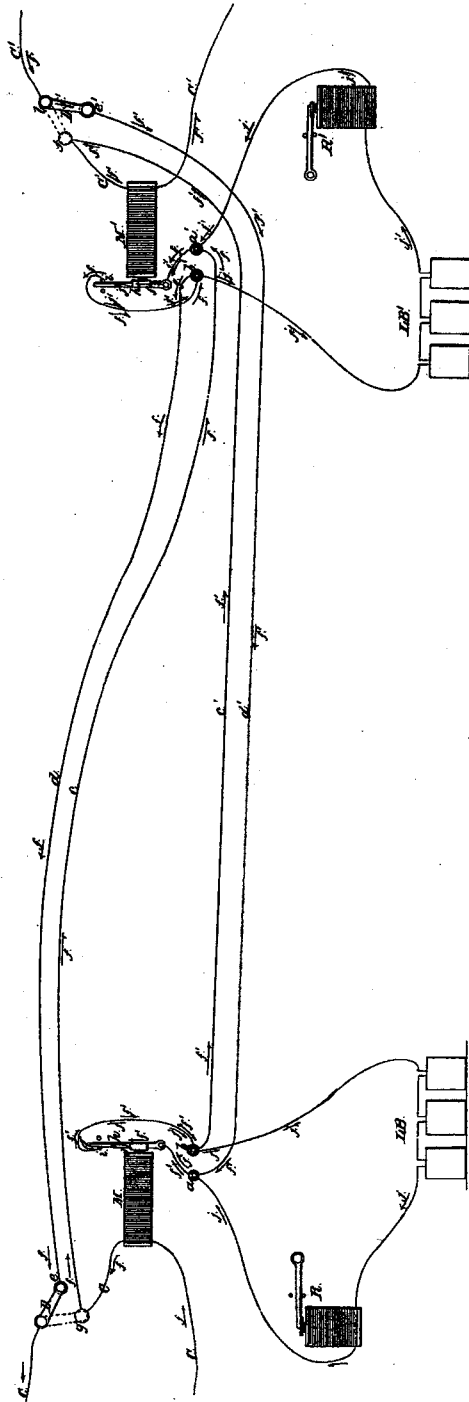


S. F. VAN CHOATE.  
ELECTRIC TELEGRAPH.

No. 27,506.

Patented Mar. 13, 1860.

Fig. 1.



Witnesses.  
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Fig. 2.

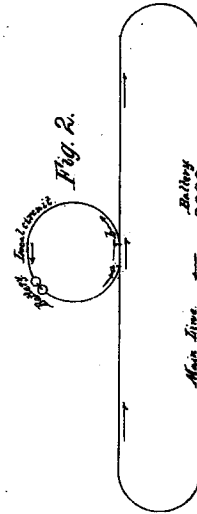
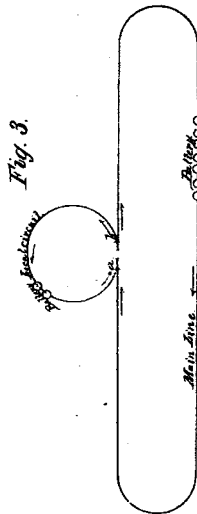


Fig. 3.



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# UNITED STATES PATENT OFFICE.

S. F. VAN CHOATE, OF YREKA, CALIFORNIA.

## IMPROVEMENT IN ELECTRIC TELEGRAPHING.

Specification forming part of Letters Patent No. 27,506, dated March 13, 1880.

### *To all whom it may concern:*

Be it known that I, S. F. VAN CHOATE, of Yreka, in the county of Siskiyou and State of California, have invented a new and useful Improvement in Electric Telegraphs, which is also applicable to other electric apparatus; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

The principal object of my invention is to effect a repetition of the signals from one line of electric telegraph to another in such a manner as to enable the operator at any station on one line to write or send messages to any or every station on another line or its branches, and to receive messages therefrom; and to this end my invention consists in the employment of the novel system of connections hereinafter described between a station on one and a station on the other of any two lines between which the repetition of the signals is desired.

In the accompanying drawings, Figure 1 is a diagram representing the apparatus used at a station on each of two main lines of Morse's telegraph and my system of connections, which I call the "universal repeater," for repeating the signals from either line to the other. Figs. 2 and 3 are diagrams illustrative of the action of my system of connections.

O is the main wire of one line, and O' the main wire of the other line.

M is the relay-magnet at a station on the line O, and M' the relay-magnet at a station on the other line, O'.

R and R' represent the registers or sounders at the two stations.

L B and L B' represent the two local batteries.

The connections between the several parts of the apparatus at each station are the same as are commonly employed in Morse's telegraph.

The keys are not shown, but are supposed to be arranged and applied in the usual manner.

The lines O and O' may be supposed to pass through the same office, or to pass on opposite sides of a street, or not to approach each other within several miles, the distance between them being quite immaterial.

The system of connections which constitutes my invention is made in the following manner, which is, for the most part, illustrated by red lines, representing wires or other conductors in Fig. 1.

In each main line, near where it connects with one of the helices of its respective relay-magnets, I provide an opening, *l g*, which is opened and closed by a switch, D or D'. From that end *g* of the switch-opening of the line O which is next its respective relay-magnet M, I lead a wire, *c*, across to the screw-cup *a'* of the local circuit of the relay-magnet M' of the other line, O', and lead another wire, *d*, from the screw-cup *b'* of the same local circuit back to a stud, *e*, with which the switch D of the line O may be brought in contact by opening the line O. I then proceed to lead a wire, *c'*, in the same manner from that end *g* of the switch-opening in the line O' that is next its respective relay-magnet M' across to the screw-cup *b* of the local circuit of the relay-magnet M, and another wire, *d'*, back from the screw-cup *a* of that local circuit, back to a stud, *e'*, arranged near the switch-opening of the line O'. The wires *c d c' d'* may, for the sake of distinction, be termed "repeating-wires."

The switches D D' are so arranged that each may close its respective main line, as shown by dotted lines in Fig. 1, so that the currents will pass over it without passing through the repeating-wires connected with its opening, or that each may open its respective main line and connect it with its respective repeating-wire *d* or *d'*, as shown in bold outline in Fig. 1, so that the circuit of the main line may be completed through the repeating-wires and the local-circuit wire of the station on the other line.

In making the connections at the screw-cups *a b* and *a' b'*, in which it will be seen by reference to Fig. 1 that the ends of the wires *c d*, which form part of main circuit of the line O, meet the local-circuit wire of the line O', and the ends of the wires *c' d'*, which form part of the main circuit, O', meet the local-circuit wire of the line O, care must be taken that positive poles of the main circuits meet positive poles of the local circuits, and vice versa.

In the drawings the positive poles are supposed to meet in the cups *a a'* and the nega-

tive poles in the cups  $bb'$ . The reason for this will be explained in the explanation of the operation of the repeater, which is as follows:

To place the two lines in condition for repetition the switches  $DD'$  on both are placed in the positions represented in Fig. 1 in bold outline—that is to say, to connect the repeating-wires  $c$  and  $c'$  with the ends of the switch-openings of their respective lines  $CC'$ . While both main circuits remain closed, as they are till an operator on one line opens it by his key, the main circuit of the line  $O$  takes the course indicated by the black arrows  $ff$  and that of the line  $O'$  the course indicated by the black arrows  $f'f'$ , the circuit in each main line being completed through the armature  $h$  of the relay-magnet of the other line and the short wires which connect the cups  $a$  and  $b$  with the armatures  $h$  and the posts  $i$ , against which said armatures are respectively held by the magnetism induced in the magnets  $M$  and  $M'$  by their own main circuits.

It will be seen by reference to Fig. 1 that the main circuit of each line from  $a$  to  $b$  or from  $a'$  to  $b'$  is formed by the same conductors as the local circuit of the opposite line, the course of the local circuits of the line  $O$  being indicated by red arrows  $jj$  and of that of  $O'$  by red arrows  $j'j'$ . When an operator on either line—suppose, for instance, the line  $O$ —opens his key, the relay-magnet  $M$  of that line ceases to attract its armature, which falls back from the post  $i$  and breaks the local circuit of that line and the main circuit of the opposite line,  $O'$ , between the armature and the post; but yet these circuits both remain closed, for the two are connected by the cups  $a$  and  $b$ , though, owing to the arrangement of the connections with regard to polarity in those cups, as described, and indicated by arrows, a repulsion is caused to take place in the said cups between the two currents, which is equivalent to breaking the circuit of the main line  $O'$ , the armature of every one of whose relay-magnets  $M'$  is thereby caused to fall back from the post  $i$  and open its own local circuit, in the same manner as though a key had been opened on the said line  $O'$ . When the key on the line  $O$  is closed again and the armature of its relay-magnet  $M$  drawn back against its post  $i$ , the said armature is caused again to complete both the main circuit of the line  $O'$  and the local circuit of  $O$ , and hence both currents flow through the armature again, as before described, and the relay-magnets  $M'$  of the line  $O'$  attract their armatures again, and so close their local circuits. In this way the signal is repeated all along the line  $O'$ . The opening and closing of any key on the line  $O'$  is caused to produce the same effect throughout the line  $O$  as the opening of a key on the latter produces throughout the former line. In this operation it may be observed that the current of the local circuit does not pass through the main line, nor does the current of the main line ever pass through the whole of the local circuit.

To make the above-described action of the main circuit of each line, in connection with the local circuit of the opposite line, to effect the repetition from one line to the other clearer than it is in Fig. 1, I have represented the diagrams, Figs. 2 and 3, representing the two circuits unincumbered by any instruments. The short space between the points  $a$  and  $b$  represents the space occupied by the armature of the relay-magnet and the short wires connecting said armature and the post  $i$  with the cups  $a$  and  $b$ , and the black arrows indicate the course of the main circuit and the red ones the course of the local circuit. When the short space is closed, as shown in Fig. 2, the currents of the main and local circuits pass from  $a$  to  $b$ , as indicated by arrows, without interrupting each other; but when the said space is open, as shown in Fig. 3, the currents meeting at  $a$ , a repulsion takes place between them, and hence, though neither circuit is actually broken, each being completed by the wires of the other, the effect will be the same as though both were broken.

This system of connections may be used on telegraph-lines using various descriptions of instruments for making and recording the signals; but it is obvious that the local circuit and relay-magnet are indispensable. The system of connections is only necessary between one station of one and one station of the other of any two lines to be connected, and in the connections of branch lines will be applied at their junction with the lines to which they form branches. The same system of connections is applicable to other purposes than telegraphing where it is desired to render alternately continuous and interrupted any electric circuit by the opening and closing of another circuit—as, for instance, in lighting the gas in the streets of cities or in large buildings by electricity, in which operation it may be desirable to use a main line or circuit and several branch lines or circuits.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The employment of a system of connections, substantially as herein described, connecting the main circuit of one line of electric telegraph and the local circuit of another line in such manner that by opening the main circuit of one line the current of its local circuit shall produce an interruption to the current of the main circuit of the other line by repulsive action, as herein specified.

2. The employment of a substantially similar system, of connections operating in a substantially similar manner, to render any electric circuit continuous or interrupted at pleasure by the closing and opening of another and entirely separate circuit.

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Witnesses:

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THOS. PETINGALE.