W. E. SAWYER & J. G. SMITH.

AUTOGRAPHIC TELEGRAPH.

No. 184,302. Patented Nov. 14, 1876.

Fig: 1.

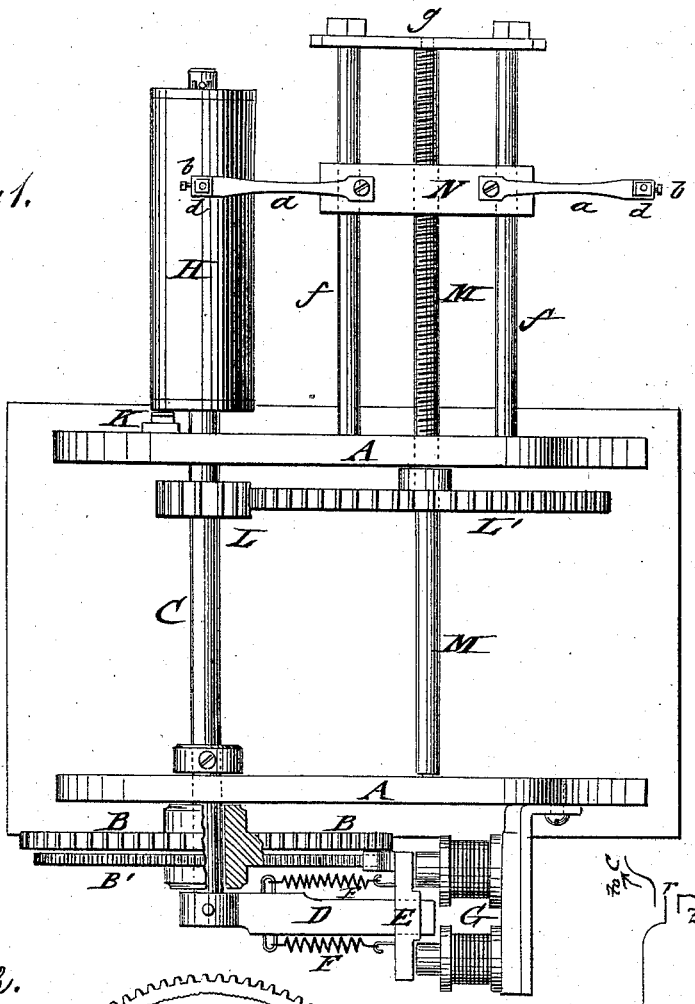


Fig: 2.

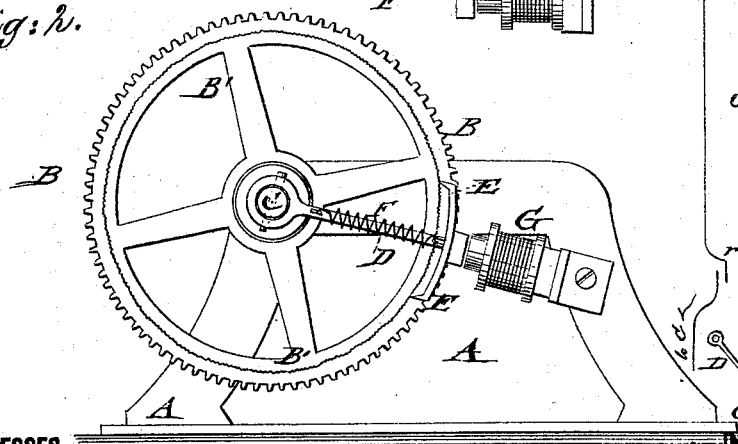
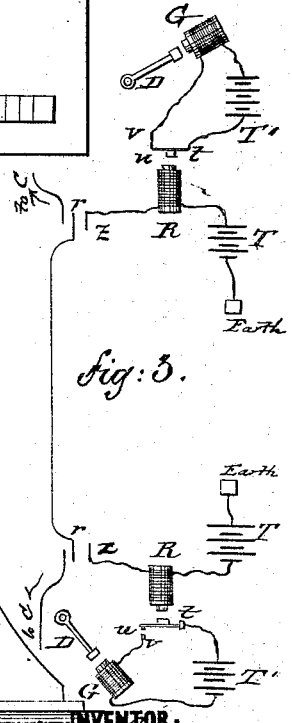


Fig: 3.



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UNITED STATES PATENT OFFICE.

WILLIAM E. SAWYER, OF NEW YORK, N. Y., AND JAMES G. SMITH, OF HACKENSACK, ASSIGNORS OF ONE-HALF OF THEIR RIGHT TO ROBERT F. STOCKTON AND EDWARD J. ANDERSON, OF TRENTON, NEW JERSEY.

IMPROVEMENT IN AUTOGRAPHIC TELEGRAPHS.

Specification forming part of Letters Patent No. **184,302**, dated November 14, 1876; application filed September 8, 1876.

To all whom it may concern:

Be it known that we, WILLIAM EDWARD SAWYER, of the city, county, and State of New York, and JAMES GILMORE SMITH, of Hackensack, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Copying or Autographic Telegraphs, of which the following is a specification:

Our invention relates to certain mechanism for accomplishing autographic or fac-simile transmission of messages over lines of telegraph, and to electrical circuits connected therewith.

As the principal features of fac-simile telegraphs are well understood by those skilled in the art, we shall, as far as possible, confine ourselves to a description of the mechanism of our present invention. At the present day the principal feature of any and all fac-simile telegraph systems is the method of obtaining accurate isochronous motion in two or more instruments distantly separated. This is what is accomplished by our present invention.

In the drawings accompanying this specification we have not shown the motive power, as our improvement is of such a character that the source of motion is comparatively inconsequential. An electro-motor, water, steam, or other power may be employed; but we greatly prefer a clockwork, operated by a weight, and regulated by a fan or other equivalent device.

The principle of our invention may be stated as follows: First, a steady, or nearly steady, motion is obtained by means of any mechanism; second, the transmitting or recording parts are operated by this mechanism periodically, each instrument being dependent upon the speed of the other for this periodical operation, as well as upon a line-current or a local current, controlled by a clock-work, which is in some respects, perhaps, preferable to a line-current.

With this general reference to the nature of our invention, we will proceed to describe the construction of the mechanism in detail, so far as necessary to an understanding of the same by persons skilled in the art.

In the drawings accompanying and forming a part of this specification, Figure 1 is a plan view of our improved autographic telegraph instrument. Fig. 2 is a sectional side elevation of the same; and Fig. 3, a diagram showing the circuit-connection of the transmitting and receiving stations.

Like letters indicate similar parts in all the figures.

Referring to Fig. 1, A is the supporting-frame, which may be made of any suitable material. B is the gear-wheel, by which the transmitting and recording mechanism is operated, and to which the motive power is applied by clock-work, or any kind of motive power giving the steady motion. This gear-wheel is placed loosely on the shaft C, and transfers its motion to the shaft by means of an arm, D, keyed to the shaft C, and a clutch, E, which slides on the arm D. The clutch E is connected by spiral springs F to projecting pins of arm D, and attracted or released by a stationary magnet, G, the clutch being shaped at the side facing the magnet in the nature of an armature to the same. The gear-wheel B is cast or otherwise provided with a small milled wheel, B′, sidewise to the main gear, the clutch being so arranged on the fixed revolving arm D as to enter the teeth of the milled section B′, when not attracted by the magnet. Now, it is obvious that as long as the clutch E is bearing on the milled edge of the gear-wheel the shaft C will revolve; but as soon as the magnet G draws the clutch, by means of its armature, away from the milled edge B′, so as to clear the same, the motion of the shaft C will be arrested, while the gear will continue to revolve unobstructed, it being designed to have the natural friction of the gear revolving on the locked shaft exactly equal to the friction of the rest of the mechanism when the clutch takes hold of the gear and the shaft revolves. Herein is involved the main principle of the invention, for when, in one instrument, the clutch-armature arrives before the magnet G,

the motion of the shaft C is arrested until the clutch-armature of the distant instrument arrives at the same points, when both instruments proceed together for another revolution, as will appear from the following description of the transmitting and receiving apparatus. Upon the shaft C, and fixed to the same, and unfixed, as desirable, (but fixed to the same, when transmitting or receiving,) is a metallic cylinder, H, insulated from the shaft, but electrically connected by a spring, K, which bears upon the cylinder. Upon and fixed to the same shaft C is a small gear, L, which meshes into a larger gear, L′, which is fixed to its shaft M. Bolted to the frame are two rods, *f f*, which are joined in a head-piece, *g*, in which one end of the shaft M has a bearing.

Upon the shaft M is cut a screw-thread, the object of which is to move along the rods *f f* the stylus-carriage N, which has a joint bearing upon the thread. Fixed to the stylus-carriage are two springs, *a a*, having two heads and set-screws, *b b*, and carrying two styles, *d d*.

It is obvious that, as the cylinder revolves, the style *d* is moved along its length, and, since the style bears upon the cylinder, a real or imaginary spiral line of any fineness is is traced upon the cylinder, or the paper or metal placed thereon, by the point of the style.

We have preferred to use, for ordinary writing, a thread upon the shaft M, which will cause the style to trace upon the cylinder a spiral one-sixtieth of an inch apart, or sixty to the inch; but, inasmuch as one writing might be so fine as to make greater minuteness desirable, we will point out that there may be two sets of gears, L L′, which, while the mechanism is at rest, may be loose upon the shafts C and M, but either of which sets may be fixed to their respective shafts by a reversible clutch or changeable spring, or other device.

When it is desired to transmit a message, there is placed around the transmitting-cylinder H either a sheet of metal or metallic paper, upon which the message is written in an insulating-ink, or the sheet upon which a message has been transferred, so as to obtain the same features of insulation and conductivity, the same being secured by a rubber band or bands, or in other manner; and upon the receiving-cylinder is placed a sheet of chemical paper capable of electrolyzation.

Now, as the style upon the transmitting instrument comes upon a line of insulating writing, a mark is made by the style of the receiving instrument upon the chemical paper, and as the styles of both instruments move along the cylinder, the entire surface is finally covered, and, as the cylinders of the two instruments move isochronously, the message is finally reproduced from the transmitting to and at the distant receiving-station.

If two instruments could be designed which would run indefinitely at the same rate of speed, of course no regulation would be necessary; but it has been, and, in fact, is, impossible to accomplish any such nicety of motion, except to a certain extent, with the slowly-vibrating pendulum, the most-accurately moving of mechanical devices. It is necessary, therefore, that the transmitting-instruments shall be regulated, either by some accurate motion independent of themselves, or some impulse common to both, so that neither shall increase its speed, except in a single revolution of the cylinders, above the other. Therefore, we have arranged that when one instrument shall arrive at a certain point upon the cylinder, it shall wait for the other instrument to arrive at the same point, and neither instrument can pass until the other shall have arrived at that point.

Independent of the transmitting and receiving electrical circuits which we have deemed it necessary to illustrate in the accompanying drawings, the same being well known and fully set forth in patents heretofore granted, we have shown the method of accomplishing this arresting and releasing of the mechanism in Figs. 1 and 2. We have not deemed it necessary to show any mechanism for accomplishing the changing of a circuit, there being many well-known mechanical and electrical devices to that end, but will merely state that the device should be attached to the shaft C, represented in the drawing, Fig. 3. The line is connected to the contact-points *r*. So long as a message is being transmitted, or, rather, so long as the cylinders are undergoing that portion of their revolution which is devoted to transmitting and receiving, the line is connected to the shafts C C; but so soon as the clutch-armatures E of the arms D arrive at the magnets G G, and are arrested there, the circuit of the line is changed from *r r* to *z z*, and thence, through ordinary relays R R, through batteries T T to the earth. When the armatures of the relays are attracted and the circuits of local batteries T′ T′ are broken, through the forward motion of the levers *t t* of relays R R, by separation of the contact-points *u u* and *v v*, by which the local circuits of the magnets G G are closed, whereupon the cylinders of both instruments start and accomplish another revolution.

In ordinary operation one instrument will generally arrive at the arresting-point before the other; but this movement is apt to vary. Hence it is necessary that neither should be released until the other shall have arrived at the same point, which is accomplished by our invention.

For purposes of signaling an ordinary Morse key is employed in the arresting-circuit, through relays R R, at which both instruments are detained by a switch until it is desired to transmit and receive a message, when the two instruments are set in motion, so far as the transmitting and recording parts are concerned, by closing the Morse keys, and

throwing open the detent-switch, it being understood that the rest of the mechanism moves on uninterruptedly, if desired.

Two styles are employed, one to transmit, the other to receive, a message. Either style is brought to bear upon the cylinder H by turning round the stylus-holder N.

The clutch shown in the drawings, it is obvious, may be raised in many ways—for instance, it may be fixed intermediately upon a lever hinged upon the arm D, and carrying the armature at its free end. In this case, as in that shown, it would be brought to a bearing upon the milled edge of the gear, by means of a spring, or the springs F F. In the drawings it is shown as sliding upon the arm D, drawn in one direction by the two springs F F, and in the other by the magnet G. It may equally well be drawn to the milled edge of the gear by a magnet, and thrown out in the path of a fixed projection by a spring, or to a fixed magnet by its attractive power.

It may happen that when a message shall be presented for transmission, it will not be in the right condition. In this event, it will be necessary to make an exact copy of the same, and this is accomplished by tracing, and transferring the tracing to a metallic plate or a conducting-surface. In order to carry out our invention in this respect we lay upon the message a transparent sheet, trace the lines of the message, and transfer the same, as above. For repeating messages, or forwarding messages over circuits too long to be operated at a single transmission, we have resort to the same device.

It will thus be seen that in most points our invention is not essentially different from that of ordinary telegraphs, excepting in the matter of isochronous motion, where we claim to have trebled and sextupled the speed of transmission hitherto obtained by similar instruments.

A metallic point draws imaginary advancing lines over a metallic surface, upon which is an insulating writing, and the interruptions of the line-circuit occasioned by the point coming upon the lines of writing effect the record at a distant station, which record, chemical or otherwise, is a fac-simile of the insulating-lines of writing, owing to the fact that both the transmitting and receiving cylinders move isochronously, and the transmitting and recording points move isochronously.

In transmitting a message written upon a metal or a metallic surface, it is obvious that the face of the received message will be the fac-simile of the original; but when a message is transferred from ordinary paper to a metallic plate or surface before transmission, it is in reverse, and therefore is produced in fac-simile only by employing a thin chemical receiving-paper, which the received lines of writing penetrate, so as to be as legible inversely as obversely.

It is by no means necessary, except in point of speed, to arrest the instruments and release them by a line-current. This may be done, as hereinbefore indicated, by locally operating clock pendulums at each station, and thereby a complete vibration can be made to accurately register one hundred revolutions of the cylinders per minute, and by half vibrations two hundred revolutions. They are, of course, used simply to break the local circuits of the magnets G. The variations between distant stations in temperature and latitude are regulated, as usual, by raising and lowering the pendulum weight. This is seldom necessary in the transmission of ordinary writing, but is quite necessary when maps or figures are to be sent.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a copying-telegraph, the method of obtaining isochronous motion of different instruments, consisting in throwing out of gear at a certain point and arresting the motion of the faster-running instrument until the slower-running instrument shall arrive at the same indicated point, without arresting the motion of the accompanying mechanism, substantially as herein shown and described.

2. In a copying-telegraph, transmitting or recording mechanism, operated by a clutch, which is taken off when one instrument is moving faster than another, and restored so soon as both instruments arrive at the same point, as set forth.

3. In a copying-telegraph, transmitting or receiving mechanism, operated by a clutch, which is taken off when an instrument is running ahead within a certain interval of time, and restored when that interval of time has expired, substantially as specified.

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JAMES G. SMITH.

Witnesses:
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ALEX. F. ROBERTS.