(No Model.) 3 Sheets—Sheet 1.

J. P. SMITHERS.

TELEGRAPHIC REPEATER.

No. 279,670. Patented June 19, 1883.

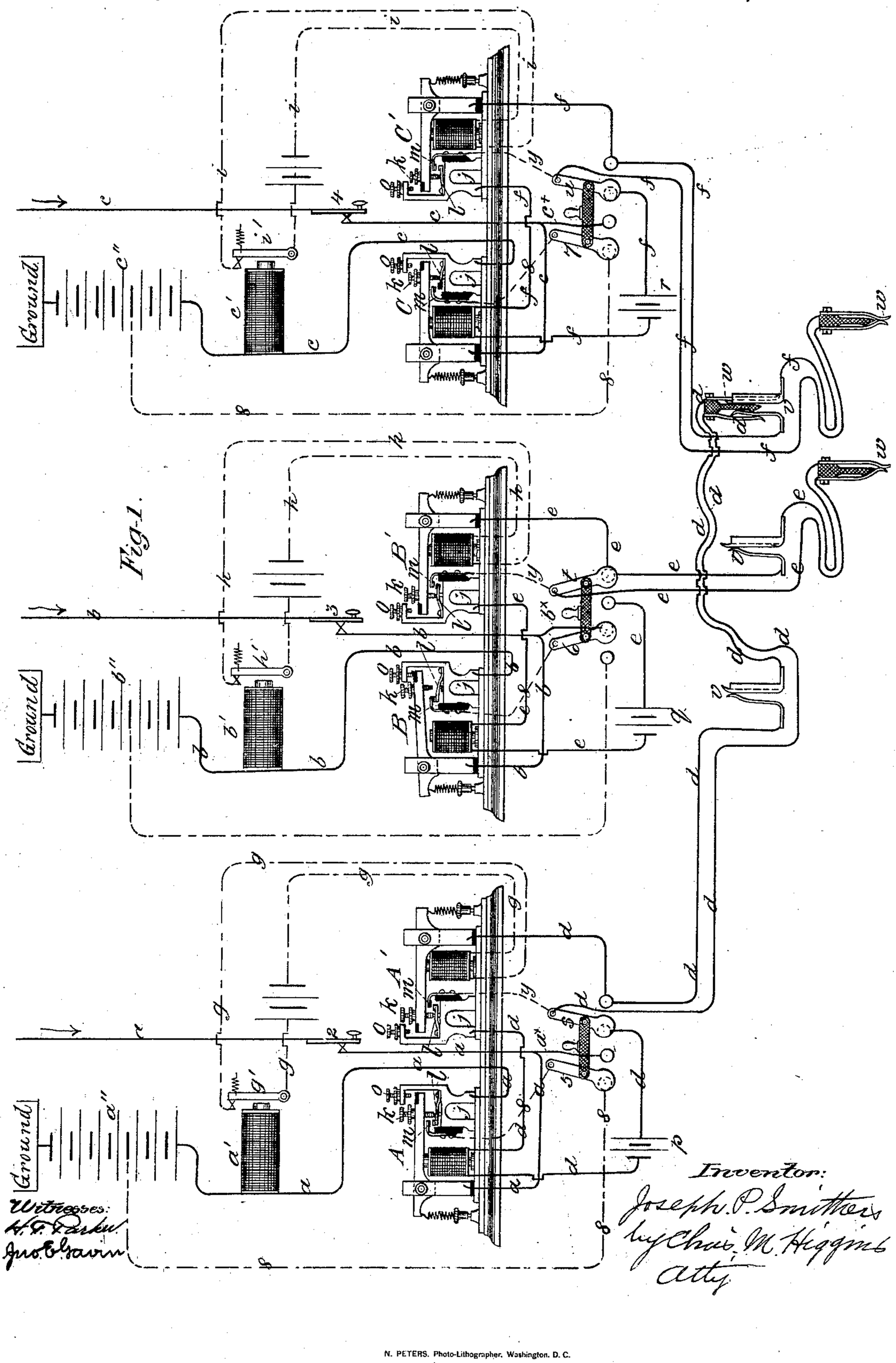


Fig-1.

(No Model.) 3 Sheets—Sheet 2.

J. P. SMITHERS.

TELEGRAPHIC REPEATER.

No. 279,670. Patented June 19, 1883.

Fig. 2

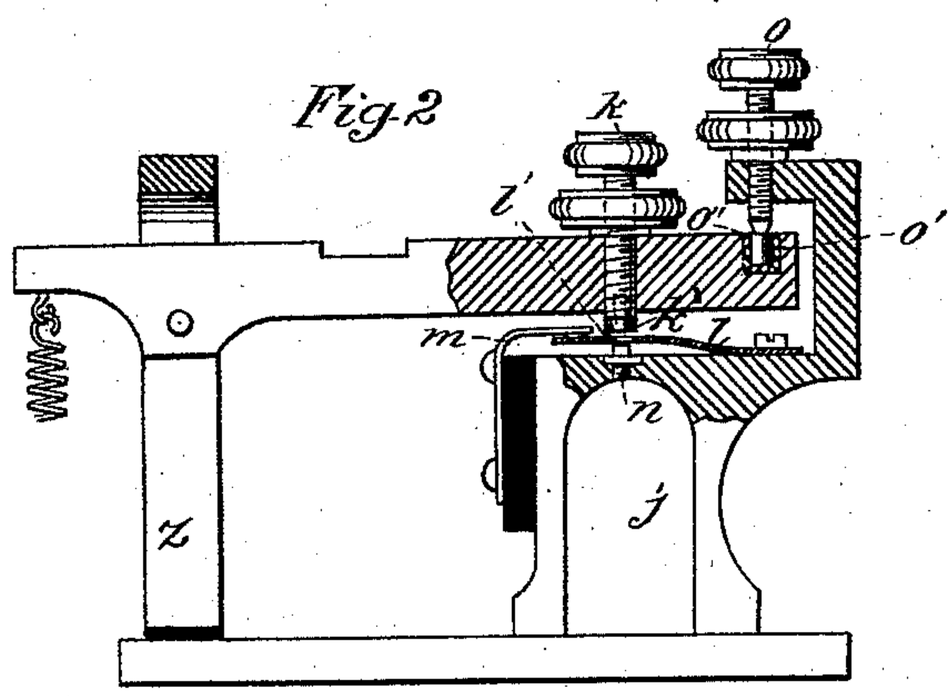


Fig. 3

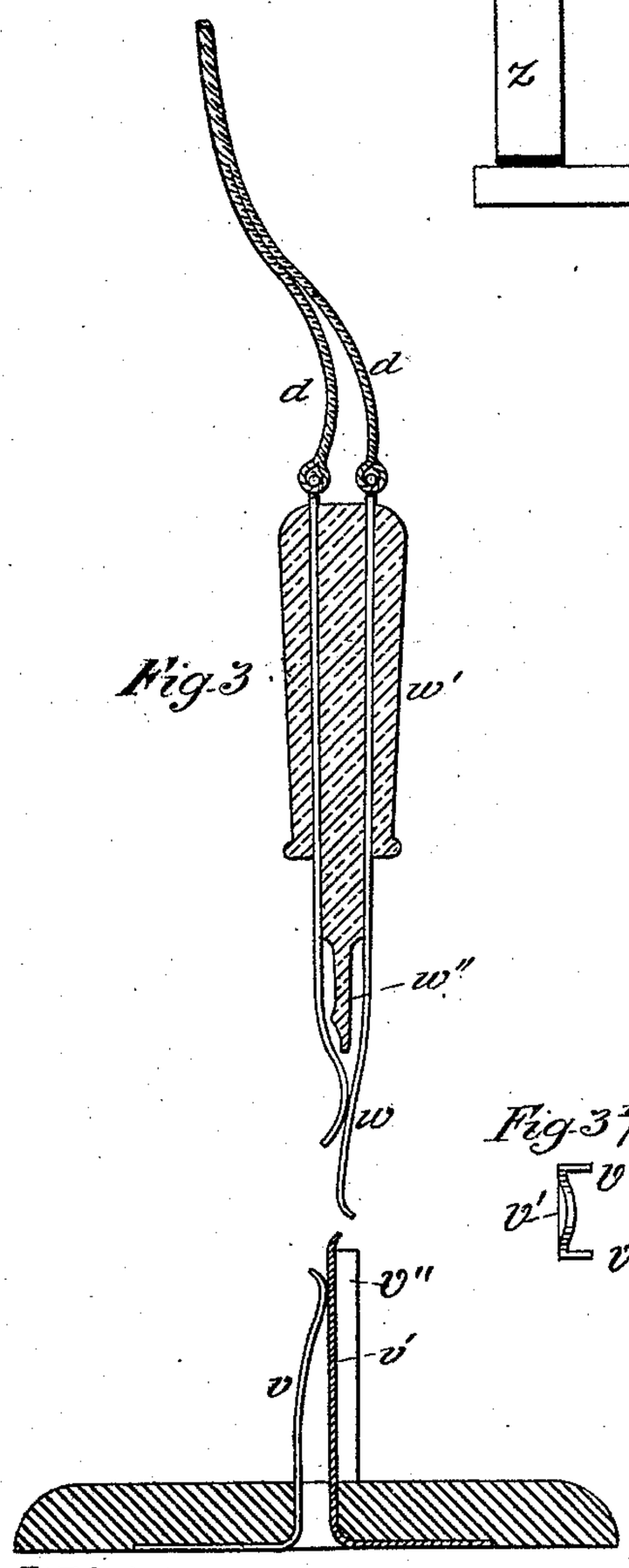
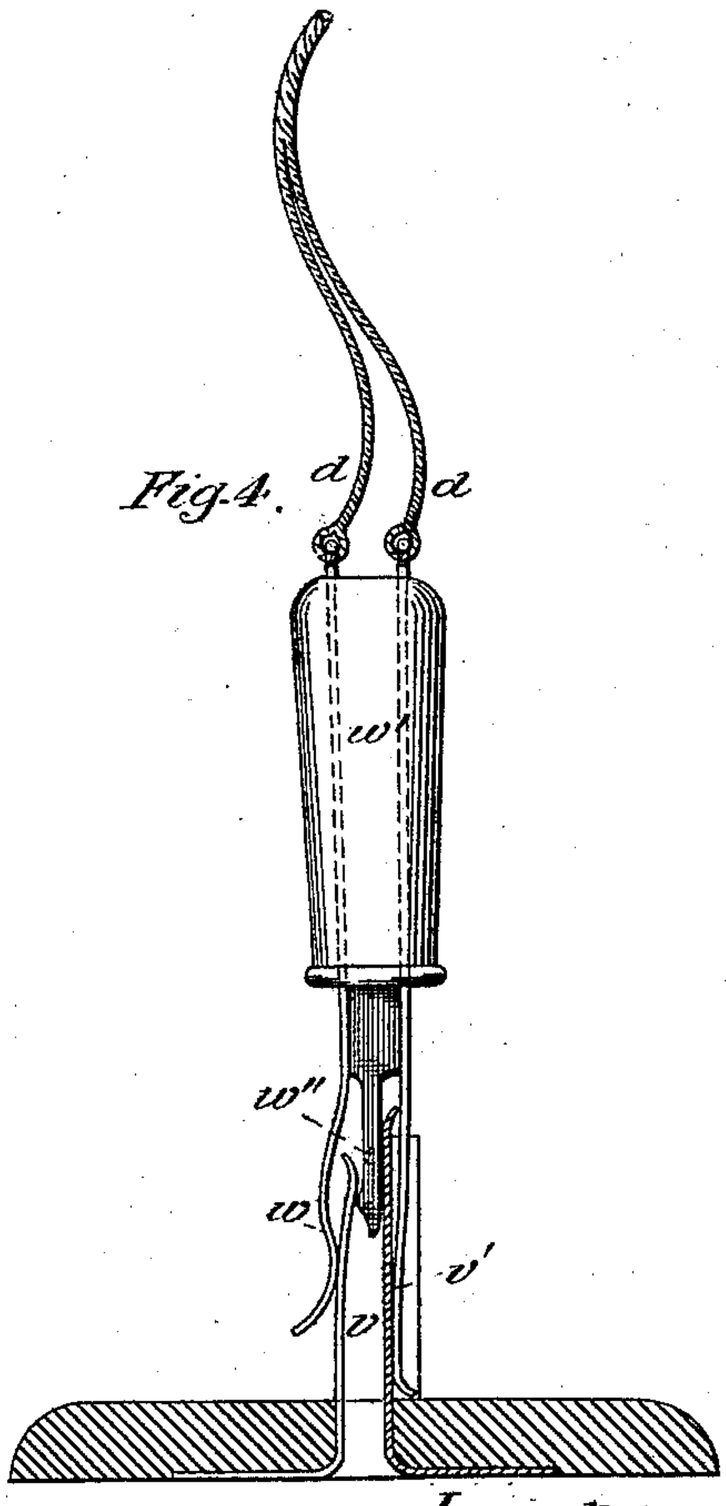


Fig. 3½.

Fig. 4.



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(No Model.) 3 Sheets—Sheet 3.

J. P. SMITHERS.

TELEGRAPHIC REPEATER.

No. 279,670. Patented June 19, 1883.

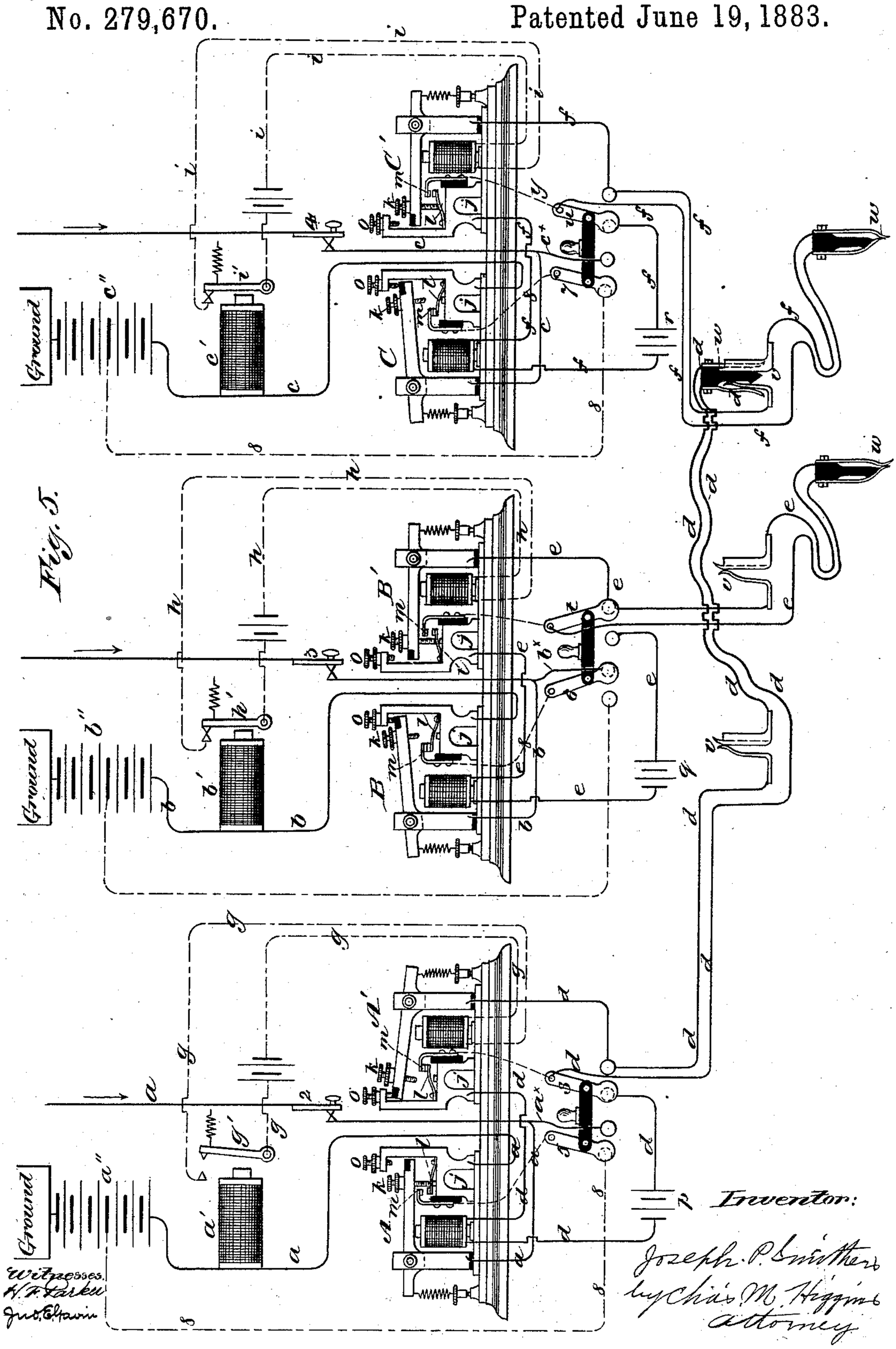

Fig. 5.

UNITED STATES PATENT OFFICE.

JOSEPH P. SMITHERS, OF BROOKLYN, NEW YORK.

TELEGRAPHIC REPEATER.

SPECIFICATION forming part of Letters Patent No. 279,670, dated June 19, 1883.

Application filed November 11, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH P. SMITHERS, of Brooklyn, Kings county, New York, have invented certain new and useful Improvements in Telegraph-Repeaters, of which the following is a specification.

Telegraphic repeaters, as is well known, are usually capable of repeating onto a single line only, whereas my improvement aims to provide a repeating system wherein any number of lines may be so coupled that the messages of one line may be repeated on as many other lines as desired, or wherein two or more lines may be coupled, so as to repeat the signals of one of the lines, while another set of lines may be coupled to repeat the signals of a separate line, while any one of the lines may be cut out of the repeating system for individual operation when required, thus allowing of single or multiple repeating or of individual operation, as required.

The broad and main feature of my present invention consists in employing a local or intermediate circuit in the repeating-station with which the several individual lines emanating therefrom are so related that by suitable switches or couplers any one or number of the individual lines may be so coupled with this intermediate circuit that a signal sent in on one line will be repeated on the intermediate circuit, and this intermediate circuit will thence repeat the signal on any of the other lines which may have been coupled with the intermediate circuit, and vice versa.

My invention also lies in the special arrangement of the circuit-connections, loops, and branches, and in the special construction of the contacts on the sounders, and in the form of the switches and couplers between the individual lines and the intermediate or repeating circuit, all of which features are hereinafter fully set forth, and distinctly formulated in the claims.

In a former application, filed June 28, 1882, No. 65,371, and allowed July 18, 1882, I showed a form of single repeater (that is, involving two individual lines only for single repetition from one to the other) in which each individual line was provided with the usual relays, and with local sounders having double contacts on their armatures, so arranged that one contact would close by attraction and the other by retraction, the retracting-contact always being closed before the attracting-contact was opened. The circuit of one individual line was completed through the attracted contacts on the sounder of the other line, and a short loop-circuit was employed which included a small or supplemental battery, the relay-magnet or its corresponding sounder-magnet, and the retracting-contacts of the sounder on the opposite line. By this arrangement the breaking of the sending-line at the distant station would first close the said loop-circuit, and thus prevent the sending-line from being itself broken in the near or repeating station, but would at the same time break the receiving-line in the near station, and thus repeat the message of the sending-line thereon. My present application employs substantially the same double-contact-making instrument and loop-circuits acting in the manner above outlined; and I would further state that my former application also showed a multiple repeating system involving the feature of an intermediate circuit; but I did not claim the intermediate circuit, broadly, in that application, having reserved it for the main subject of this application, and having limited my claim in the former application to the combination of the intermediate circuit with other specific features therein shown. In my present application, however, the contact-making sounders are of improved construction, as are also the switches or couplers between the individual lines and the intermediate circuit, and the organization of the intermediate circuit relatively to the individual lines is such that one set of lines may be coupled with the intermediate circuit for the repetition of one set of messages, while another set of lines may be coupled for repeating an entirely different set of messages; or, again, any one line may be switched out of the combination for individual operation, or one sending-line may be coupled with all the others for multiple repetition of the same messages. My former application had the capacity of the two last-named operations, but not the capacity of the

first-named operation of coupling one set of lines for repeating one set of messages and another set of lines for repeating different messages, which is an important feature of my present invention.

In the drawings annexed, Figure 1 is partly an elevation and partly a diagram representing a repeating-station provided with my improved repeating mechanism in completeness, from which three distinct or individual lines emanate to three different distant stations. Fig. 2 is an enlarged fragmentary sectional elevation of one of the sounders, showing thê novel construction of the contacts thereon. Figs. 3 and 4 represent, respectively, a section and elevation of one of the couplers used on the intermediate circuit, the former view showing the coupler in uncoupled position and the latter in coupled position. Fig. 3½ is a plan view of one of the tongues of the coupler. Fig. 5 is a view similar to Fig. 1, but showing the parts in a reverse position—that is, Fig. 5 showing the position of parts when the sending-line is broken, while Fig. 1 shows the positions of parts when the sending-line is closed.

Referring to Fig. 1, *a b c* represent the three individual telegraph-lines, which, coming in from the distant stations, go to ground as usual through the relay-magnets *a' b' c'* and the main batteries *a'' b'' c''* in the ordinary manner, except that the current of the lines on their way to the ground is completed through the contacts of their respective contact-making instruments A B C, as will more fully appear hereinafter.

d e f indicate the intermediate circuit in the repeating-station, with which any one or more of the individual lines is or may be related, as will hereinafter appear. Now, each individual line is represented in the repeating-station by two sounders, A A', B B', and C C', in a similar manner to that shown in my former application. The sounders A', B', and C' on the right of each line are in fact the local sounders of each line, the magnets thereof being circuited in the usual local circuits, *g h i*, controlled by the contacts *g' h' i'* of the respective relays in the well-known manner, so that the local sounders thus respond to the opening or closing of their respective lines. The sounders A B C on the left, however, may be termed the "repeating-sounders," for it will be noted that their magnets are circuited in the intermediate or repeating circuit *d e f*, and they serve to repeat the signals of one line on the intermediate circuit, and thence on the other lines, as will be seen later on. The sounders shown in my former application were similar to that employed in Toy's repeater, with the attracting-contacts on one arm of the armature-lever and the retracting-contacts *m l* on the opposite arm. In my present application, however, it will be seen by referring first to Fig. 1, and then to Fig. 2, that the sounders are of a well-known and approved form adopted in the regular Morse system, but that the contacts are of novel construction, and are both placed below the sounding end of the armature-lever and attached to the top of the sonorous arch or anvil *j* of the instrument and operated by the tip of the adjusting-screw *k*, which adjusts or limits the attracting movement of the armature-lever. One part of the contacts is formed by a flat horizontal spring-tongue, *l*, affixed on the top of the arch *j*, and in metallic connection therewith, while the other part consists of a tongue or hook, *m*, which is affixed on the side of the arch, and insulated therefrom, as indicated, and which hook is bent laterally at the top, to overhang the arch and overlie the free end of the tongue *l*. The hook *m* is rigid, while the spring *l* is of course yielding and constantly tends to spring in contact with said hook, as shown in Fig. 2, the meeting faces of the two being coated with platinum, as usual. Now, the end of the adjusting-screw *k* is tipped with a steel pin, *k'*, driven into the same, as shown in Fig. 2, the end of the pin being broad and flat, as illustrated in Fig. 2, to set upon the spring *l* when depressed by the attraction of the armature. A small steel anvil-pin, *n*, is driven or screwed into the top of the sonorous arch *j*, in direct line with the tip of the screw *k* and in line with a hole, *l'*, which is formed through the spring in coincident position, and which hole is a free fit for the anvil-pin *n*, but smaller than the top of the screw *k*, so that when the armature-lever is attracted and depressed the broad tip of the screw *k* will first strike the spring *l* around the hole *l'*, thus separating the contact end of the spring *l* from the contact-hook *m*, and pressing the spring downward over the anvil-pin *n*, against which the tip of the screw will finally strike. The tip of the screw first seats elastically against the contact-spring *l*, and finally strikes a hard metallic blow upon the anvil-pin *n*, which serves to give a clear, sharp, and loud sound, so that while the armature thus operates contacts in its movement the sounding function of its movement is in no way impaired, but rather improved by the fact of the steel-tipped screw striking upon an isolated steel projection on the sonorous arch *j*, usually of brass. This construction forms a minor feature of my improvement. It may, therefore, be now noted that the depression of the armature will operate two contacts—that is, the first contact between the tip of the screw *k* and the spring *l*, which is closed as the armature is depressed, and the second contact between the spring *l* and hook *m*, which is opened as the armature is depressed, and vice versa. Now, the contacts *l m*, which are closed when the armature is retracted, are termed the "retracting-contacts," and the contacts *k l*, which close when the armature is attracted and depressed, (which is, of course, its normal and energized position,) are termed the "attracting-contacts." The second adjusting-screw, *o*, which limits the retracting movement of the armature, as shown best in Fig. 2, does not contact directly with the metallic tip of the

armature-lever, but with a little metal anvil-pin, *o'*, which is inclosed in an insulating-bushing, *o''*, embedded in the top of the lever, so that while the retraction of the armature will also emit a clear sharp sound by reason of hard metallic contact, yet its contact will be non-conducting with the arch *j*, so that the circuit will be always broken at the contacts *k l* between the arch and armature-lever when the armature is retracted, as will be understood. For the same reason the pivotal standard *z* of the armature is, of course, insulated from the metal base on which the arch rises, as seen in Fig. 2. Any other means of insulating the retracting-contact of the armature with the arch may, however, be employed.

It may now be noted that the great advantage of constructing and arranging the contacts *k l* and *l m* as above described is that the screws *k o* may be freely adjusted as the operator may desire to set the armature in the desired proximity to the magnet-poles, and allow it the desired play in the ordinary way, without in the least altering the relations of the contacts to each other or to the armature-lever; whereas in my former arrangement the contacts would require to be adjusted every time the adjustment of the screws was altered.

The special construction of the attracting and retracting contacts on the sounders being thus explained, we will now refer again to the main view, Fig. 1, to show how the magnets and contacts of the several sounders are circuited in relation with the several lines and circuits of the apparatus. I would first remark that in Fig. 1 the central line, *b b*, is represented as cut out of the repeating system for individual operation, while the two end lines, *a c*, are coupled through the intermediate circuit, *d d f f*, for repeating, so that the signals of one line will be repeated on the other. It may be further noted by reference to Fig. 1 that the circuit of each of the lines *a c* is completed through the attracting-contacts on the repeating-sounders A C of said lines, for by tracing the lines it will be seen that in entering the station they pass first to the operating-keys 2 3 4, thence to the pivotal standards of the armature-levers on the repeating-sounders A C, through the armature-lever and the attracting-contacts thereof to the arch, and thence to the relay and main battery to the ground. The intermediate circuit, *d e f*, is not one simple circuit, but is in fact composed of distinct sections, *d e f*, one section corresponding to each distinct telegraph-line and its sounders A A', &c., and each section having an independent battery, *p q r*.

Each section is provided with a cut-out switch, *s t u*, whereby that section may be broken, which will, of course, render the circuit inoperative and operatively detach the line corresponding thereto from the repeating system for individual operation, as is the case with the middle line, *b*, in Fig. 1. Referring first, for sake of greater clearness, to this intermediate circuit, *e e*, of the central line in Fig. 1, it will be seen that each intermediate circuit is completed through two sets of contact springs or tongues, *v* and *w*, which normally always tend to spring into contact to close the circuit, and these two sets of contacts I term the "couplers," as they serve to couple the intermediate circuit or section of one telegraph-line with the intermediate circuit of any other line, as will soon appear. These couplers are shown best in Figs. 3 and 4, to which we may now refer in connection with Fig. 1. The set of tongues *v* are fixed on a base or "switch-board," while the set of tongues *w* are movable, and may be intermeshed with any set of the fixed tongues *v*, as seen in Fig. 4, also in Fig. 1, and when the movable tongues of any one section of the intermediate circuits are thus inserted or intermeshed with the fixed tongues of any other section of the intermediate circuits such sections will be coupled together to form one continuous circuit, as may be observed in Fig. 1, where the first and last sections of the intermediate circuits are coupled together by the intermeshing of the coupling-tongues of said sections, as shown, and therefore the said circuits or sections become continuous with each other. Hence by this system of couplers it will be obvious that the intermediate circuits may be coupled together in any desired combinations—that is, all three together in continuous series, or the first with the last, the first with the second, the second with the last, &c., as may be desired—and when thus coupled the telegraph-lines represented thereby will be coupled for repeating in corresponding order, as may be desired. By referring again to Fig. 1 it will be seen that the intermediate circuits or circuit is completed through the magnets of the repeating-sounders A B C and through the attracting-contacts of the local sounders A' B' C'. As, however, the intermediate circuit through the sounders B B' of the middle line is broken at the open switch *t*, we need not now consider that part of the intermediate circuit, but may confine our attention to the first and last sections, *d f*, which are coupled together. Now, referring to the cut-out switches *s u* of these sections, it will be seen that a short branch wire, *y*, extends from the switch-bar to the retracting contact-hook *m* on the local sounders A' or C', and that this will form a short loop-circuit in the intermediate circuit, *d* or *f*, including the magnet of the repeating-sounders A or C, the battery *p* or *r*, and the switch *s* or *u*, this loop-circuit being, however, open at the retracting-contacts *l m* on the local sounders A' or C', as will be understood. Now, each of the cut-out switches *s t u* are linked by an insulating-bar with a second switch, 5 6 7, which will be shifted in "closed" position simultaneously with the cut-out switches, and will then form a second loop-circuit, 8, similar to that shown in my former application, and which includes a section of

the line-battery a'' or c'', the relay-magnet a' or c', a portion of the main line a or c, and the retracting-contacts on the repeating-sounders A or C, at which point this loop is broken, as shown.

The loop 8 I may term the "relay-holding loop," as it acts to hold the relay on the receiving-line closed when the line is itself broken to repeat the signal of the sending-line, while the loop $d\ s\ y$ or $f\ u\ y$ in the intermediate circuit I may term the "repeating-magnet holding-loop," as it acts to hold the magnet of the repeating-sounder on the sending-line closed when the sending-line is itself broken at the distant station, as will be seen farther on, so as to prevent the sending-line being broken at the same time in the repeating-station, which would of course render the line inoperative to the distant operator.

We have now seen how the several magnets and contacts and batteries of the apparatus are circuited, and we will now proceed to show how the apparatus acts to repeat the signal of one line through the intermediate circuit to another line. We will first observe how any one line is cut out of the repeating system for individual operation. Referring to the middle line in Fig. 1, which is thus cut out, it may be remarked that when the cut-out switch t is shifted to break the intermediate circuit $e\ e$ and cut the line b out of the repeating system, it will also shift its connected relay loop-switch 6. The shifting of the cut-out switch t will not only break the intermediate circuit of that section, but also break the repeating-magnet loop $e\ t\ y$ in that section, thus demagnetizing the magnet of the repeating-sounder B, and hence causing its armature to be retracted, as illustrated in Fig. 1, that being the only sounder that is shown in demagnetized and retracted condition, as will be observed. Now, it will be seen that a branch, $b^{\times}$, of the line b goes to the opening seat of the loop-switch 6, and that the switch connects through a portion of the relay-loop 8 with the retracting-contacts on the repeating-sounder B, from which the line continues to the relay and ground. Hence, when the loop-switch 6 is shifted to its "open" seat, it will not only break the relay-holding loop, which is not now necessary, and thus render it inoperative, but it will also close the circuit of the main line b through the retracting-contacts of the repeating-sounder B *via* the branch $b^{\times}$, switch 6, and part of loop 8. It will therefore be seen that while the switches are shifted into their closed positions, as on each of the end lines, and while the repeating-sounders are energized, the circuit of the main lines will be always completed through the attracting-contacts $k\ l$ of said repeating-sounders, as illustrated at A C; but when the switches are shifted into open position, as on the middle line, the repeating-sounder will be instantly demagnetized, and as its armature retracts it will first close the retracting-contacts $l\ m$ and then open the attracting-contacts $k\ l$. As, however, the circuit of the line thus becomes closed through the retracting-contacts before it becomes broken at the attracting-contacts by the retracting motion of the repeating-sounder B, the circuit of the line thus remains intact for individual operation either in sending or receiving.

Disregarding now the middle line, we will confine our attention to the two end lines, which are coupled for repeating, considering the line $a\ a$ as the sending-line and the line $c\ c$ as the receiving-line, on which the signals of the sending-line are repeated. We will now observe how the apparatus acts to produce this result. When the apparatus is in repose, according to the usual telegraph system, the circuit of the main lines, the local circuits, and the intermediate circuits are of course all closed, and all the magnets—relay, local, and repeating—are energized, as shown in Fig. 1. The relay-holding loops 8 are, however, broken at the retracting-contacts $m\ l$ of the repeating-magnets A C, and the repeating-magnet loops $d\ s\ y$ and $f\ u\ y$ are broken at the retracting-contacts $m\ l$ of the local sounders A′ C′, as illustrated. If now the distant operator breaks the sending-line a, this break will throw the parts into the positions shown in Fig. 5—that is, it will demagnetize the relay a', open the local circuit g, demagnetize the local sounder A′, and cause its armature to retract, which retraction will first close the retracting-contacts $l\ m$, thus closing the holding-loop $d\ p\ s\ y$ on the magnet of the repeating-sounder A, and hence keeping this repeating-sounder energized and its contacts unchanged, and immediately after this the attracting-contacts $k\ l$ (of A′) will open, which contacts, being in the intermediate circuit, $d\ d\ f\ f$, will of course break the intermediate circuit, and consequently demagnetize the repeating-sounder C. As the armature of this sounder C retracts, it will first close its retracting-contacts $l\ m$, and thus close the relay-holding loop 8 c 8 7, and immediately after open the attracting-contacts $k\ l$, and thus break the receiving-line c, which line is completed through said contacts, thereby repeating the "break" of the sending-line on the receiving-line. The immediately previous closing of the relay-loop, however, will of course hold the relay c' energized, although its main line is broken, and thus prevent the opening of the local circuit i and the demagnetizing of the local magnet C′, which would break the intermediate circuit itself in a second place, and thus render it inoperative, but which cannot occur by means of the previous closing of the relay-loop, as will be understood. When the distant operator closes the sending-line a, all the aforesaid parts will return to their normal positions, as seen in Fig. 1, and the closing-signal will be repeated on the receiving-line, as will be understood.

It will also be noted that the relation of the two lines $a\ c$ to each other and to the intermediate circuit is such that the messages may be

repeated through the intermediate circuit in either direction without any change in the apparatus—that is, the line *c* may now become the sending-line, when its signals will be repeated on the intermediate circuit, and thence repeated therefrom onto the line *a* in precisely the same manner as already described, where the line *a* was the sending-line.

It may also be understood that in order to couple the cut-out line *b* with the other two lines for repeating, it is only necessary to close its cut-out switches 6 *t* and insert the coupler *w* of its intermediate circuit, *e*, in the tongues *v* of the intermediate circuit, *d*, thus connecting the parts in the same order as the parts of the end lines are shown connected in Fig. 1. All these lines will then be coupled for repeating, so that signals sent in on any one of the three lines will be repeated out on the other two lines.

I am aware that certain duplex telegraph systems have been devised, as shown in patents to Stearns and Edison, in which the incoming signal is repeated onto a local circuit and from this local circuit the signal is thence repeated out on another line; but this, while it may seem to present some resemblance to my system, is quite distinct from it, for in the systems cited the local circuit acts only in one direction, and is adapted only for duplex work, in which the home instrument does not respond to the action of the home key, but only to the incoming current from the distant key. For example, we might say that in these cases the incoming line *x* repeats its signal onto a local circuit, *y*, which in turn repeats it out on an outgoing line, *z*, but will not act in the reverse direction—that is, the line *z* cannot repeat through the local line *y* onto the line *x;* but a second local circuit, *y'*, connects the lines *x* and *z* in the reverse direction; whereas in my case the one intermediate circuit has the same relation with both lines in either direction and repeats in each direction, so that one line or the other may be the sender or receiver through said intermediate circuit. Again, in the cases referred to but two lines are connected with the local circuit for action in one direction, whereas my system is specially designed to connect a series of three or more lines with the intermediate circuit for operation in either direction, which cannot be done in the duplex systems cited.

We may now return to Figs. 3 and 4, showing the couplers where their special construction is illustrated, and may now be described. One of the fixed tongues, *v'*, is rigid, while the other tongue, *v*, is yielding, as will be understood, and constantly tends to spring against the rigid tongue near the tip, the tips of both tongues being, however, diverged, as shown. The rigid tongue *v'* is longer, and projects up beyond the yielding tongue *v*, and has lips or guiding-flanges *v''* on the back, along each edge thereof, as seen best in Fig. 3½. Both of the movable tongues *w* are yielding, and constantly tend to spring in contact near the tips, and they are fastened in an insulating-handle, *w'*, at the top of which the flexible wires of the intermediate circuit are attached to connect with the tongues, as illustrated. An insulating and separating wedge, w^2, projects from the handle down between the tongues near their point of contact, and these tongues diverge at the tips in the same way as the fixed tongues. The tip of one of the movable tongues projects beyond the tip of the other, as shown, so that when the movable tongues are forced down upon the fixed tongues they will readily intermesh therewith, the movable tongues *w* sliding over the fixed tongues *v'*, the long tongue *w* first contacting with the tongue *v'*, and being guided between the lips *v''* thereof, which renders the engagement of the tongues easy and accurate. As the movable tongues thus intermesh with the fixed tongues, they become separated from each other and put in contact with the fixed tongues, and the insulating-wedge w^2 finally enters between the fixed tongues, and thus separates the fixed tongues from each other, as seen in Fig. 4, thereby coupling the circuit of the fixed tongues with the circuit of the movable tongues, and rendering the two circuits continuous with each other without making a break in either circuit, as before described, and shown in Fig. 1.

Referring to Fig. 1, it may be seen that the contact end of the switches 5 *s*, &c., are broader than the space between their two seats, so that in the shifting movement they will always contact with one seat before breaking contact with the other, so that one of the loops or circuits controlled by these switches will always be closed before the other is broken, and the possibility of breaking the two at the same time is thus prevented.

By referring to Fig. 2 it will be seen that the position of the contact-springs might be readily reversed—that is, instead of being affixed on the top of the arch, they might be affixed on the under side of the armature-lever and operated by contact with an adjustable stop-screw rising through the arch. In the exact construction shown in Fig. 2 it may also be understood that the anvil-pin *n* may be formed by the tip of a steel set-screw adjustable tightly in the arch, if preferred.

From the above specification it may now have been noted that one important improvement herein shown over my former application is that each telegraph-line has, in fact, a distinct intermediate circuit, and that means are provided for coupling any one intermediate circuit with any other intermediate circuit, or of leaving the circuits isolated from each other. Hence by this means not only can any of the lines be operated individually, and, furthermore, that one line may be coupled with all the others for multiple repetition, but, what is very important, any one line can be coupled in any desired combination with any of the others.

It may be also noted that in the apparatus

which I have illustrated in Fig. 1 the loop-circuits 8, which are the same as shown and claimed in my former application, serve to hold the relay and local magnets closed when the line is itself broken. Any other means, however, for producing this same result may be used without departing in the least from the main feature of my repeating system. For example, the means used in the Milliken repeater, which is a magneto-mechanical holder, may be so used without any objection, although I prefer the loop-circuit illustrated for sake of simplicity.

It will also be seen that the loop-circuit *d p s y* in the intermediate circuit serves to hold the intermediate or repeating magnet on the sending-line closed when the intermediate circuit is itself broken, and thus prevent the sending-line from becoming broken in the repeating-station, this feature being shown and claimed in my former application. I do not, however, limit the main feature of my present invention to this loop-circuit for holding the repeating-magnet of the sending-line closed, as some other means might be adopted without departing from the principle of my repeating system. For instance, the Milliken holding device may be used in place of this loop with the same effect as if used in substitution of the relay-holding loop 8.

It may be also understood that in lieu of the special form of couplers for coupling the intermediate circuits, any other system of couplers or switch-boards may be used—for example, that well-known form of switch-board known as the "Western Union Pin Switch-Board" may be employed.

I do not limit myself to the special construction of contact-making instruments shown, as instruments of any equivalent construction producing an equivalent result may be employed.

Such novel features as I may have shown but not claimed in this application I reserve for the subject of a future application.

What I claim, therefore, as my invention is—

1. A repeating telegraph system formed by the combination, with three or more distinct telegraph-lines, of one independent intermediate circuit and contact making and breaking instruments related with the individual lines and with the intermediate circuit, substantially as herein set forth, so that the signal transmitted on one line will be duplicated on the intermediate circuit, and thence repeated on the other line or lines, and vice versa, essentially as specified.

2. A repeating telegraph system adapted for single or multiple repeating on any desired combination of lines, consisting in the association, with two or more telegraph-lines and suitable contact making and breaking instruments, of a distinct or isolated intermediate circuit for each line, arranged substantially as herein set forth, that a signal transmitted on the line shall be repeated on the intermediate circuit of that line, and vice versa, together with means for coupling the intermediate circuits of said lines together in desired combinations, whereby a signal transmitted on any one of the lines shall be repeated on all the others whose intermediate circuits are thus coupled, substantially as herein set forth.

3. In a repeating telegraph system, the combination, with two telegraph-lines, each provided with a double contact-making sounder or instrument, substantially such as A′, responding to the opening and closing of the line, and having one set of contacts closed by attraction and another set closed by retraction, one closing before or when the other opens, together with a second similar instrument, such as A, and a distinct intermediate circuit connected with each set of said instruments and completed through the attracting-contacts of the instrument A′, and through the magnet of the instrument A, with means for coupling the intermediate circuit of one line with the intermediate circuit of the other line, and means for holding the intermediate magnet of the sending-line in close circuit when the intermediate circuit is broken through the intermediate magnet of the receiving-line, substantially as herein set forth.

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Witnesses:
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