(No Model.) 3 Sheets—Sheet 1.

# J. ANDERSON & B. SMITH.

## ELECTRIC TELEGRAPH.

No. 261,895. Patented Aug. 1, 1882.

*Fig. 1.*

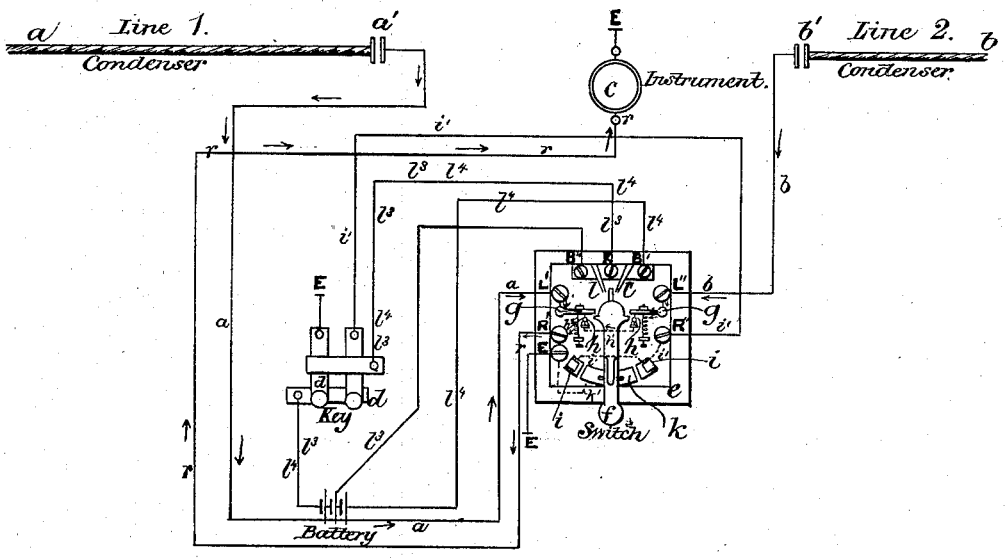
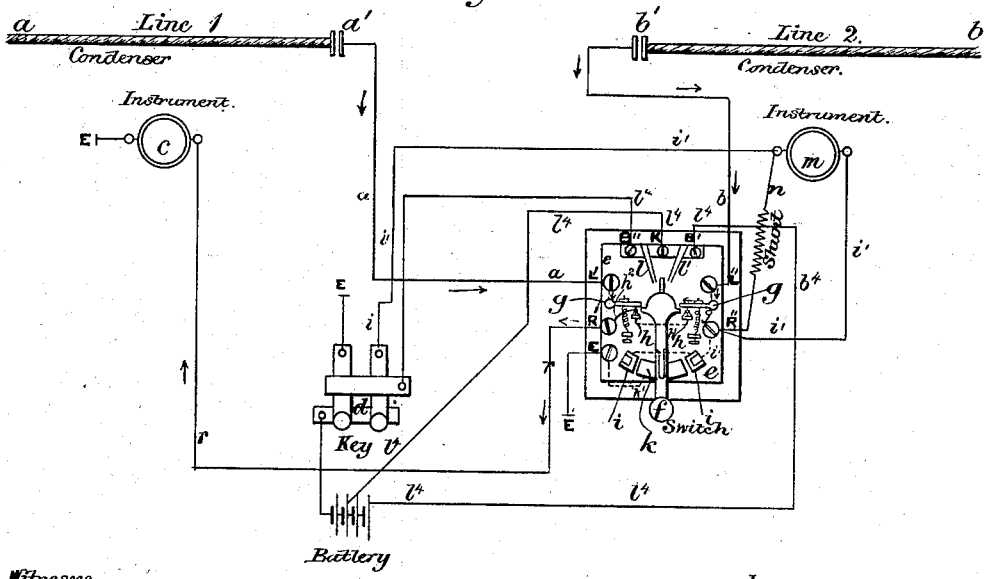



*Fig. 2.*

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(No Model.) 3 Sheets—Sheet 2.

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## ELECTRIC TELEGRAPH.

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*Fig. 3.*

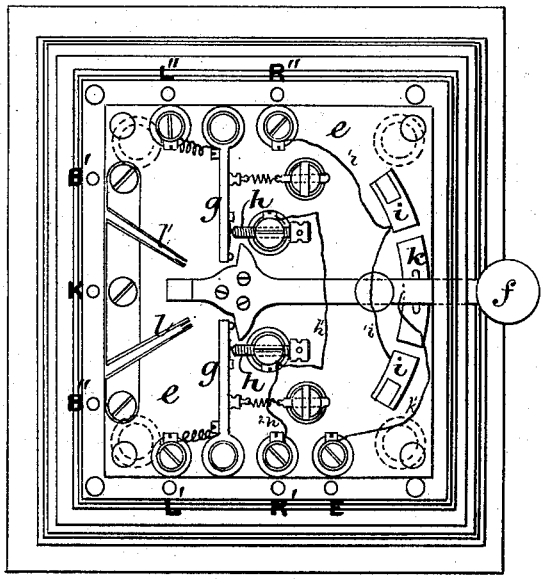
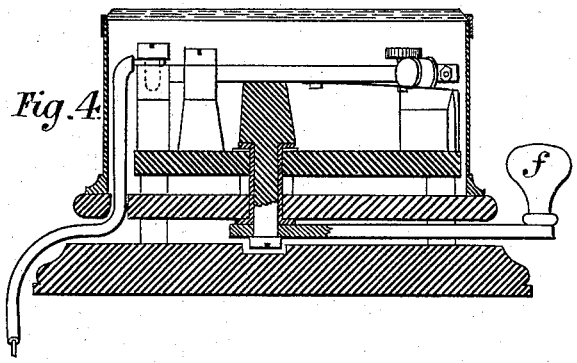



*Fig. 4.*

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(No Model.) 3 Sheets—Sheet 3.

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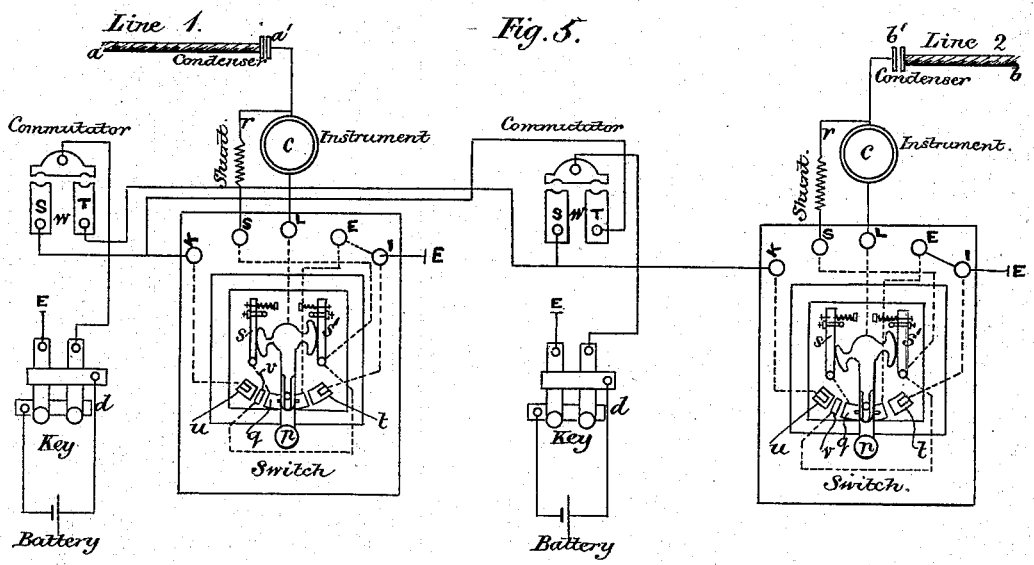
## ELECTRIC TELEGRAPH.

No. 261,895. Patented Aug. 1, 1882.

Fig. 5.

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# UNITED STATES PATENT OFFICE.

JAMES ANDERSON, OF 66 OLD BROAD STREET, LONDON, AND BENJAMIN SMITH, OF PRINCES STREET, HANOVER SQUARE, COUNTY OF MIDDLESEX, ENGLAND.

## ELECTRIC TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 261,895, dated August 1, 1882.

Application filed February 1, 1882. (No model.) Patented in England December 20, 1881, No, 5,577.

*To all whom it may concern:*

Be it known that we, Sir JAMES ANDERSON and BENJAMIN SMITH, subjects of the Queen of Great Britain, residing respectively at 66 Old Broad Street, in the city of London, and Princes Street, Hanover Square, in the county of Middlesex, England, have invented certain new and useful Improvements in Electric Telegraphs, (for which we have made application for Letters Patent in Great Britain, No. 5,577, dated December 20, 1881,) of which the following is a specification.

This invention has for its object improvements in electric telegraphs, and relates more especially to the means of and apparatus for retransmitting or "translating" telegrams from one telegraph-cable or telegraph-line to another. Our improvements render fewer the operators necessary to be employed and expedite the transmission of telegrams.

At intermediate cable-stations—such, for example, as Aden, which is connected on the the one hand with Suez and on the other with Bombay—it has heretofore been usual that each cable should have a separate and complete set of instruments, and the two cables have been independently worked. Thus a telegram received at the intermediate station is usually written out by an operator at one cable and given to the operator at the other cable for retransmission.

Our invention is not confined to the working of cable-lines, but is equally applicable to land-lines, whether aerial or subterranean; but for convenience of description we shall speak of the invention as applied to a cable-line. Neither is it essential to our invention that the recording-instruments should be employed, for other receiving-instruments may be made use of; but for convenience of description we shall style the receiving instrument the "recorder."

In the accompanying drawings, Figure 1 is a diagram of our arrangement for using one recorder, one transmitting-key, and one switch for the two cables. Fig. 2 is a diagram similar to Fig. 1, but showing also the way of applying another recorder to record the outgoing signals. Fig. 3 is a plan view, and Fig. 4 a vertical section, of the switch-box. Fig. 5 shows an arrangement in which each cable has a full set of instruments so arranged that at any time the transmitting-key of one cable can be made use of for translating or retransmitting into the other.

According to the preferred form of our invention, (illustrated in Figs. 1, 2, 3, and 4,) we are able to employ one set of instruments, one key, and one recorder for the two cables, and for this purpose we employ a novel switch having a lever-handle which has three positions. In the central position of the handle both cables (or the condensers into which the cables work, if such be employed, as is usual,) are connected through the recorder to earth, and in this position a call-signal sent through either cable is received upon the paper of the recorder. When the handle is moved to either side one cable remains connected with the recorder, while the other becomes connected with the key, and through the key with the battery. The operator then, on receiving a call, moves the handle over from the central position to that side which leaves the calling-station connected with the recorder, and as the telegram comes in he reads it from the paper of the recorder and retransmits it by means of the key into the other cable. When the handle of the switch is moved over to the other side the connections are reversed and become suitable for working in the opposite direction through the cables. The same movement of the handle alters the battery from what is suitable for one cable to that which the other cable requires.

Referring to the drawings, *a b* represent the two cables, working into the condensers *a' b'* in the way in which it is very usual to employ condensers with cables.

*c* is the recorder. *d* is the key, and *e* is the switch. The details of the construction of the switch are shown more especially in Figs. 3 and 4.

*f* is the switch-handle, and *g g* are the two levers, connected with the cables *a b* at posts L' L'', respectively. The drawings represent the levers *g g* resting against their stops *h h*,

which are both connected with the recorder by wires $h'$ $h^2$ to post R′, and through the recorder to earth by wire $r$.

$i$ $i$ and $k$ are blocks, on which the handle-piece $f$ rests in its several positions. The center block, $k$, is connected to earth by wire $k'$, and blocks $i$ $i$ are connected with the transmitting-key by wire $i'$. When the handle-piece $f$ is put to one side it lifts one of the levers $g$ and takes one of the cables off the recorder and connects it with the key through the metal of which the handle-piece is formed.

$l$ and $l'$ are pairs of springs, which, when separated, break the battery-circuit, and the movement of the switch-handle to either side presses together one pair of springs by means of a vulcanite stud provided upon the handle, thereby putting on as much of the battery as is required.

Ignoring the condensers, which may or may not be used, and which do not affect the other connections, the circuit may be traced as follows: With the handle-piece $f$ in the central position, as shown in the drawings, an incoming current from cable $b$ passes to binding-post L″, lever $g$, stop $h'$, wire $h'$, opposite stop $h$, wire $h^2$, post R′, and by wire $r$ through the recorder. This circuit is represented by solid arrows. The circuit from cable $a$ can also be traced by the solid arrows, and follows a substantially similar course to that above traced. The recorder will therefore now respond to signals received over either cable. With the handle to the right the current from cable $a$ passes through the recorder by its circuit just described, while the cable $b$ will be connected with the key of the battery, the latter circuit being as follows: from key $d$, by wire $i'$, to post R″, block $i$, handle $f$, right-hand lever $g$, post L″, to cable $b$. With the handle in this position the pair of springs $l$ will be closed. This will throw only the portion of the battery required on the line, as it will be perceived by tracing the line by the letters $l^3$ that one of the springs is in connection with one pole of the battery and the other is connected to the middle of the battery. The battery-power may of course be regulated and changed as may be necessary. Two keys, $d$ $d$, are shown, by means of which either pole of the battery may be thrown on either of the cables. With the cable to the right, as above described, with the right-hand key depressed, the circuit will be as follows: from battery to lower bar of key, right-hand key, wire $r'$, post R″, block $i$, handle $f$, right-hand lever $g$, post L″, and cable $b$, to earth; from earth to left-hand key, $d$, top bar of key, wire $l^3$, post K, springs $l$, post R″, to opposite pole of battery. By depressing the left-hand key the pole of the battery thrown to the cable, as above described, is grounded and the opposite pole put on the cable. The circuit is as follows: from battery, lower key-bar, earth, from earth, by cable $b$, post L″, right-hand lever $g$, handle $f$, block $i$, post R″, wire $i'$, right-hand key-lever, top bar of key, wire $l^3$, post K, springs $l$, post B′, to battery again. When key is placed to the left the conditions will be reversed. The cable $b$ will be in connection with the recorder, while the cable $a$ will be in circuit with the battery. The arrangement of the parts is symmetrical, and it is therefore unnecessary to trace the circuits again. The springs $l'$, however, are connected with the opposite poles of the battery, as may be traced by following the letters $l^4$, and the entire battery will therefore be thrown upon the cable $a$.

In Fig. 2 an exactly similar arrangement is shown, except that the recorder $m$ is placed between the right-hand key $d$ and the binding-post R″. This recorder is partly shunted by the shunt $n$, so that only the required amount of current will pass through the recorder. By this arrangement the message transmitted by the keys over either line will be recorded on the instrument $m$. The circuits and connections are exactly the same as in Fig. 1, and it is unnecessary therefore to describe them again.

In Fig. 5 we have shown an arrangement in which each cable is provided with its own recorder, switch, and key for independent working. The connections can at pleasure be changed so that the key of one cable is made available for retransmitting into the other cable. Each switch, like the switch already described, consists of a handle having three positions—a middle position and two side positions—the latter being respectively the sending and the receiving positions. In the middle position the cable, or the condenser into which it works, (where such a condenser is employed,) is connected to earth both through the shunt and the recorder. When the handle is in the receiving position the cable or condenser is put to earth through the receiver only. When the handle is in the sending position the key is brought in, and the currents originated by it pass to the cable or condenser both by the shunt and the recorder, which then keeps a record of the outgoing signals. By means of peg-commutators the connections of the keys can be changed so that the key properly belonging to one set of instruments becomes temporarily the key of the other set. Thus an operator, as he reads an incoming telegram on his own recorder, can retransmit it at once by the other cable. A record of the outgoing signals is kept upon the second recorder. For working in the contrary direction all that is required is to move the switch-handles over and to alter the positions of the pegs in the commutators. Also, the two cables can be rendered wholly independent by changing the positions of the pegs of the commutators.

Referring to the drawings, $a$ and $b$ are the cables, $a'$ $b'$ their condensers. $c$ $c$ are the recorders, and $d$ $d$ are the keys. The recorders are in each case connected with the receiving-condenser on the one side and the handle $p$ of the switch on the other. When the switch-handle is in the middle position, as shown, the

recorder is connected through the handle to earth, the handle-piece resting on the earth-connected block *q*. The shunt *r* is also earth-connected through the side lever, *s'*, the handle *p*, and the block *q*. When the handle is moved to the right—which is the receiving side—it rests upon another earth-connected block, *t;* but the handle-piece *p* has passed out of contact with the lever *s* and the shunt-circuit is broken. By passing the handle over to the left it is brought into contact with the block *u*, which is connected with the transmitting-key, as is shown, and also into contact with the stud *v*, connected with the shunt, so that the key-currents are divided, part going along the handle to the recorder and part going by the lever *s* to the shunt. The connections for the most part are double, whereby the risk of bad contacts is greatly lessened.

*w w* are peg-commutators. By shifting the pegs the transmitting-keys are, as will be seen, in effect changed over from the one cable to the other.

It will be observed that the handle *p* is always connected with the line, either through the recorder or otherwise. Both the levers *s s'* rest against the handle when it is in the middle position; but the handle leaves the earth-lever when it is put over to the sending side, and it leaves the shunt-lever when it is put over to the receiving side. The circuits are as follows: With the switch-lever put over to the right hand for receiving, an incoming current from the cable *a* will pass to the recorder *c*, post L, lever *p*, block *t*, binding-post I, to earth. An outgoing current on the same cable, with the lever *p* put over to left and with the peg in the hole *s* of the commutator, would be as follows: from battery to S, binding-post K, and block *u*. The current now divides, part passing from *u*, by handle *p*, post L, recorder *c*, to cable *a*, the other part of the current passing, by block *v*, post S, shunt *r*, to cable *a*. The current passes from cable to earth to key and battery again.

The arrangement of apparatus for the cable *b* is similar and need not be described.

For receiving by cable *a* and transmitting through cable *b* with the left-hand key, or the key belonging to line 1, the switch-lever *p* of the right-hand switch is placed to the left for sending and the lever of the left-hand switch is placed to right for receiving. The peg is put into the hole T of the left-hand commutator. The circuits may now be traced as before; but it will be observed that the key-currents from the key of line 1 will pass into the cable *b*. The circuits are the same as those above described and need not be repeated.

Having thus described the nature of our said invention and the manner of performing the same, we would have it understood that we claim—

1. The combination, substantially as set forth, with two telegraph-lines, of a receiving-instrument, a transmitting-instrument, and a switch, which latter, when in one position, permits the receiver to respond to signals coming over either line, and in the second position causes the receiver to respond to signals received over one line and throws the transmitter into the other line, and in the third position reverses the relations of the transmitter and receiver to the respective circuits, so that messages can be received from either circuit and transmitted over the other.

2. The combination, substantially as set forth, of two telegraph-lines which are both grounded through a receiving-instrument or recorder common to both lines, the switch-lever, and its central, right, and left contacts and connections, the battery, and the transmitting-key, the organization being such that when the switch-lever is in its normal central position both lines will pass through the recorder, when the switch is set over to one side one line will pass to earth through the recorder and the other line will be put in circuit with the key and battery, and when the switch is set over to the opposite side the relations of the lines to the recorder and to the key and battery will be reversed, for the purpose set forth.

3. The combination, substantially as set forth, of two telegraph-lines, the receiving or recording instrument common to both lines, the switch-lever, and its central, right, and left contacts and connections, the battery, the transmitting-key, and the second recorder placed in the battery-circuit between the key and switch, for the purpose set forth.

4. The combination, substantially as set forth, of two telegraph-lines, the receiving or recording instrument, the three-point switch-lever and its contact-blocks and connections, the contact-arms *g g*, the battery contact-springs *l l'*, the battery, the circuits $l^3$ $l^4$ of the battery contact-springs, and the transmitting-key.

5. The combination, substantially as set forth, of the two telegraph-lines, the switch lever or handle, the battery contact-springs *l l'*, the battery, the circuits $l^3$ $l^4$ of the battery contact-springs, which circuits include different strengths of battery, and the transmitting-key.

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