(No Model.) 4 Sheets—Sheet 1.

J. A. PARKER & L. L. SUMMERS.

SYSTEM OF TELEGRAPHY.

No. 510,929. Patented Dec. 19, 1893.

Fig. 1.

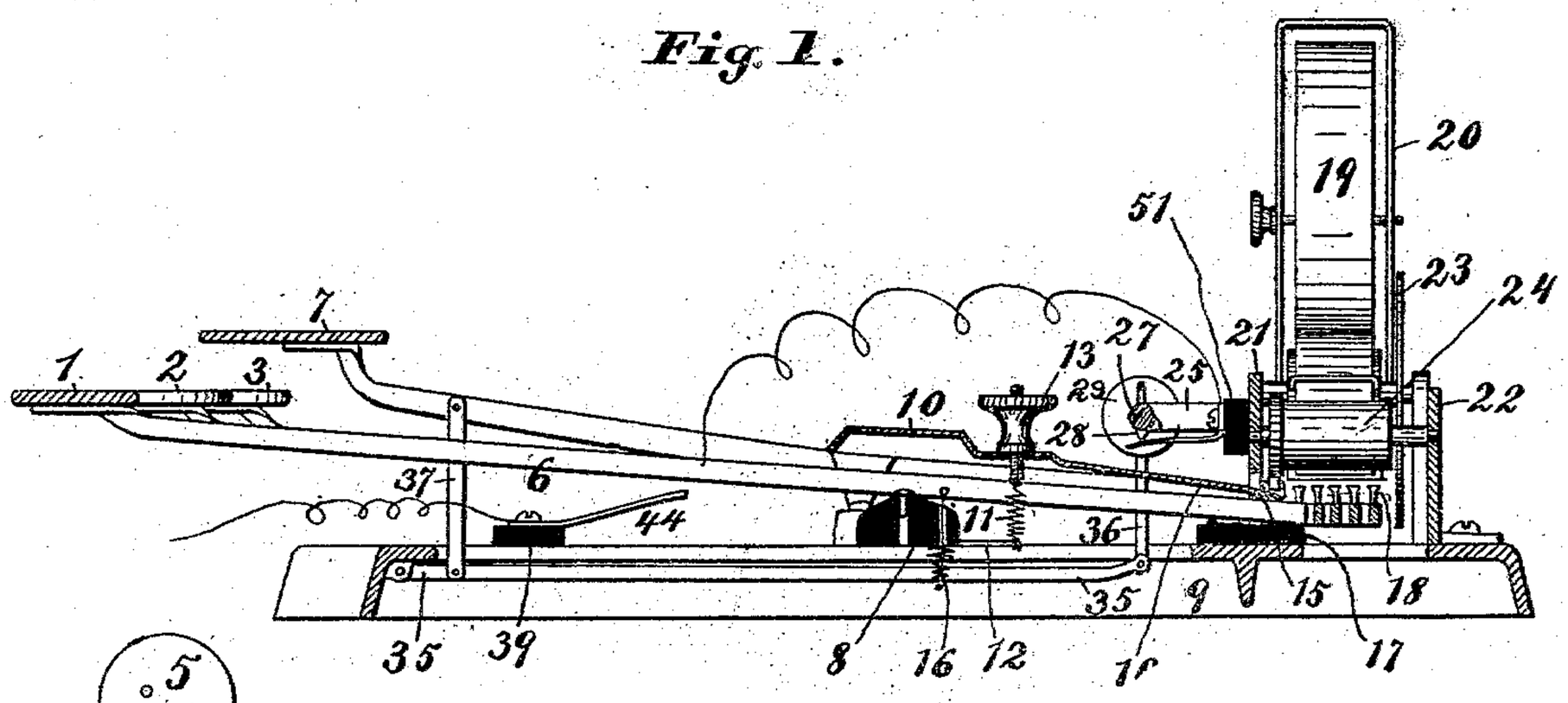

Fig. 2.

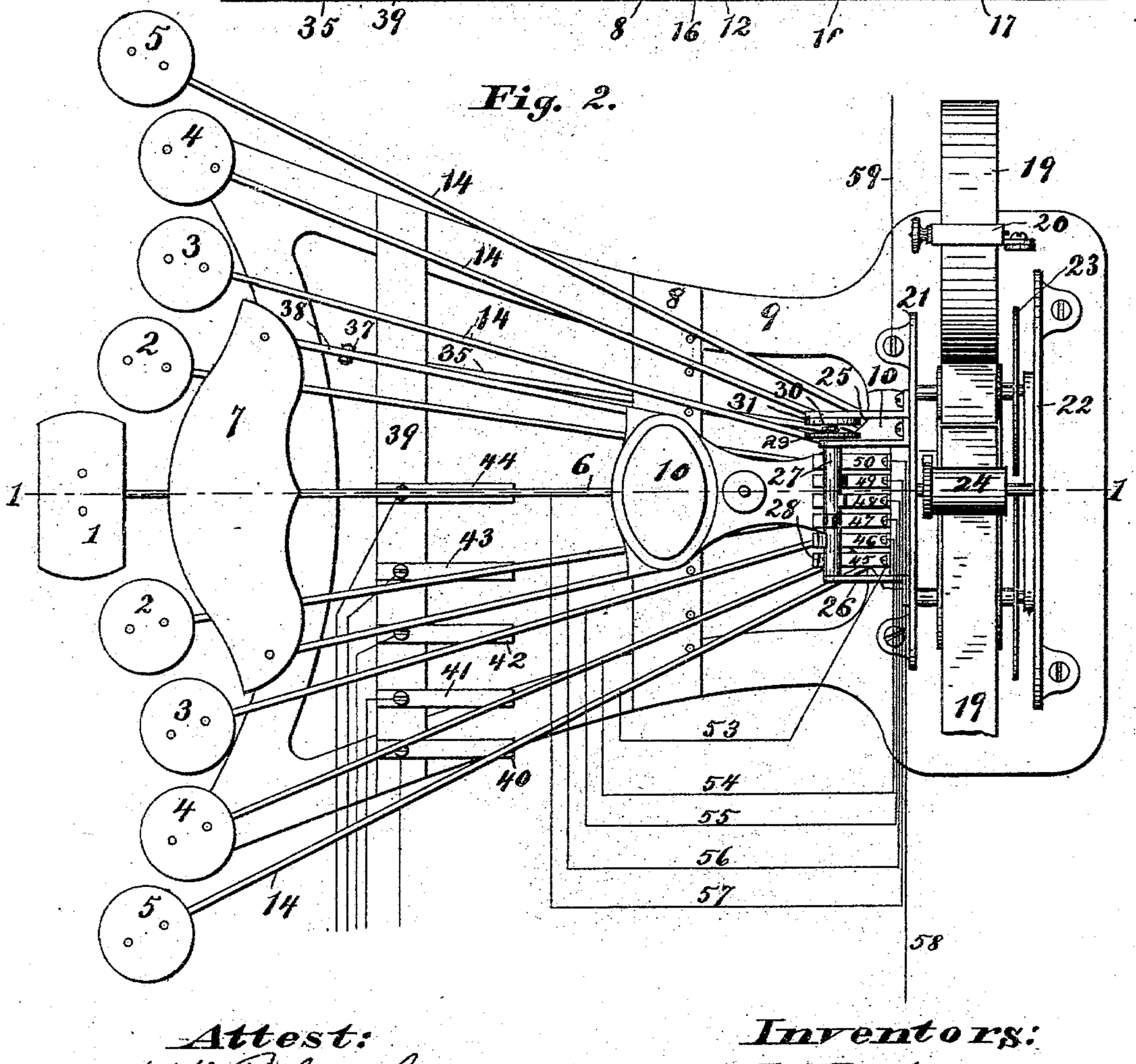

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Fig. 3.

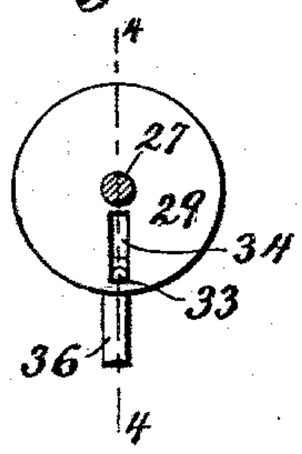

Fig. 4.

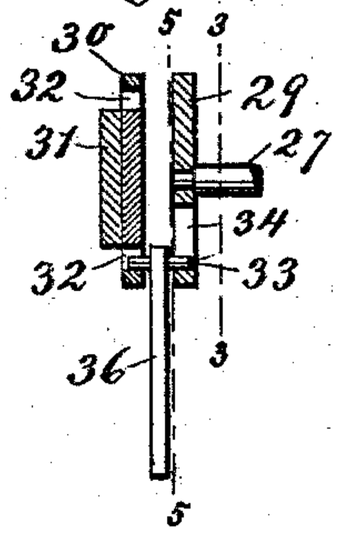

Fig. 5.

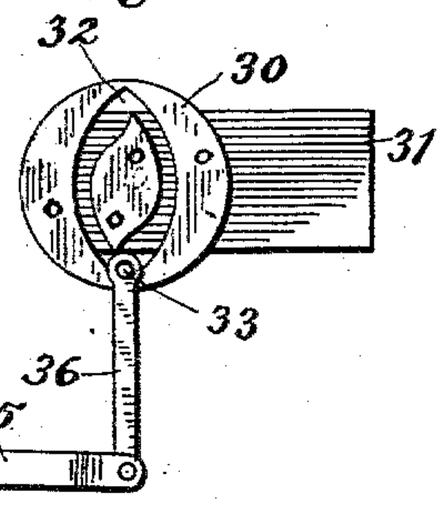

Fig. 6.

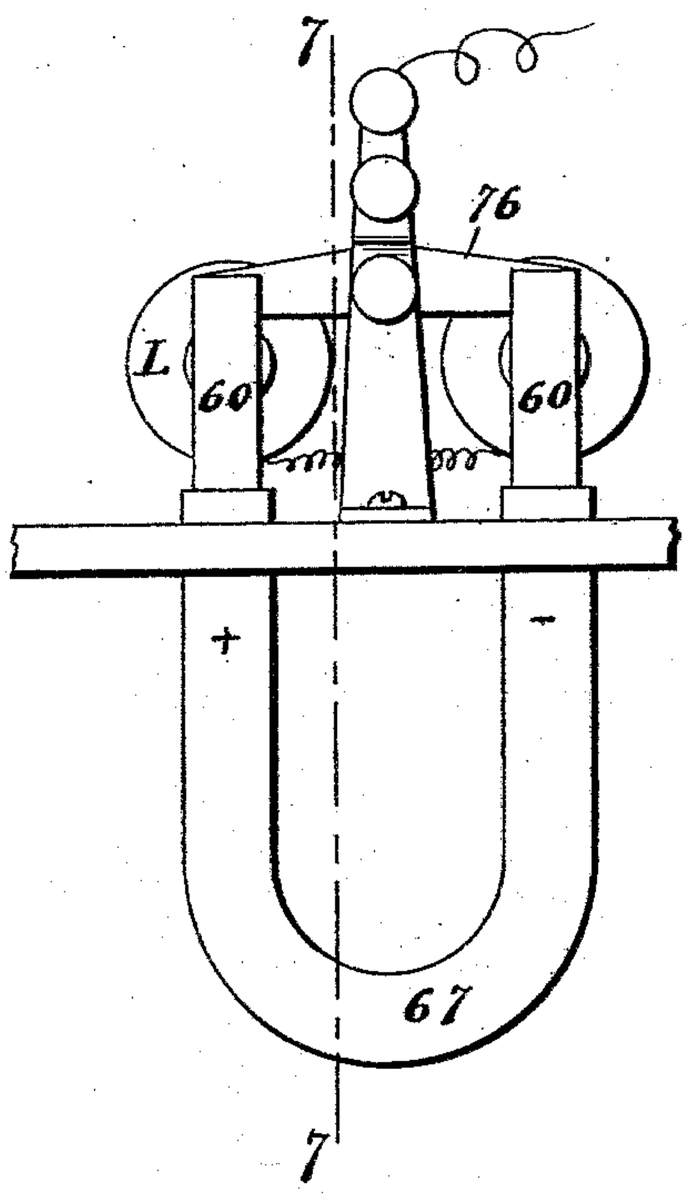

Fig. 7.

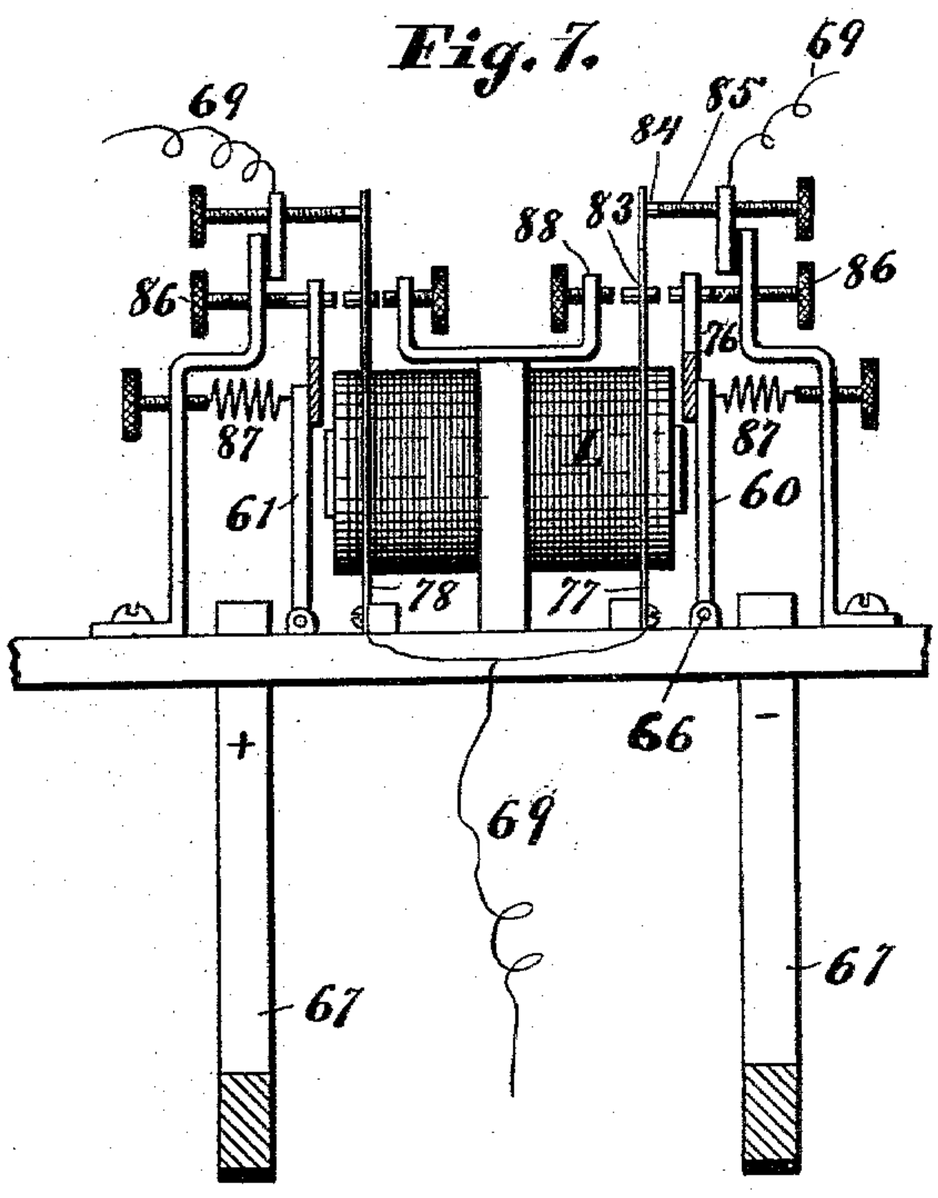

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Fig. 8.

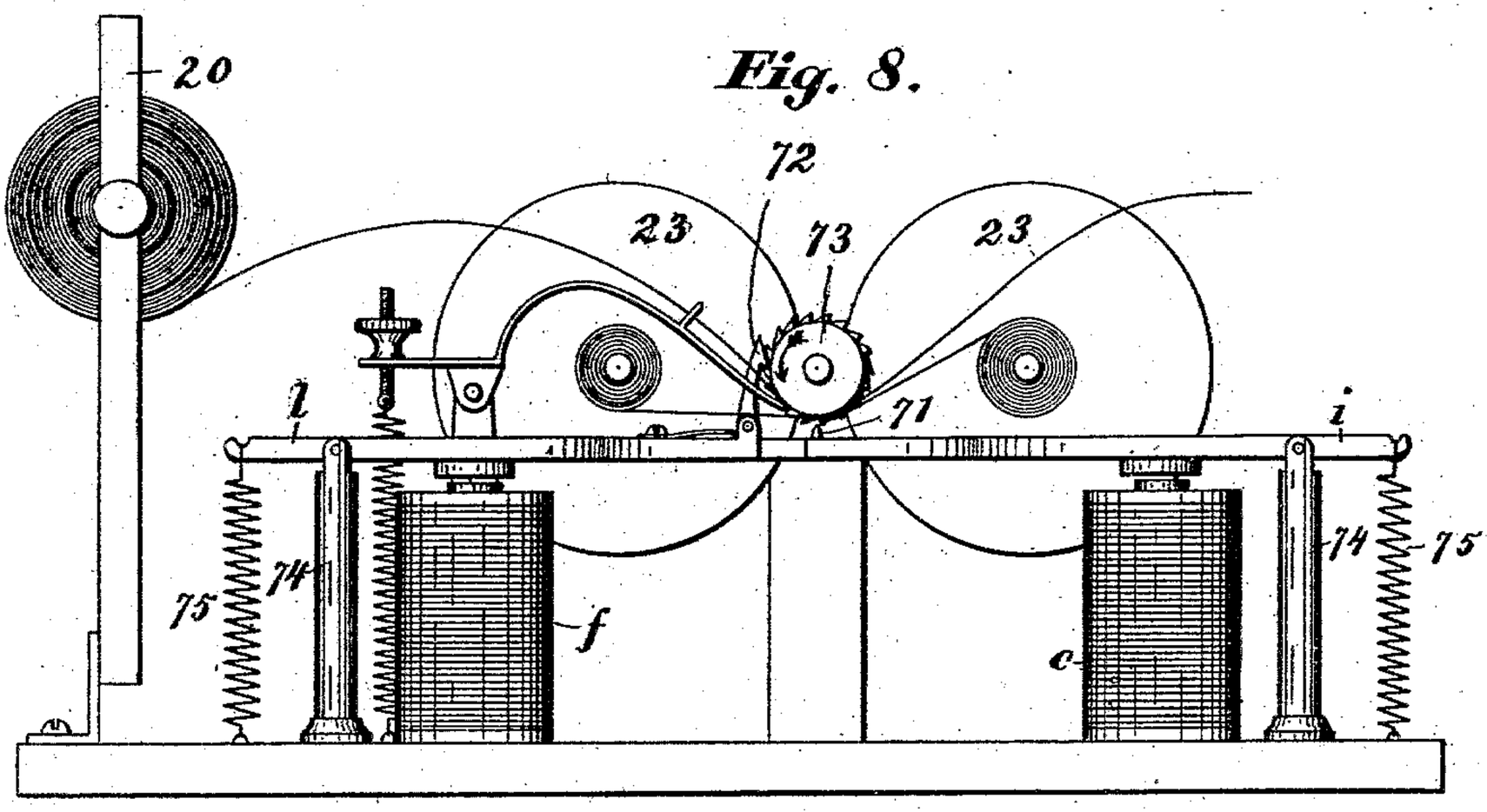


Fig. 9.

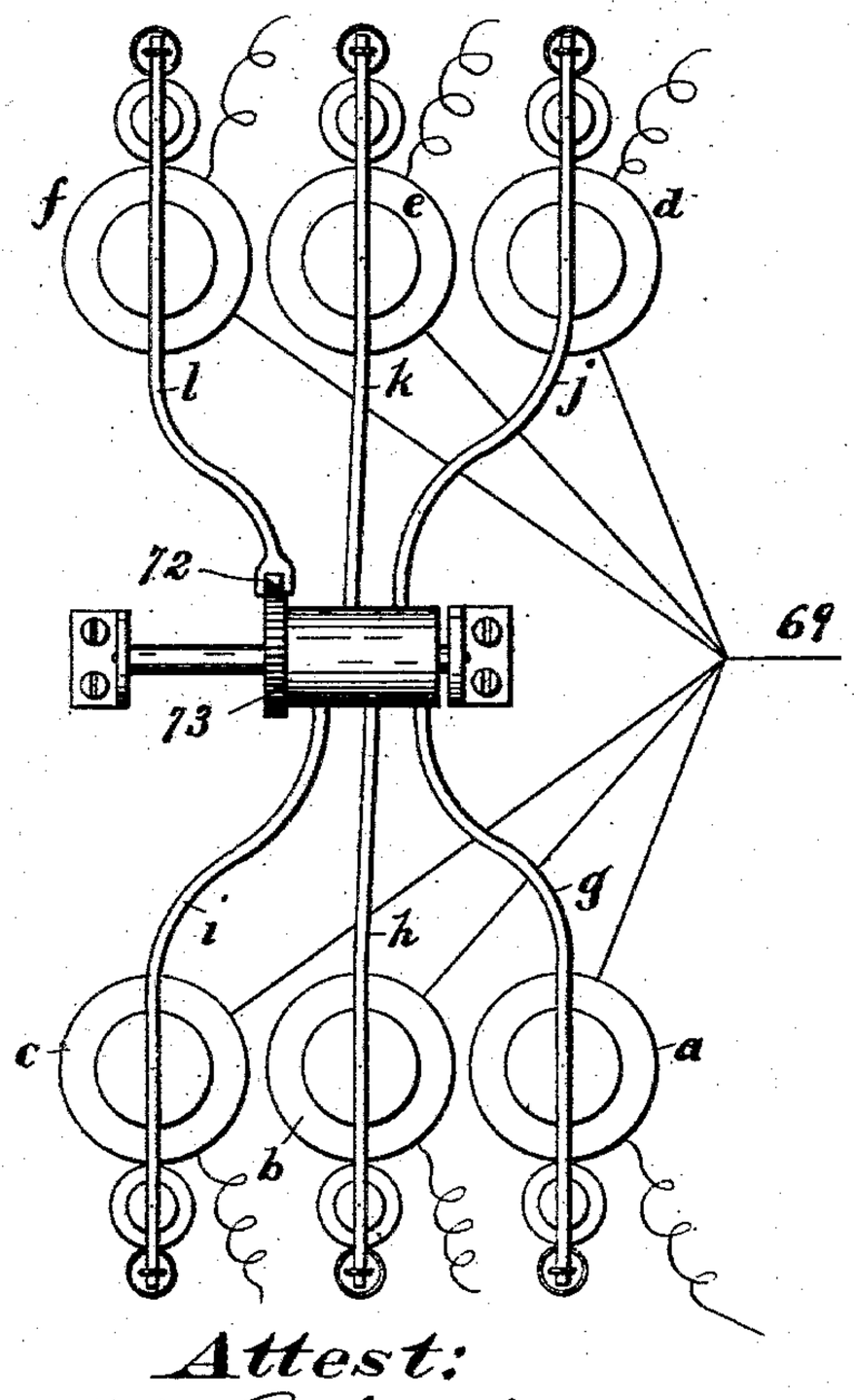


Fig. 10.

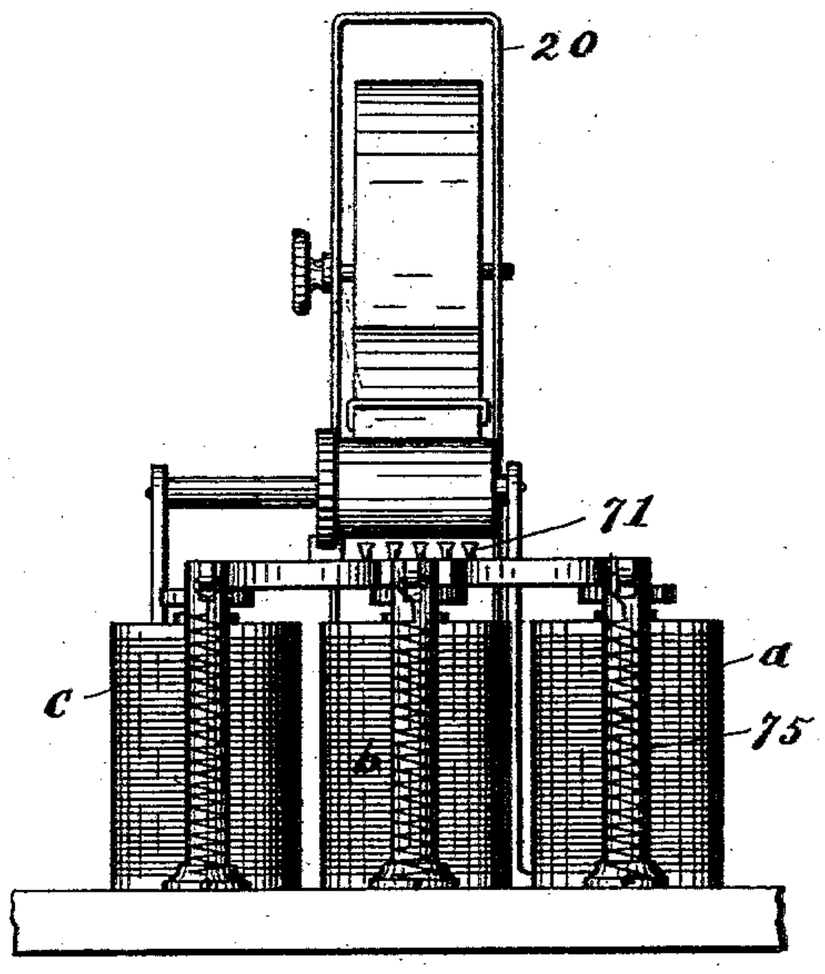
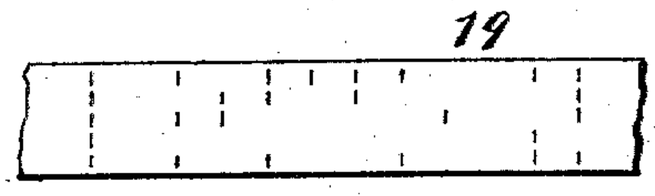


Fig. 11.



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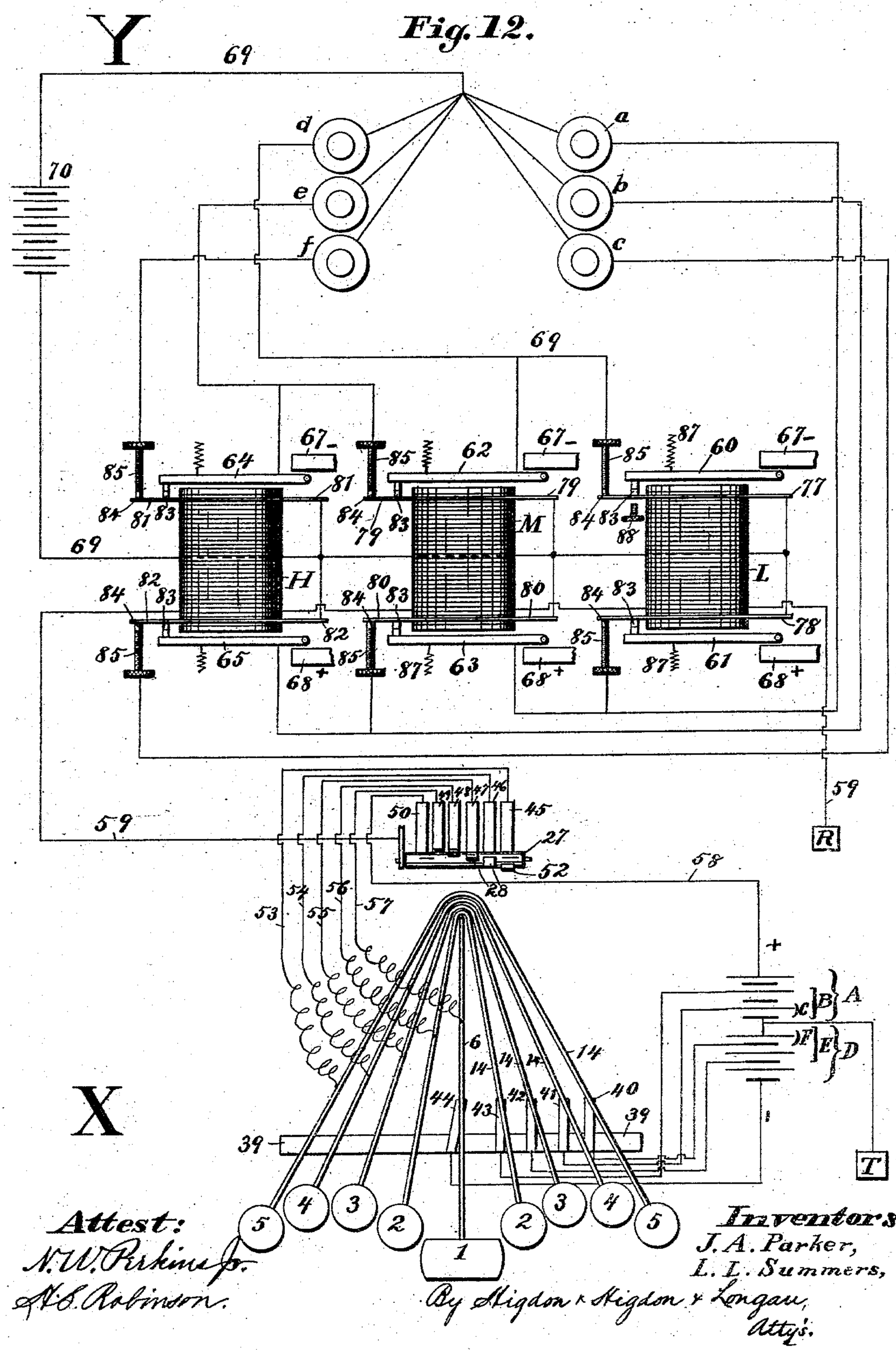
SYSTEM OF TELEGRAPHY.

No. 510,929. Patented Dec. 19, 1893.

Fig. 12.



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UNITED STATES PATENT OFFICE.

JOSIAH ATKINS PARKER, OF ST. LOUIS, MISSOURI, AND LELAND LAFLIN SUMMERS, OF CHICAGO, ILLINOIS.

SYSTEM OF TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 510,929, dated December 19, 1893.

Application filed July 30, 1892. Serial No. 441,712. (No model.)

To all whom it may concern:

Be it known that we, JOSIAH ATKINS PARKER, of St. Louis, Missouri, and LELAND LAFLIN SUMMERS, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Systems of Telegraphy, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

Our invention relates to telegraphy, as is hereinafter fully set forth.

In United States Letters Patent granted to J. A. Parker, No. 447,198, dated February 24, 1891, there is described what is known in the art as a "stenographic transmitter" having a number of divaricate circuit closing or breaking keys, each key having at the ends finger buttons for the corresponding fingers of the right and left hands, arranged at one station and connected by a suitable line to electro-magnets located at another station and having armatures whose levers have markers thereon adapted to mark a ribbon in a series of marks transverse to the ribbon, said electro-magnets being excited by movement of said keys.

The object of our present invention is to improve upon the methods and instruments in this class of telegraphy and provide for increased speed and accuracy in the operation of the transmitting and receiving (or recording) instruments.

In the drawings: Figure 1 is a sectional side elevation of a transmitting instrument, the section being taken on line 1—1 of Fig. 2. Fig. 2 is a top plan view of the same. Fig. 3 is a detail section taken on line 3—3 of Fig. 4. Fig. 4 is a detail vertical section on line 4—4 of Fig. 3. Fig. 5 is a detail elevation at 5—5 Fig. 4, looking from the right hand of the sheet. Fig. 6 is a side elevation of one of the polarized-relays used in carrying out the invention. Fig. 7 is a transverse vertical section of the same, taken on line 7—7 of Fig. 6. Fig. 8 is an elevation of a recording instrument. Fig. 9 is a diagrammatic plan of the same. Fig. 10 is an end elevation of the same. Fig. 11 is a broken plan of a portion of the traveling record strip, which may be used in the recording instrument. Fig. 12 is a diagrammatic view, illustrating the instruments located at two stations connected for operation.

Our present invention is particularly adapted for sending to line and recording or indicating, the class of electrical impulses described in the Letters Patent above mentioned; but its use is not limited to such adaptation.

Referring to the drawings: X and Y indicate, respectively, the transmitting and receiving stations of an ordinary line, or of any of the well known exchange systems.

The important feature of our invention resides in the system of telegraphy, hereinafter described, in which determinate numbers of electrical impulses of determinate tension and polarity traverse a line and are indicated or recorded at a receiving station, or at a number of receiving stations, in determinate succession.

We will first describe the preferred form of transmitting instrument and connections located at the transmitting station X.

1, 2, 3, 4, and 5 are the metallic keys of the stenographic instrument, referred to in the patent above mentioned, which are in proper positions for the thumbs and fingers, the key 1 being for both thumbs, while the keys 2, 3, 4, and 5 are for the fore, middle, ring, and little fingers, respectively. The thumb key 1 has a straight shank 6, while the other keys are U-shaped or divaricate, and all have at the front ends plates or buttons to receive the pressure of the fingers. These plates or buttons may be of insulating material, or they may be insulated in any suitable manner. It is immaterial which hand is used to depress the keys, as each finger works the same key as the corresponding finger of the other hand. In practice it is customary to strike with the hands alternately, and thus work with greater speed than could be attained with one hand, as one hand may be on the descent while the other is on the ascent.

7 is what is known in the stenograph as a space-key, the construction of which is substantially as in the ordinary stenograph. It is pivotally mounted upon a transverse strip of insulating material 8 and thereby insulated from the stenograph frame 9, which latter is

usually of metal. The finger button of the space-key 7 is mounted in a plane above that in which the finger buttons of the keys 1, 2, 3, &c., are located and extends transversely such a distance as to be conveniently reached by the fingers and thumbs of either hand. Its inner end, or portion, has an extension in the form of a metal plate 10, which extends transversely above, and is urged downwardly toward the inner portions of all the keys of the series, by means of a suitable spring 11, which latter is secured to a small projecting bracket 12 fixed to the transverse insulating strip 8, or the lower end of said spring may be secured to some fixed portion of the frame 9. (See Fig. 1.) The upper end of the spring 11 is adjustably secured to the extension 10 of the space-key 7, being so secured by means of a thumb-nut 13 threaded upon a short bolt. Said spring 11 normally holds the plate 10 firmly in contact with the inner portions of the shanks 14 of the keys 1, 2, 3, &c., and urges them to and holds them at the limit of their downward movement. The extension 10 is insulated from the keys, at the point where it comes in contact with them, by means of insulation 15, which will be found at the inner end of said extension, in Fig. 1. A small spring 16 is applied to each of the shanks 14 of the keys 1, 2, 3, &c., at a point intermediate of their pivotal point and the terminals of their inner portions, and draws and normally holds their inner portions at the limit of their downward movement and resting in contact with another transverse insulating strip 17, there being one spring 16 for each of said series of keys. Thus, each key is mounted to rock upon the frame 9, although insulated therefrom.

Upon the inner portions of the keys 1, 2, 3, &c., are vertical markers 18, the space-key 7 and its extension 10 having no marker, for the reason that the function of said key is to feed the record strip 19 through a determinate space upon the depression of any one of the keys 1, 2, 3, &c., and upon depression of said space-key itself.

The specific construction of the mechanism for holding and feeding the record strip, in the transmitting instrument, is the same as in the ordinary stenograph, and need not be further described, except to say that in the accompanying drawings 20 indicates the roll-holder adapted to hold a roll of record-strip and permit it to be reeled off by the feeding mechanism.

21 and 22 indicate two vertical transverse frame plates, in which the ribbon-reels 23 and the rubber impression roller 24 are journaled, so that the record strip is passed between the roller 24 and the markers 18 during operation.

Projecting from the vertical plate 21 is a pair of brackets 25 and 26, in the outer ends of which a short transverse shaft 27 is mounted to revolve and has a determinate number of contact-studs 28 spirally arranged upon its surface at a distance apart. Said revoluble shaft 27 is in electrical contact with each of said brackets 25 and 26, and said brackets are each in electrical contact with the vertical frame plate 21. Said revoluble shaft is provided with suitable means for revolving it a complete revolution upon the completion of a stroke of any one of the keys 1, 2, 3, &c., and the space key 7. The means employed for that purpose may be that which we here show, comprising a crank-disk 29 fixed upon one end of the shaft 27 which projects through the bearing in the bracket 25 for the purpose, so that when said disk is revolved said shaft will move with it; a stationary plate or disk 30 fixed to a bracket 31 projecting from the vertical frame plate 21 in a manner similar to the way in which the brackets 25 and 26 project, with the exception however that said bracket 31 is preferably insulated from said frame plate. The stationary cam-plate 30 has two vertical cam-tracks 32 formed therein and connected at their uppor and lower ends so that a continuous cam-track is provided.

The cam-plate 30 is located adjacent the crank-disk, so that a pin 33 may simultaneously engage said cam-track and a radial slot 34 in said crank-disk 29, and thereby cause said crank-disk (and the shaft which carries it), to be revolved when said pin is caused to traverse said cam-slot. This is accomplished in the following manner: With the parts in the position shown in Figs. 3, 4, and 5, when the pin 33 is moved upward it will rise in a vertical line until it strikes the overhanging wall of said cam-track and will be guided upward thereby and come to rest at a point exactly opposite where it started from, and upon said pin now being moved downward it will be guided in such movement by the underlying wall of said cam-track and be guided back to the starting point, and so on. It will be observed that the pin 33 engaging loosely in the radial slot 34 of the crank-disk will travel through a complete circle during such movement, and thereby revolve the shaft 27 with it. The pin 33 is caused to travel a little more than a half revolution during its upward movement, and its return movement is accomplished, as will now be described.

Pivotally connected to the frame plate 9, near the outer end of same, in a plane below that in which all the keys are located is a lever 35, which has its free end extended inwardly and connected to said pin 33 by means of a vertical connecting rod or bar 36, which is adapted to operate in a manner similar to that which the connecting rod of an ordinary crank operates, passing up into the space between the crank-disk 29 and cam-plate 30 during operation. Another vertical connecting rod 37 connects the lever 35 to the shank 38 of the space-key 7, so that whenever said space key (or any other key) is depressed the free end of said lever 35 will be depressed, and will be elevated to normal position by the action of spring 11 before described. The free end of the lever 35 moving upward will carry

with it the pin 33; likewise when moved downward, and cause said pin to traverse the cam-track 32 in cam-plate 30. In Fig. 1 we have illustrated these parts in normal position, that is—with the free end of the lever 35 at the limit of its upward movement, and with the pin 33 at the limit of its upward movement in the cam-track 32, while in Figs. 3, 4 and 5 we have shown these parts at the limit of their downward movement. The construction is such that when any of the keys are depressed, that is—when their outer ends are moved downward, the free end of lever 35 will move upward. (See Fig. 1.)

39 indicates a transverse plate, preferably formed of insulating material, which is located upon the frame plate 9 beneath the keys, and a series of contact springs 40, 41, 42, 43, and 44 are mounted at one end upon said plate 39, so that their respective free ends, one each, will project into the path of each of the keys 1, 2, 3, &c., during downward movement. (See Figs. 1 and 12.)

We desire to refer now to Fig. 12 of the drawings. It will be observed that the keys 1, 2, 3, &c., are normally elevated out of contact with the contact spring 44. The key 5 is adapted to contact with spring 40; the key 4 is adapted to contact with spring 41; the key 3 with spring 42; the key 2 with the spring 43 and key 1 with spring 44. 45, 46, 47, 48, 49, and 50 are a series of contact springs having their inner ends mounted upon and secured to a strip of insulation 51 fixed to the vertical frame plate 21, so that the respective ends of said contact springs will rest adjacent the shaft 27 and be engaged by the studs 28 when said shaft is revolved, that is—each of said springs is adapted to be engaged by an appropriate one of said studs. The spring 45 is adapted to be engaged by the stud 52, (see Fig. 12,) the spring 46 by the next stud of the series; the spring 47 by the next, and so on. The key 5 is connected to the spring 45 by means of an electrical conductor 53; the key 4 is connected to spring 46 by conductor 54; the key 3 is connected to spring 47 by conductor 55; the key 2 is connected to spring 48 by conductor 56; the key 1 is connected to spring 49 by conductor 57, and the contact spring 50 is connected to the plus pole of the battery, or other source of electricity, by means of conductor 58. The shaft 27 is connected to the main line 59, through some portion of the frame plate 9. Herein we show it connected to the vertical frame plate 21. A, B, C, D, E, and F indicate a battery, or other source of electricity, for the main line, and in case a battery is employed it is split into two main sections A and D having their poles reversely arranged, so as to send to line currents of different polarity, and each main section is divided into three unequal series adapted to send to line currents of different tension, so that currents of low, medium, and high tension and alternate polarity may be sent to line by such a battery. Of course, if dynamos are employed they will be connected to produce a like result. The contact spring 40 is connected to minus series F of the battery; the spring 42 is connected to minus series E; the spring 44 is connected to the minus main section D; the spring 41 is connected to plus series C; and the spring 43 is connected to plus series B. The contact spring 50, forming one of the series of contacts located adjacent the shaft 27, is denominated by us the "space-key contact," and it is permanently connected to the plus main section A of the battery, for the reason that the record strip at the receiving station is moved forward at each revolution of the shaft 27 of the transmitting instrument, in other words—the record strip is to be moved forward when any one of the keys is depressed. We have adopted this connection as the simplest and most desirable for the purpose. It will be observed, therefore, that a series of contacts 45, 46, 47, &c., are successively connected to main line 59, and that any determinate one of said series of contacts may be thrown into circuit at the will of the operator; or that all (except 50) or a determinate number of the series may be thrown into circuit. At the receiving station Y we locate the receiving instrument constructed to receive the electric impulses sent over the line by the instrument just described, and indicate them in a suitable manner, or record them in intelligible characters. Herein we describe one form of such, which may be denominated as a "three-strength" polarized-relay in main line, constituting a selecting device, and adapted to control a series of indicating or recording magnets located in the normally closed local circuit.

In Fig. 6 we have shown a magnet, having double coils and double poles, while in Fig. 12 we have illustrated three double pole magnets. We have shown three double pole magnets, marked respectively L, M, and H, each connected to main line 59, and said line grounded at the receiving station at R. The battery at the transmitting station is grounded in the middle at T. Each pole of the magnets L, M, and H, is provided with an armature, that is—magnet L is provided with armatures 60 and 61; magnet M is provided with armatures 62 and 63; and magnet H is provided with armatures 64 and 65. The lower end of each armature is pivotally attached at 66 to some portion of the frame of the selecting instrument, so that its upper end will be free to vibrate toward or from the pole of its magnet. The coils of the magnets L, M, and H are wound for line currents of low, medium and high tension, respectively, so that of the six armatures 60, 61, 62, &c., three will respond simultaneously to currents of high tension and given polarity; and the three adjacent the opposite poles of said magnets will respond to currents of high tension and opposite polarity; two of which armatures will respond simultaneously to currents of medium tension

and given polarity; and the two adjacent the opposite poles of two of said magnets will respond to currents of medium tension and opposite polarity; and one of which will respond to currents of low tension of given polarity; and the armature opposite this last named armature will respond to currents of low tension and opposite polarity. In other words, a weak current passing to ground at R, will affect only the armatures of the magnet L; a medium current will affect the armatures of only the magnets L and M; and a current of high tension will affect the armatures of all three magnets L, M and H. But whether the armatures adjacent given poles of said magnets are affected by a passage of such currents, will depend upon the polarity of said currents. In other words, a plus current of high tension will energize all three of the magnets and affect all three of the armatures of the adjacent poles of said magnets, while a minus current will have the opposite effect and will affect all the armatures of the adjacent opposite poles of said magnets, and will release the armatures which were affected by the plus current.

In order to control the several armatures of the series by the successive electric impulses of determined tension and polarity, which are sent to line by the transmitting instrument, we polarize said armatures by means of suitable permanent or other form of magnets. This is preferably done in the manner illustrated in Fig. 12, in which the three armatures of adjacent poles of the three magnets are polarized by means of permanent magnets 67, so placed as to induce magnetism of minus polarity in said three armatures, and in which the armatures of the opposite poles of said magnets are polarized by means of permanent magnets 68, placed to induce magnetism of plus polarity in said last mentioned series of armatures.

The indicating or recording instrument is clearly shown in Figs. 8, 9 and 10. In this instance it is composed of a series of six indicating or recording magnets *a*, *b*, *c*, *d*, *e*, and *f* each located in a local circuit 69 normally closed through each magnet and through local battery 70. Over the poles of the magnets *a*, *b*, *c*, &c., is a series of vibrating armatures *g*, *h*, *i*, *j*, *k* and *l*, corresponding in number to the said magnets. Circuit being normally closed through this series of magnets the armatures thereof will rest normally in contact with their poles. All of this series of armatures are provided with markers 71 at or near their inner ends, except the armature *l* which is provided at its inner end with a spacing dog or pawl 72, which is adapted to engage the spacing ratchet wheel 73, and feed the record strip, as in the ordinary stenograph, whenever said armature *l* is attracted by its magnet *f*. The recording instrument is fitted with a paper-holder 20 and ribbon-reels 23, all as in the transmitting instrument, and as in the ordinary stenograph. Each of the armatures *j*, *h*, *i*, &c., is pivotally mounted upon a standard 74, and is provided with a spring 75, which opposes the action of the magnets, and causes the armature to which it is attached to record or indicate only upon being released by its magnet. In case the form of selecting relay indicated in Figs. 6 and 7, is made use of, the magnets therein employed will be fitted with armature 60, which are secured together at their upper ends by means of a brass plate 76 and are thus caused to move and rest simultaneously, two armatures at each pole of each magnet. We will limit our description to one relay magnet, as all three of the series are identical. The two armatures at the poles of each magnet are, as before stated, connected by a brass yoke 76, so as to form a connected pair of armatures at each pole of each magnet. A permanent horse-shoe magnet 67 is located with its poles adjacent said armatures, so as to induce magnetism of opposite polarity in each armature of said connected pair. This arrangement is carried out at both poles of each magnet. (See Fig. 7.) Although one armature of the connected pair carries polarity of one kind, and the other armature of said pair carries the opposite polarity, yet the coils of the magnets are so wound that the passage of current through said coils will attract or repel both of said armatures simultaneously, as is well known to persons skilled in the art. The magnets above described are to be connected as shown in the diagrammatic view, Fig. 12, when their use is desired. 77, 78, 79, 80, 81 and 82 are a series of contact springs included in circuit with the local battery and the series of magnets *a*, *b*, *c*, &c. One of these springs is mounted adjacent the poles of the selecting magnets L, M and H, properly insulated and provided with contacts 83 and 84. The contacts 84 normally rest in contact with a back contact 85. The armatures 60, 61, 62, &c., are normally held against their back-stops 86, by the action of suitable springs 87.

The operation is as follows: Supposing the key 4 of the transmitting instrument to be depressed and immediately released by the ring finger of the operator, such action will cause its shank 14 to contact with the underlying spring 41, which will permit a low tension plus-current to flow from plus series C of the battery through said spring 41, through said shank, and through the conductor 54 to the contact 46 located adjacent the revoluble shaft 27. Meanwhile, the depression of the key 4, and its release (as described) has turned said shaft through one complete revolution, and the appropriate one of the series of spirally located studs 28 on said shaft, has made contact with said contact 46, and the plus low-tension current (or impulse) from the series C of the battery flows through said shaft to line 59 and through each of the selecting magnets H, M and L to ground at R. This being a low-tension plus impulse, will not cause the armatures of the medium and

high tension magnets H and M to be attracted, but will cause the armature 60 of the magnet L (which armature carries induced minus polarity) to respond and move inward into contact with the contact 83 carried by the contact spring 77, and throw said contact 83 against the in-stop 88, which will break the local circuit 69 by separating the contact 84 carried by said spring 78 from stationary back-contact 85. This action breaks circuit through the recording magnet *d* releasing its armature *j*, which latter is instantaneously thrown upward by its spring 75, and its marker 71 makes precisely the same mark upon the record-strip 19, at the receiving station, as if the said strip had been placed in the ordinary stenograph, and precisely the same mark as is made on the record-strip of the transmitting instrument. The same action follows upon the depression and release of the other keys, that is—a mark is made upon the record-strip at the receiving station, excepting the space-key 7, as its depression and release make no mark upon either record-strip, as previously explained. Upon depression of key 5 a low-tension minus current from minus series F of the battery will flow to ground at T and to line at R; through the magnets L, M and H in a direction the reverse of the plus current, through the shaft 27 to contact 45; through conductor 53 to the shank 14 of said key 5, through contact 40 in the path of said shank and to the series F of the battery. This will release armature 60 of selecting magnet L, and attract the opposite armature 61; the contact 84 (which is carried by spring 78) will thereupon be separated from contact 85, and local circuit will be broken through magnet *a*, and armature *g* will be released and mark or indicate. When key 2 is operated a medium tension plus current from plus series B of the battery flows through contact spring 43; through shank 14 of said keys; through conductor 56; through contact 48 to roller 27; through said roller to line 59, and through the selecting magnets H, M, and L to ground, as before, and the armature 60, and 62 of magnets L and M will be attracted simultaneously, and although the spring 77 and its connections will be apparently cut out of the local circuit, yet the response of armature 62 closes the local circuit through magnet *d* prior to such cut out, by contact of said armature with contact 83 carried by the spring 79. Immediately after this action, the inward movement of armature 62 separates contact 84 (carried by spring 79) from contact 85, and local circuit is broken through recording magnet *e*, and its armature *k* is thereby released and caused to mark or indicate. It may be well to state here that the springs 77, 78, 79, &c., and the armatures 60, 61, 62, &c., of the selecting instrument, are connected in multiple with the local battery 70 and the series of recording magnets *a*, *b*, *c*, &c., whereby the receiving apparatus is capable of performing certain peculiar functions hereinafter described. When the space-key 7 (not shown in Fig. 12, see Fig 2) is operated, a high-tension plus current from main section A of the battery flows through conductor 58 to contact 50; through the shaft 27 to line 59 and through magnets H, M and L to ground, and all three of the armatures 60, 62 and 64 respond, and local circuit is broken through magnet *f*, and its armature *l* is thereby released, and the pawl 72 carried thereby is caused to make a stroke upward, by the action of spring 75. But, as will be hereinafter explained, the effect of the electrical impulses upon the armatures of H, M and L, is only momentary, and therefore the armatures 60, 62 and 64 are immediately released. Hence, the contact 84 carried by spring 81 will, immediately after the release of said armature H, be caused to resume its normal position in contact with 85, by the recoil of said spring 81, and local circuit will again be established through said magnet *f*, and the pawl 72 will immediately make a down stroke, engage the teeth of the ratchet-wheel 73, and feed forward the record-strip through a determinate space. The operation just described will take place upon the depression and release of any one of the keys of the transmitting instrument, that is—the record-strip will be fed forward, for the reason before stated that the contact spring 50 of the said instrument is permanently connected to main line battery, and is momentarily connected to line at each revolution of the shaft 27. When key 3 is depressed and released, a medium-tension minus current flows from series E of the battery to ground and to line; through magnets L, M and H through roller 27 to contact 47 adjacent said roller: through conductor 55 to the shank 14 of said key, and through contact-spring 42 back to said series E of the battery. The armatures 61 and 63 will respond to this last-mentioned impulse, and local-circuit will be broken through recording-magnet *b*, by separation of contact 84 (carried by spring 80) from the back-contact 85, and the armature *h* of said magnet will be released and mark or indicate. During this action, local circuit is maintained through magnet *a* by way of spring 80, contact 83 carried by said spring, and armature 63, the spring 78 and its connections being cut-out, in a manner similar to that in which spring 77 was cut out. When key 1 is operated, a high-tension minus current from minus main-section D of the battery flows to ground at the transmitting-station: then to line at the receiving-station: through the selecting-magnets L, M and H: through the shaft 27: through contact 49: through conductor 57: through the shank 6 of said key to spring 44 and back to said section D of the battery. This will cause all three of the armatures 61, 63 and 65 to respond: contact 84 carried by spring 82 will be separated from contact 85 in local circuit with recording-magnet *c*, and local-circuit will be

broken through said magnet *c*, and its armature *i* will be released and mark or indicate. The springs 80 and 78 will be cut out, or short-circuited: but local-circuit will be maintained through magnet *b* by way of contact 83 (carried by spring 82) and the armature 65. Local-circuit will also be maintained through magnet *a* during the action just described, by way of spring 80, contact 83 carried by said spring, and armature 63. It will be seen that local-circuit is broken through but a single recording-magnet at a time, all the others having circuit closed through them. Very frequently, in using stenographic-transmitters of this class, a number of keys, say four, are operated simultaneously. This may be done. No confusion will occur at the receiving instruments, as such action will simply send to line a determinate number of electrical-impulses of determinate tension and polarity. The impulses are sent successively, that is—in regular order, one following another, with a short interval of time between each. The interval will depend upon the extent of separation of the contact-studs on the revoluble-shaft 27. The outer terminals of said studs are not in alignment, it will be semembered. They are located spirally and radially upon said shaft. (See Fig. 1.) From the instant of contact of one of them with its contact-spring, until the succeeding one contacts with its spring there elapses a short space of time. This prevents one impulse from merging into another, and the signals are received distinctly and accurately. No matter if all keys be operated simultaneously, electrical-impulses from the different sections and series of the battery will be sent to line successively, will be received successively, and recorded or indicated successively. Each impulse sent to line moves a separate local armature, and records or indicates a signal. It will be seen that the feeding-mechanism for the record-strip 19 does not move said strip forward until a key has been depressed and released, which, as in the ordinary stenograph, places said strip in position to receive another series of marks extending transversely of it.

We are aware, in telegraphy and telephony, that instruments have been devised to send to line electric-impulses of varied tension and polarity to indicate and record signals, and we therefore do not claim such, alone, as our invention. We do not, however, confine ourselves to the specific construction of instruments which we here show for carrying out our invention, as the same may be modified by persons skilled in the art, without departing from the scope of said invention.

The receiving-apparatus may be constructed to receive signals by sound or sight (by the use of any well known instruments for such purposes) instead of being recorded. Herein we show an instrument constructed to receive and record signals upon a traveling record-strip, by marks made in certain defined places transversely of the strip, each marker being located adjacent a different imaginary longitudinal-line on the strip: but it is obvious that the signals may be indicated to the sight by the simple movement of one or more of the markers or other indicators, or that the indicators may be used to sound different tones, thus indicating to the ear a certain letter or word by a certain note, or by two or more notes sounded simultaneously. A way of carrying out this is shown in the above-mentioned Letters-Patent granted to J. A. Parker, wherein the indicators are shown adapted to impinge upon bells of different tones.

Upon a review of the operation of the device it will be seen that any particular current of greater intensity than the low tension current has a capacity to select for action the particular relay which operates the recording magnet corresponding to the current sent by its representative key, closing the circuit with respect to all magnets operated by a current of lower tension. Thus, depressing key 2 which conveys a medium positive current operates relays L and M; but having a selective capacity for relay M, it acts upon magnet "*e*" and closes the local circuit with respect to the magnet "*d*." Of course, the momentary high tension current sent by the space key immediately after, selects magnet *f* and closes the local circuit with respect to the remaining recording magnets. The currents sent to line though of progressive intensity may be, and generally are communicated in variable succession.

What we claim is—

1. In a telegraph apparatus, a series of depression keys, a source of electrical energy composed of suitable subdivisions adapted to generate currents of variable intensity and polarity, conducting wires leading from said subdivisions and adapted to make electrical contact with each key of the series, a second series of conducting wires leading from the keys, a rotating drum adapted to conduct the respective currents from the second series of conducting wires, and a single line wire for communicating the impulses formed on the depression of the keys, substantially as set forth.

2. In a telegraph apparatus, a series of depression keys, a source of electrical energy composed of suitable subdivisions adapted to generate respectively currents of low, medium and high tension and positive and negative polarities, conducting wires leading from said subdivisions and adapted to make electrical contact with each key of the series, a second series of conducting wires leading from the keys, a rotating drum adapted to conduct the respective currents from the second series of conducting wires, and a single line wire for communicating the impulses formed on the depression of the respective keys, substantially as set forth.

3. In a telegraph apparatus, a series of de-

pression keys, a source of electrical energy composed of suitable subdivisions adapted to generate currents of variable intensity and opposite polarities, conducting wires leading from said subdivisions and adapted to make electrical contact with each key of the series, a second series of conducting wires leading from the keys, a rotating drum adapted to conduct the respective currents from the second series of conducting wires, a space key adapted to rotate said drum upon the depression of any key, and a single line wire for communicating the impulses formed on the depression of the keys, substantially as set forth.

4. In a telegraph apparatus, a series of depression keys, a source of electrical energy composed of suitable subdivisions adapted to generate currents of variable intensity and opposite polarity, conducting wires leading from said subdivisions and adapted to make electrical contact with each key of the series, a second series of conducting wires leading from the keys, a rotating drum adapted to be rotated by the space key, a spiral series of projections upon said drum and contact springs co-operating with said series to successively send to line a character upon a simultaneous or successive depression of the series of keys, and a single line wire for communicating the impulses formed on the depression of the keys, substantially as set forth.

5. In a telegraph apparatus, a series of depression keys, a source of electrical energy composed of suitable subdivisions adapted to generate respectively currents of low, medium and high tension and positive and negative polarities, conducting wires leading from said subdivisions and adapted to make electrical contact with each key of the series, a second series of conducting wires leading from the keys, a rotating drum adapted to conduct the respective currents from the second series of conducting wires, a single line wire for communicating the impulses of the currents, and relays in the path of the line wire operated by the selective capacity of the intensity of the current traversing the line wire, substantially as set forth.

6. In a telegraph apparatus, a series of depression keys, a source of electrical energy composed of suitable subdivisions adapted to generate currents of variable intensity and opposite polarity, electrical connections between the keys and electric energy for conveying the currents, a single line wire, a series of relays in the path of the line operated by the selective capacity of the intensity of the currents traversing them, a series of recording magnets corresponding to the depression keys, a local battery for energizing said magnets, and suitable connections in the path of the local current operated by the current traversing the relays for breaking the local circuit as to the particular magnet corresponding to the key depressed, and completing the local circuit with respect to the remaining magnets, substantially as set forth.

7. In a telegraph apparatus, a single line wire, a source of electrical energy composed of suitable subdivisions adapted to generate currents of variable intensity and opposite polarities, a series of depression keys for sending the current to line, a series of relays in the path of the line wire and operated respectively by currents of low, medium, and high tension, a series of recording magnets, a local circuit energizing the same, armatures for the relays responding in number according to the intensity of the current traversing the relays, and suitable connections co-operating with the armatures whereby a current of medium intensity breaks or renders effective the local circuit traversing the magnet corresponding to such current, and completing or rendering ineffective the local circuit traversing the magnet responsive to the current of low intensity; and whereby a current of high intensity breaks or renders effective the local circuit traversing the magnet corresponding to such current, and completing or rendering ineffective the local circuit traversing the magnet responsive to currents of medium and low intensity, substantially as set forth.

8. In a telegraph apparatus, a source of electrical energy adapted to send to line currents of progressively increasing intensity and opposite polarities, suitable means for sending the impulses of said currents in variable succession along the line, relays in the paths of the currents operated respectively by the selective capacities of the intensities of said currents, a local circuit, recording magnets corresponding each to an impulse of a particular intensity and polarity traversed by the local circuit, means co-operating with the magnets for recording the individual impulses, and additional means for sending to line a current of high intensity and given polarity but of momentary duration to represent the space key, substantially as set forth.

9. A telegraphic instrument having a number of divaricate circuit-closing or breaking keys, each key having at the ends finger buttons for the corresponding fingers of the right and left hands, and a revoluble contact device constructed to be rotated a complete revolution upon completion of a stroke by any one key of the series and make a determinate number of contacts successively at each revolution, substantially as set forth.

10. The combination, of two or more keys adapted to make and break electric circuit, a series of contacts of varied polarity constructed to carry currents of varied tension, one of said contacts arranged in the path of each key, a revoluble shaft 27 having contact studs 52 spirally arranged upon its surface and corresponding in number to the keys, a line to which said shaft is connected, and a series of

fixed contacts located a distance apart in the path of said studs, and connected to said keys, substantially as set forth.

11. In an electric-telegraph, the combination of a series of circuit making and breaking keys, as 1, 2, 3, &c., a series of contacts, as 40, 41 42 &c., fixed in the path of said keys and connected to sources of electricity arranged to send to line currents of varied tension and polarity, a revoluble-shaft, as 27, having a series of contact-studs 28 spirally arranged upon it, a line to which said shaft is connected, and an additional series of contacts, as 45, 46, 47 &c. located adjacent said shaft in the path of said studs and connected to said series of keys, and means for revolving said shaft upon depression of one or more of said keys, substantially as set forth.

12. An electric-telegraph having a sending or transmitting instrument, a line, suitable source of electricity, and a receiving-apparatus constructed with a series of six or more relay-armatures, three of which respond simultaneously to line-currents of high-tension and given polarity and operate one indicating or recording-stylus, and to line-currents of high-tension and opposite polarity to operate a second stylus: two of which armatures respond simultaneously to line-currents of medium-tension and given polarity and operate a third stylus, and to line-currents of medium tension and opposite polarity and operate a fourth stylus: one of which responds to line-currents of low-tension and given polarity and operates a fifth stylus: and one of which responds to line-currents of low tension and opposite polarity and operates a sixth stylus, substantially as set forth.

13. In a telegraph apparatus, a single line wire, mechanism for sending along said line impulses of currents of variable intensity and opposite polarities, a series of relays in the path of said line wire adapted to be operated by currents of progressively increasing intensity and either polarity and sent in variable succession, spring-actuated armatures operated by the currents traversing the relays, a series of recording magnets, a local circuit traversing the same, springs fixed in relation to the relay armatures co-operating with the latter and connected to the local circuit, each spring of the series being adapted to break or render effective the local circuit traversing the magnet corresponding to the particular intensity and polarity of the current traversing the relay operating its armature, and closing or rendering ineffective the local circuit traversing the remaining magnets, substantially as set forth.

In testimony whereof we affix our signatures in presence of witnesses.

JOSIAH ATKINS PARKER.
LELAND LAFLIN SUMMERS.

Witnesses to signature of Josiah A. Parker:
J. H. BARSACK,
H. C. WRIGHT.

Witnesses to signature of Leland L. Summers:
MERRILL WATSON,
F. E. HINCKLEY.