

T. M. FOOTE & C. A. RANDALL.
Electric-Telegraphs.

No. 153,064.

Patented July 14, 1874.

Fig. 7.

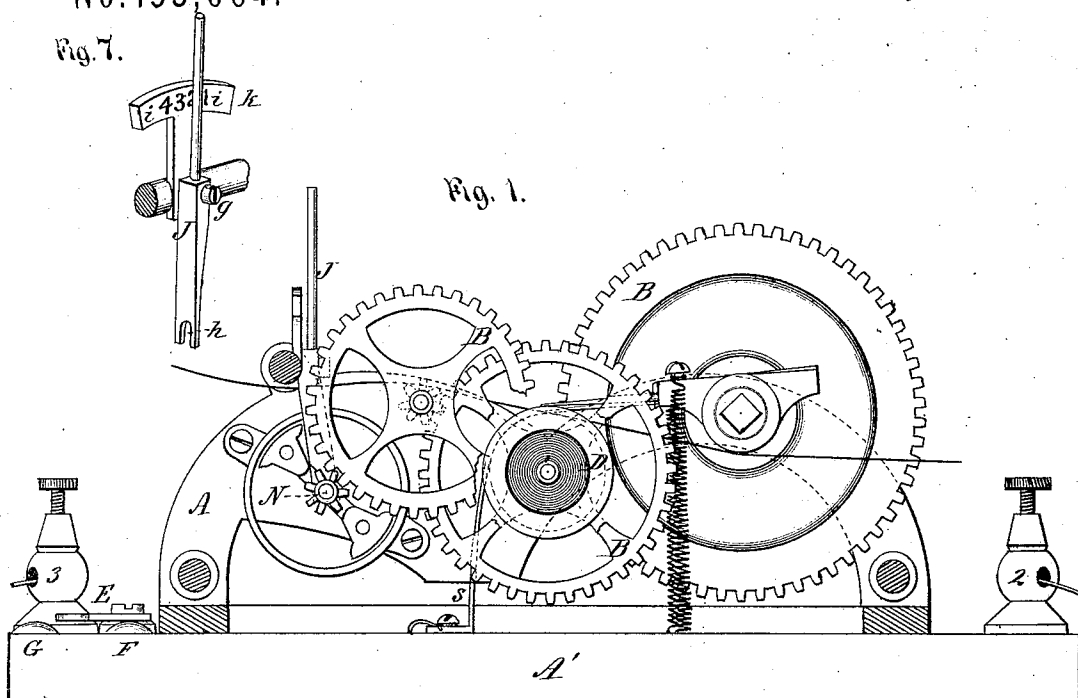
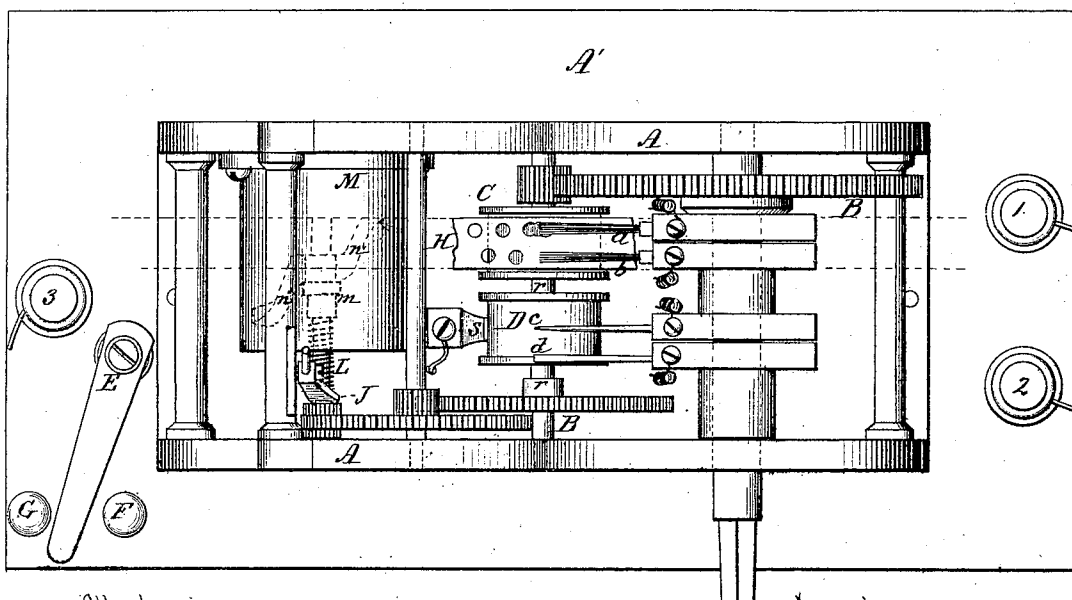


Fig. 2.



Attest:

Geo. W. Cushing Jr
 & S. Durnall

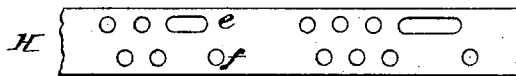
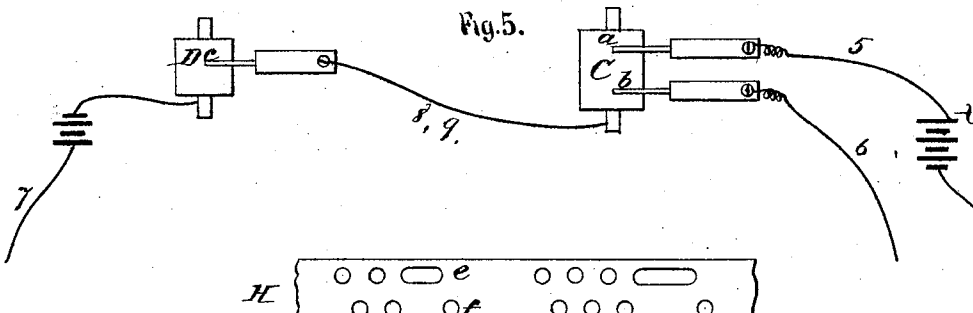
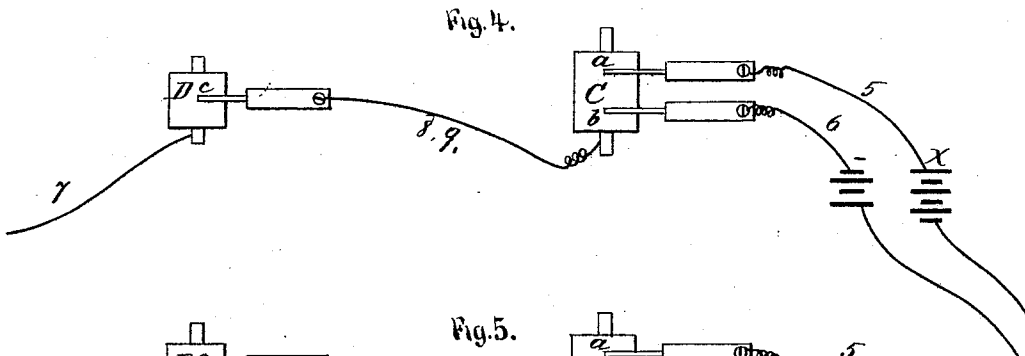
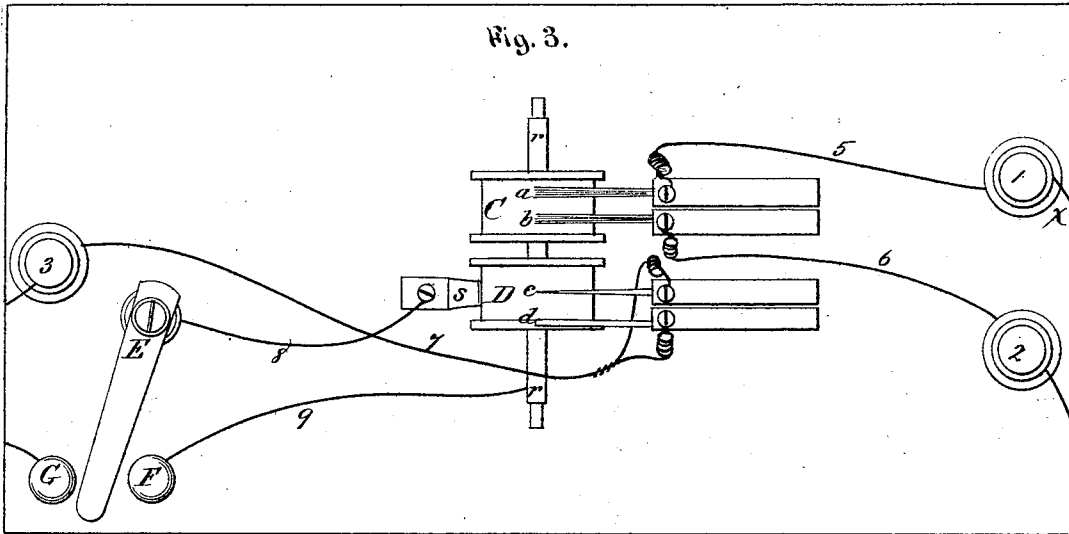
Inventor:

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 By James L. Norris,
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Attest:

George Washington
H. S. Surnall

Inventor:

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UNITED STATES PATENT OFFICE.

THEODORE M. FOOTE AND CHARLES A. RANDALL, OF NEW YORK, N. Y.

IMPROVEMENT IN ELECTRIC TELEGRAPHS.

Specification forming part of Letters Patent No. **153,064**, dated July 14, 1874; application filed June 26, 1874.

CASE B.

To all whom it may concern:

Be it known that we, THEODORE M. FOOTE and CHARLES A. RANDALL, of New York, in the county of New York and State of New York, have invented certain new and useful improvements in Chemical Telegraph and Apparatus connected therewith, of which the following is a specification:

Our invention relates to an automatic chemical telegraph, in which the proper makes and breaks in the circuit are made at the transmitting-instrument, through the medium of a perforated fillet of paper. It will be evident, however, that much of our improvements may be applied to other systems of telegraphy with advantage; hence, while it is described with special reference to the one system, we do not limit ourselves to its use therewith in those particulars capable of being used with other systems.

In working chemical telegraphs a great obstacle to rapid transmission has arisen from the fact that the lines become "clogged" or surcharged either with the battery-current, or an "extra induced" or earth-current, the result being that a discharge continues at the receiving end of a line after the battery-circuit has been completely broken at the transmitting end. The result of this is that a "tailing" is produced, which, in rapid writing, often fills the places of all the spacings, the resultant writing being merely a long indistinguishable dash or line. In some instances it has been attempted to obviate this defect by artificial leaks, in which case the battery-current also escaping by the leaks, the current arriving at the receiving-station was so weakened as to be incapable of writing clearly and legibly, or else a much larger than ordinary amount of battery was required. One part of our invention is intended to obviate this tailing, dispensing with artificial leaks, and using only the ordinary or even a smaller amount than usual of battery-power. And it consists in a method of accomplishing this, and means for carrying said method into effect. In our method we use two currents of opposite polarities, usually the positive current for actually recording the message, and

the one of opposite polarity for freeing the line, as hereinafter explained, the equating or clearing current. Upon a recording-current being transmitted for making any integral portion of a telegraph-symbol, a discharging-current from the opposite poles of the battery used for the recording, or from the opposite pole of a separate battery, is immediately transmitted, which serves to discharge any of the recording current left upon the line, or counteracts the effect of any extra-induced or earth-currents, thereby rendering it possible for the recording-current to act sharply and quickly, and to produce a well-defined signal. To carry this into effect, we use paper having an extra line of perforations for the purpose of closing the circuit of the clearing-current. If the signal or recording perforations are in one row, these additional perforations form a second row; if in two rows, as now often used, they form a third row, and must be between each and every perforation in the other row or rows.

For use with such paper we provide a drum having two styluses or pens, preferably made of a number of fine wires, forming a brush, insulated from each other, and connected to the opposite poles of one or two batteries, the current from either pole being thrown through the drum upon a common line or earth connection.

It is often desirable to retain at the sending-office a copy of the message transmitted. In another part of our invention we accomplish this by arranging upon the shaft of the transmitting-drum, but insulated therefrom, a second or receiving drum, the circuit connections being so arranged as to compel, when desired, the transmitted current to pass through this recording-drum, and mark upon properly prepared paper placed thereon the message transmitted. This recording-drum is also used as a receiver, the connections being so arranged that the currents received may be passed directly therethrough to the ground.

Furthermore, we also provide a frictional speed-governor upon the last shaft of the motive power, the friction being given through

the compression of a spring placed thereon. This compression is effected by a lever bearing at one end upon a collar resting against the spring; the lever being fulcrumed, and at its other end (the end manipulated by the operator) sweeping over an index graduated to indicate the degree of compression, and hence the speed allowed the machine. By this means, the different machines in the lines may be adjusted to a degree of synchronism sufficiently accurate for this system of telegraphy.

In order, however, to enable those skilled in the art to make and use our improvements, we will describe the same more in detail, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front view with frame removed, and Fig. 2 is a top view of our improved apparatus. Fig. 3 is a plan view, or diagram, showing the circuits in the apparatus. Figs. 4 and 5 are diagrams, showing the circuits in varying arrangements of the clearing or freeing battery. Fig. 6 shows two styles of perforated paper, each having the additional row of perforations. Fig. 7 is a detailed view of the governor-lever.

Like letters indicate similar parts in all of the figures.

A A is any suitable metallic frame for holding and supporting the various parts of the apparatus. It is placed on any suitable base, A¹, on which are also secured the binding-posts 1 2 3, the switch E, and contact-points therefor, G F. Secured in the framing is a train of wheels, B B, driven by spring, weight, or any suitable motive power, and terminating in the shaft N, on which is secured the governor-spring and governor regulating the speed of the train. This train communicates motion to the transmitting-drum C and recording-drum D fixed on shaft *r*. Drum C is in metallic connection with the shaft, and thence therethrough with the frame, while D is insulated from the shaft, and forms a metallic connection only through the spring *s* bearing against it, and through the springs or styluses *c d*, the former resting immediately upon the drum, while *d* rests upon the raised edge thereof. Upon the drum C rest two styluses, *a b*, insulated from each other. These styluses are connected with the opposite poles of either the same or different batteries—one closing the circuit of the recording, the other of the discharging, battery. The paper for use therewith is shown in Fig. 6, in which H is that kind in which the signal-perforations are in one line, *e*, while in H' they are in two lines, *e e'*. It will be seen therein that immediately succeeding every perforation for closing the recording-current one of the perforations of a second or third row, *f*, is made for closing the discharging-battery circuit, so that, upon the recording-battery being broken, the discharging-battery circuit is immediately made by one of the perforations of the extra row coming under its stylus *b* in this instance, thereby

sending upon the line a current of opposite polarity, cutting off any prolonged action of the battery-current, discharging and neutralizing the effect of any extra, earth, or induced currents with which the line may have become charged, the line being left free and clear for the next succeeding recording-current. All the styluses *a b c d* are properly mounted or supported upon one of the shafts of the train of wheels, or in any other suitable method. Upon the last shaft N of the train is fixed a spring, L, attached to a collar on, and revolving with, said shaft. Pivoted at *g*, to the frame, is a lever, J, having a recess, *h*, at its lower end, arranged to embrace the shaft N, and, upon being vibrated in one direction, to compress the spring L and bear against it. It is evident that as the end *h* is moved, and compresses the spring, it exerts a force thereon, and causes a friction between the spring revolving with N and the collar *h*, and that several machines may be brought to a certain synchometrical relation by the friction or resistance to the motive power thus brought into play. The upper end of the lever N plays over an arc, K, having graduations *i i* upon it, so that the degree of compression necessary for a certain speed may be noted and the lever adjusted accordingly. Surrounding and concentric to the shaft N is a hollow drum, M. Upon N is arranged a centrifugal governor, *n n'*, pivoted to N at *o*. This is so adjusted that at the maximum of speed to be allowed to the train the ends *n n'* shall come in contact with the inner surface of M, and keep the speed uniform by the increased resistance due to the friction between M and *n n'*.

The operation and arrangement of circuits are as follows:

Referring to Fig. 3, post 1 is, say, the positive pole of a battery, conveying, in this case, the recording-current; while 2 is the negative pole of a battery, conveying the discharging-current. From post 1 a wire, 5, leads to the transmitting-stylus *a*, and from post 2 a wire, 6, leads to *b*, the discharging-stylus. From either stylus the circuit is through the drum C, shaft *r*, and wire 9 to the button F—the shaft *r* and wire 9 here representing the connection preferably made in practice through the frame of the machine. In transmitting, the switch E is turned upon button F, and the circuit being thence by 8 to spring *s*, drum D, stylus *c* or *d*, wire 7 to post 3, and line. If, now, the switch be upon F, and the paper H be fed over C, as the stylus *a* falls into a perforation, closing the recording-circuit, the path of the circuit will be 1 5 *a c r* 9 F E 8 *s* D *c*, or *d* 7 3, line, leaving on suitably-prepared paper, passing over D *a*, its record. Immediately on this recording-circuit being broken, *b* closes the discharging-circuit by falling into one of the perforations of the extra row, this current taking the same circuit, and acting therein as before explained. To receive from a distant station the switch E is turned upon the button G, which is con-

nected to an earth-plate. The path of the incoming current is then from line to post 3 by 7 c, through paper to D s 8 E G to ground.

Figs. 4 and 5 show modifications in the arrangement of the batteries easily understood from the foregoing without further explanation.

We would remark that the drum D may be made loose on shaft r, and thrown into action with drum C by any well-known frictional device.

It is evident that the friction-rolls or equivalent devices for drawing the paper over the drums are required. As they are old, and the method of applying them is obvious, we have not deemed it necessary to complicate the drawings by showing them.

It is evident that our method of freeing or clearing the line by alternating currents may be used without the devices for retaining a copy of the message sent, and that the additional drum may be arranged to preserve a record of messages sent with ordinary transmitters by a current of unvarying polarity, we therefore do not limit ourselves to their conjoint use.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The fillet of paper for direct recording chemical telegraphs, provided with the extra row of perforations, the perforations in the extra row coming directly after each and every perforation in the row or rows corresponding to the message, as set forth.

2. The fillet of paper perforated with an extra row of perforations between each and every perforation in the row or rows corresponding to the message, in combination with an extra pen or stylus, connected to pole of battery opposite to the recording battery, for the purpose of discharging or freeing a telegraph line or cable of unavailable or surplus electricity, as set forth.

3. The fillet of paper perforated with an extra row of perforations between each and every perforation in the row or rows corresponding to the message, in combination with an extra pen or stylus, connected to earth, for the purpose of discharging or freeing a telegraph line or cable of unavailable and surplus electricity, as set forth.

4. A fillet of paper, perforated with an extra row of perforations, in combination with an extra pen or stylus, connected to earth, and a discharging or extra battery at the receiving end of a line, for the purpose of discharging or freeing a telegraph line or cable of unavailable or surplus electricity, as set forth.

5. The method of working automatic or chemical telegraphs, consisting in the transmission of alternating currents of opposite polarities, one current effecting the recording, the other acting as a discharging or freeing current, and being thrown upon the line immediately after each break in the circuit of the recording-current, substantially as described, and for the purpose specified.

6. In automatic or chemical telegraphs, the method of obviating tailings or blurs, and of effecting a ready discharge or freeing of the line, the same consisting in throwing upon the line immediately upon each and every break in the circuit of the recording-current a current of opposite polarity, substantially as and for the purpose specified.

7. The combination, with the transmitting-drum, of a recording and receiving drum and circuits connecting them and the line, the transmitted current being thereby thrown through the recording-drum, and a copy of the message sent taken, substantially as and for the purpose described.

8. The combination, with the motive power driving the receiving and transmitting drums of an automatic telegraph apparatus, of an adjustable governor, substantially as and for the purpose specified.

9. The combination, with the transmitting-drum of an automatic or chemical apparatus, of two or more styluses, inserted from each other, and connected to opposite battery-poles, substantially as and for the purpose specified.

In testimony that we claim the foregoing we have hereunto set our hands.

THEODORE M. FOOTE.
CHARLES A. RANDALL.

Witnesses:

JAMES L. NORRIS,
GEO. W. CUSHING, Jr.