paper band N, as it unrolls from roll H, first passes with gentle friction through a guide, I, placed on the top of a blade or spring, O, as is shown in Fig. 3. The object of this blade or spring is to attenuate the sharp motion of the armature *b* of the electro-magnet A, producing the motion of the paper. Such a sharp motion, unless softened and spread, as it were, by the elasticity and vibration of the spring, on a longer period of time, would communicate an impulse to the paper roll H, whose inertia would then cause to unroll a much greater length than wanted. Once such a length unrolled, the pressing-cylinders *c* and *d*, producing the motion forward, having little or no work thrown upon them, would be urged forward in their turn by their moment of inertia, and would pull or attract a much greater length of paper than necessary. The spring, on the contrary, stores up the energy by its elasticity and gives it back gradually, thus playing the part of a true regulator or governor in making the work nearly constant. The electro-magnet A, producing the advancement of the paper, is provided with a spring, J, the tension of which can be adjusted by means of a regulating-screw, K, in order to pull back the armature after the attraction. The printing electro-magnets L L, on the contrary, do not want any springs, the weight of the armature *a* itself and that of the style or letter F it supports being amply sufficient to pull it back when the current has stopped flowing through the coils of the electro-magnet.

The electro-magnets L L made use of belong, as shown in the drawings, to the type of those in which the armature hinged on one of the poles is attracted by the other. This arrangement allows a greater amplitude of motion, with a rather greater force of attraction, and with a smaller size.

In the arrangement described and illustrated by the accompanying drawings, the electrical connections of the apparatus are made through the terminals shown on the sides. The terminals corresponding to the even electro-magnets are placed on one side of the apparatus, and those of the odd electro-magnets on the other.

The return-wire is connected to the terminal T, Figs. 3 and 4.

In order to prevent as much as possible the sharp motion imparted by the electro-magnets to the styles, the length of stroke of these latter is rather greater than that of the armature of the electro-magnets, so that once the armature being fully attracted to its extreme position, the style can, through its *vis viva*, continue its stroke, push up the inking-ribbon, and print the letter or sign on the paper band, pressing the latter against a plate, *s*. This arrangement has obvious advantages with respect to the durability and the good working of the apparatus, and also for producing a neat printing on the paper. It is readily obtainable by means of the notch b^3 d^3, and lever arrangement, by giving to the notch a rather greater length than that corresponding to the stroke of the armature-lever acting upon the same.

In the present description I have summarily explained one of the numerous practical ways in which my invention can be realized and solved. However, I do not by any means intend to restrict myself to this arrangement, and although I claim it as my own, I give it rather as an instance to facilitate the more complete understanding of my system than as a definite disposition of my apparatus, to which I reserve the right of making, if need be, any such changes as may be deemed advisable.

To sum up, therefore, I claim as a new invention and wish to protect by Letters Patent as my property—

In a machine for reproducing phonetic sounds with the aid of electricity, the combination of the phonetically-marked keys *k* with the conductor V, electro-magnets A and L L, armatures *b a a*, printing-styles F F, having notched portions b^3 d^3, plate *s*, and mechanism, substantially as described, for feeding the paper, as set forth.

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GEORGE WALKER.