

(No Model.)

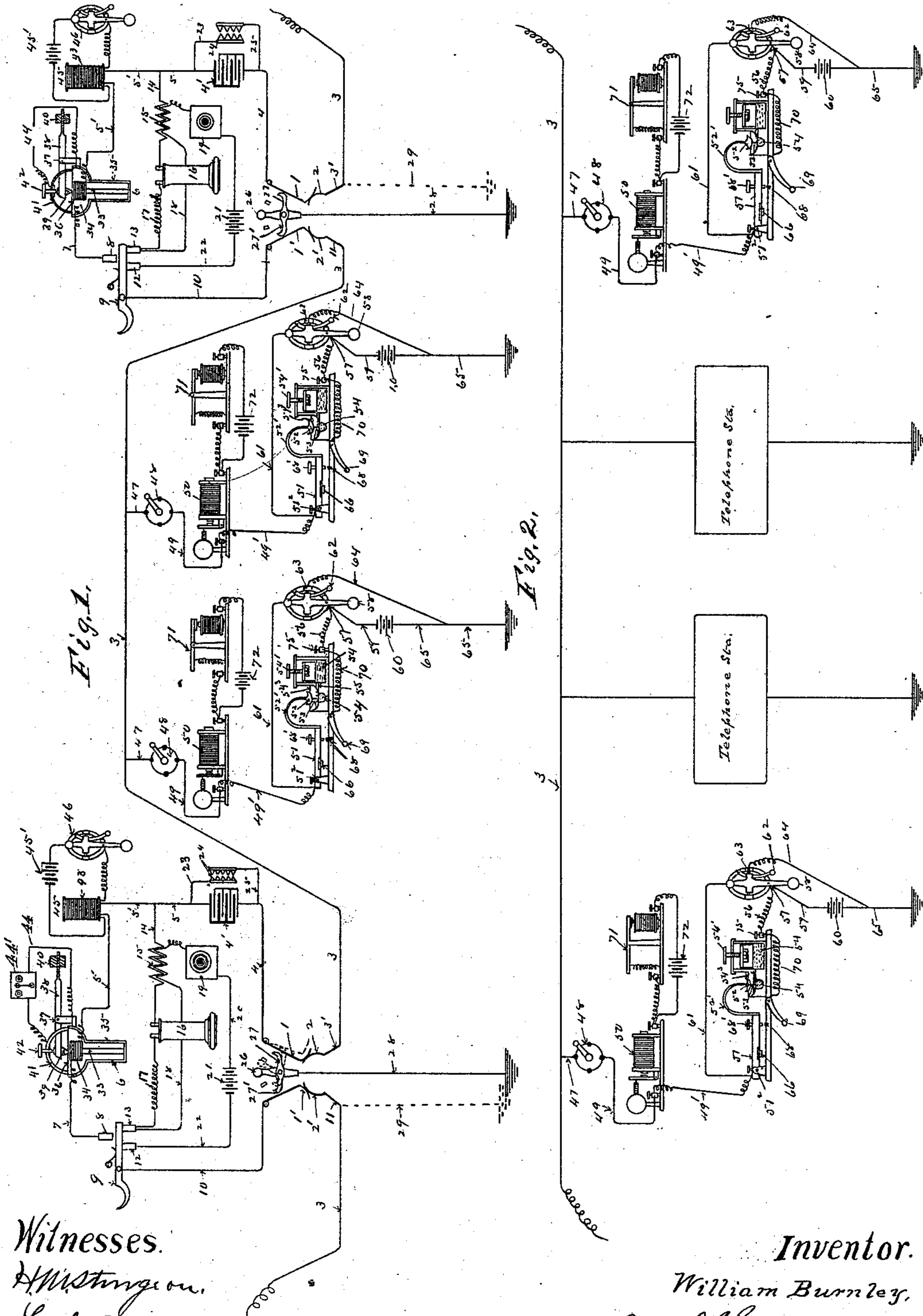
5 Sheets—Sheet 1.

W. BURNLEY.

COMBINED TELEPHONE AND TELEGRAPH SYSTEM.

No. 402,298.

Patented Apr. 30, 1889.



Witnesses.
H. Sturgeon.
G. J. Mead.

Inventor.
William Burnley,
By H. Sturgeon
Att'y.

(No Model.)

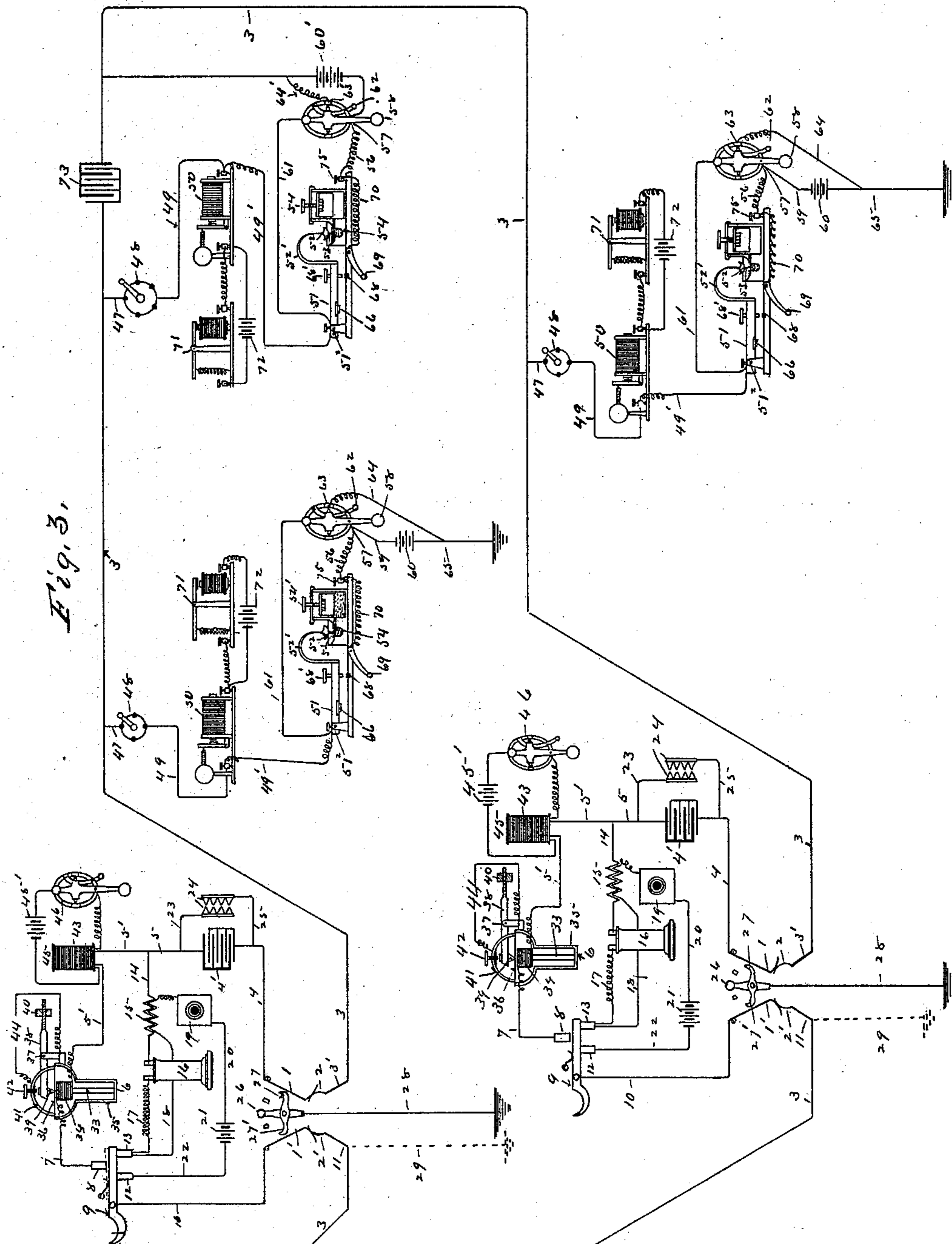
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W. BURNLEY.

COMBINED TELEPHONE AND TELEGRAPH SYSTEM

No. 402,298.

Patented Apr. 30, 1889.



Witnesses.
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(No Model.)

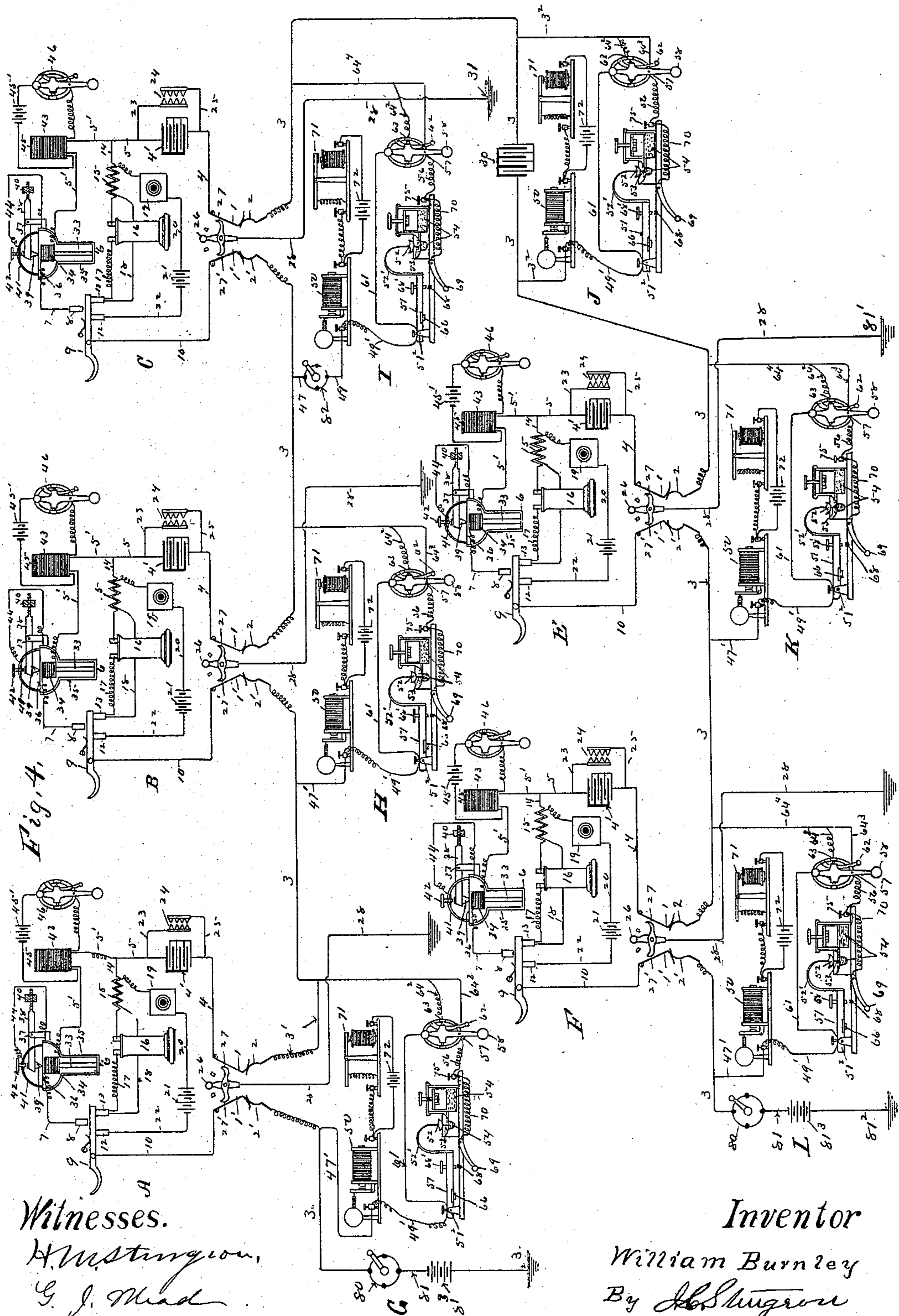
5 Sheets—Sheet 3.

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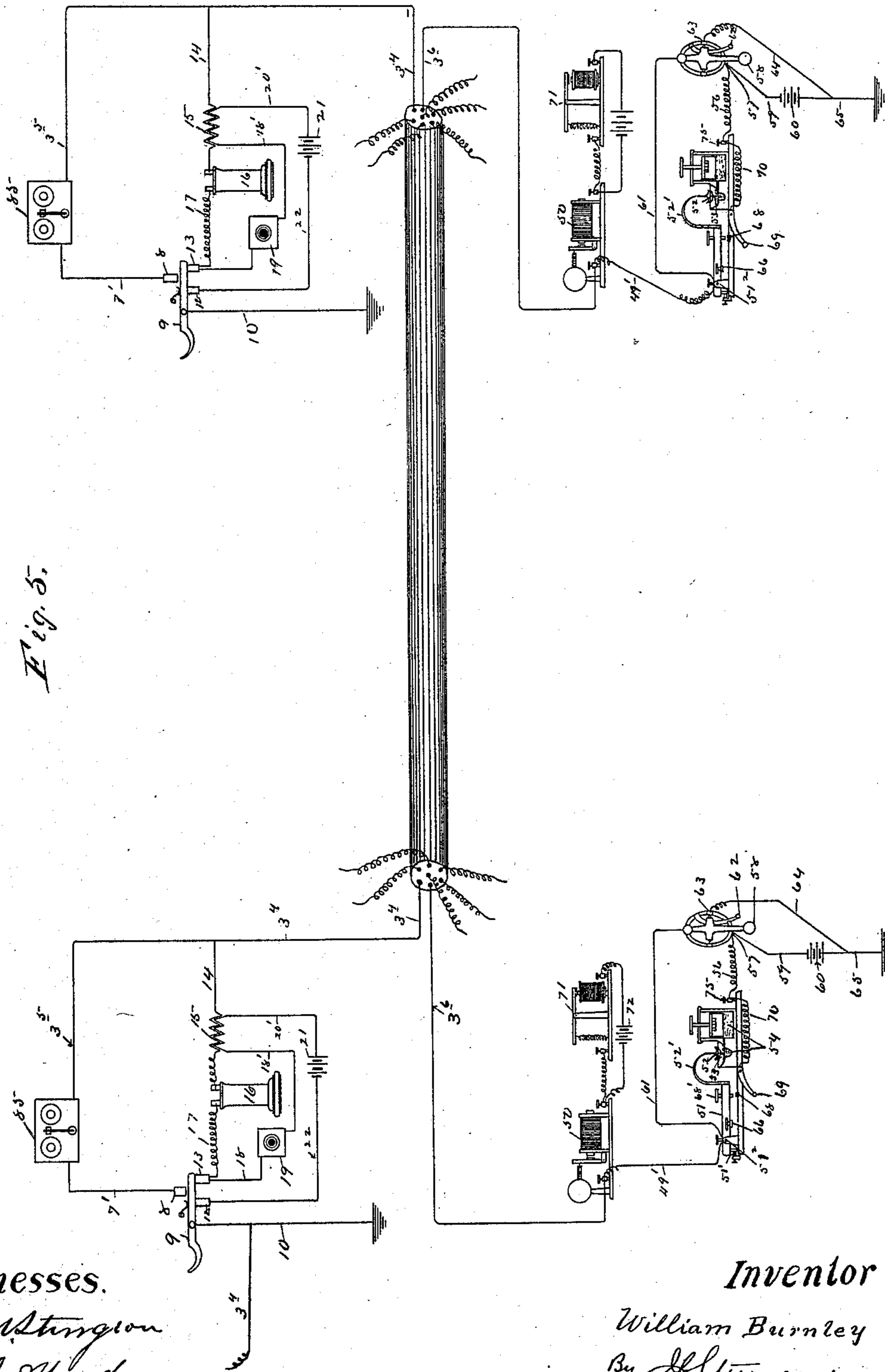
5 Sheets—Sheet 4.

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COMBINED TELEPHONE AND TELEGRAPH SYSTEM.

No. 402,298.

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Witnesses.

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Fig. 6.

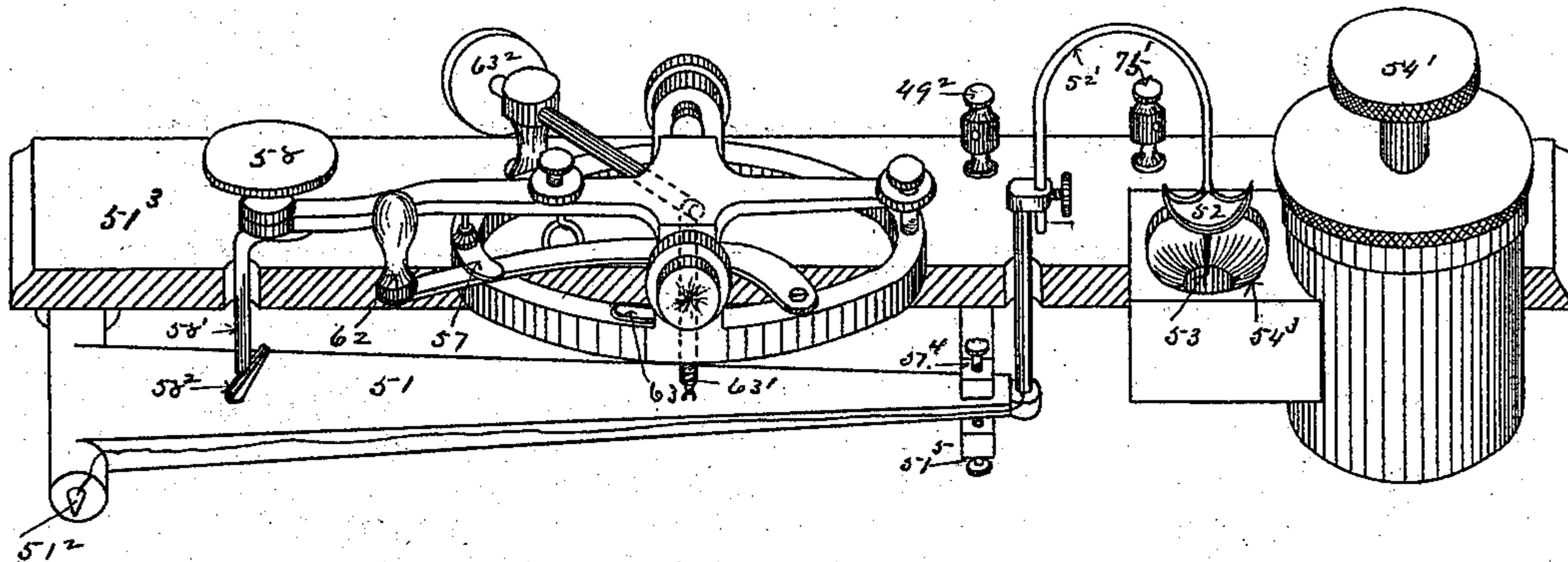


Fig. 7.

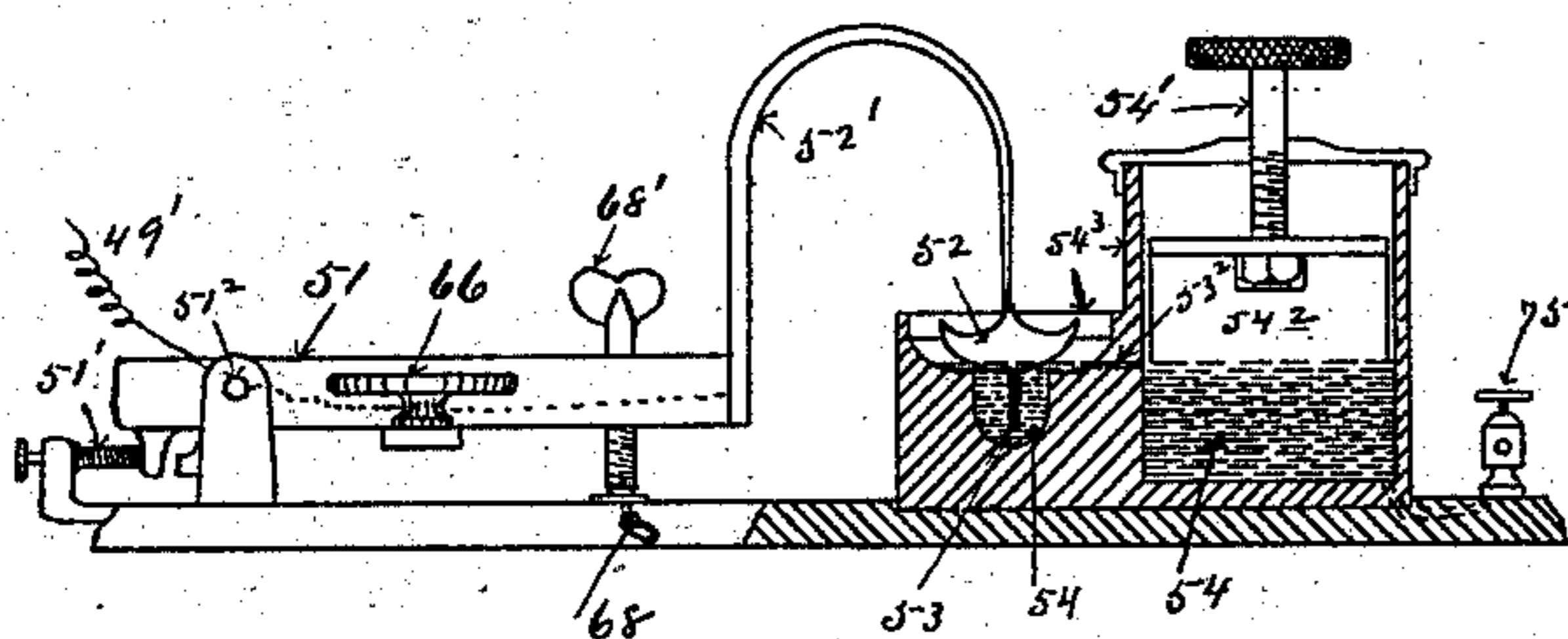


Fig. 9.

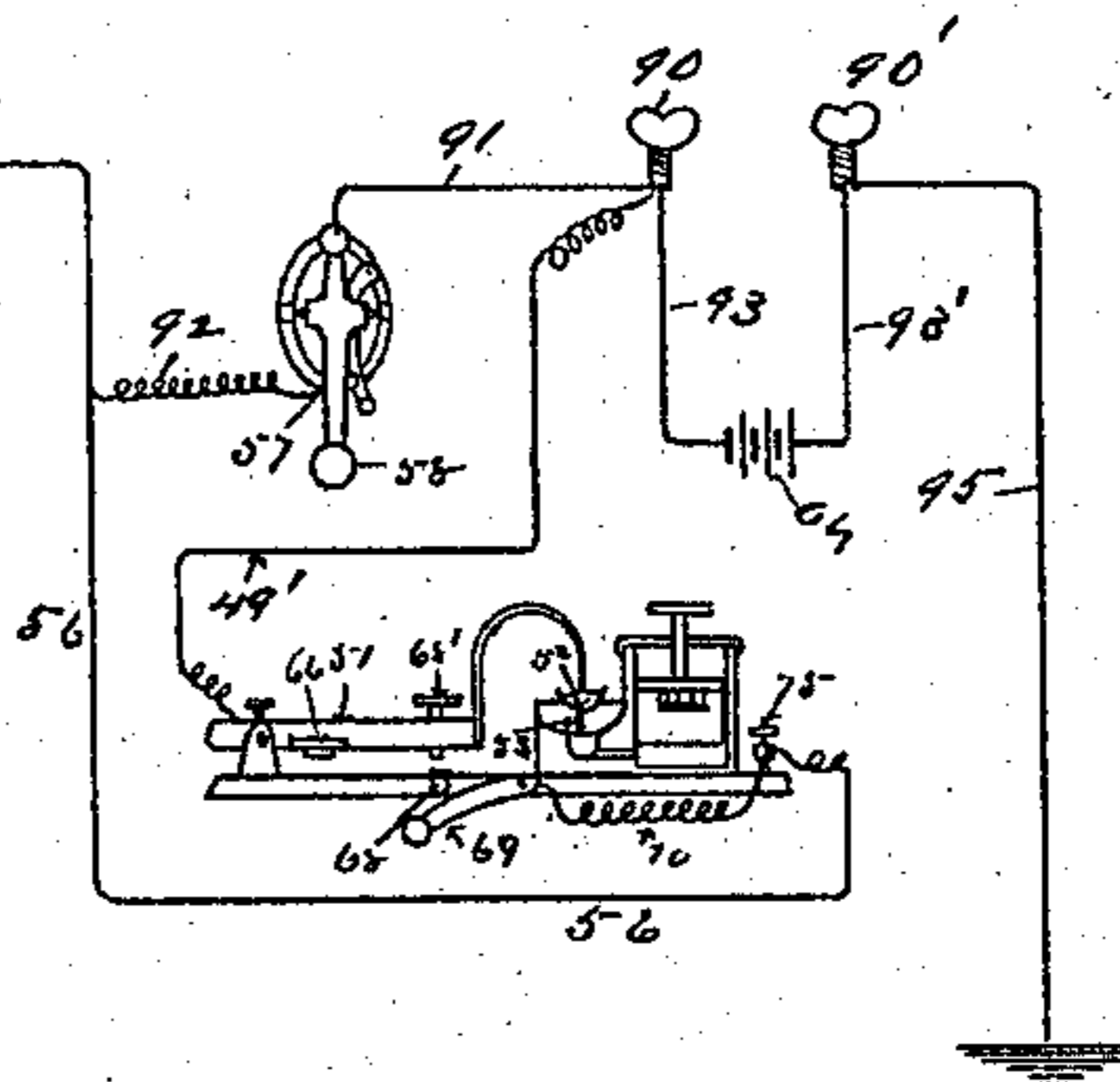
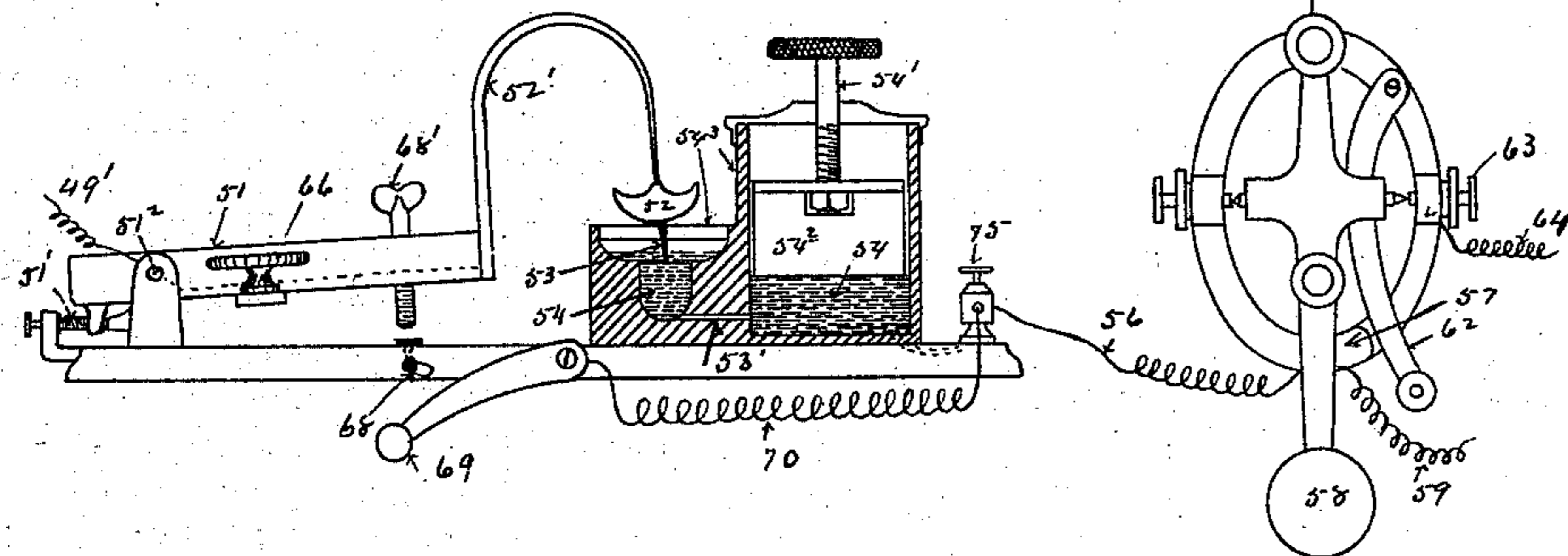


Fig. 8.



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UNITED STATES PATENT OFFICE.

WILLIAM BURNLEY, OF NORTH EAST, ASSIGNOR OF TWO-THIRDS TO CHARLES A. HITCHCOCK AND SAMUEL A. DAVENPORT, OF ERIE, PENNSYLVANIA.

COMBINED TELEPHONE AND TELEGRAPH SYSTEM.

SPECIFICATION forming part of Letters Patent No. 402,298, dated April 30, 1889.

Application filed January 30, 1888. Serial No. 262,436. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BURNLEY, a citizen of the United States, residing at North East, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Combined Telephonic and Telegraphic Systems and Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, forming part of this specification.

My invention consists in the improvements in combined telephonic and telegraphic systems and apparatus hereinafter set forth in the specification and claims, and illustrated in the accompanying drawings, in which—

Figure 1 illustrates a type of my improved combined telephonic and telegraphic system and apparatus and an arrangement thereof embodying telephonic terminal and telegraphic intermediate stations operating over the same main line. Fig. 2 illustrates a type and an arrangement thereof embodying telegraphic terminal and telephonic intermediate stations operating over the same main line. Fig. 3 illustrates a type of my improvements and an arrangement thereof embodying telephonic terminal and three telegraphic intermediate stations operating on the same main line, and also the location of the central telegraphic station in a derived circuit shunted from and back to the main line. Fig. 4 illustrates a type of my system whereby, *inter alia*, I operate my combined telegraphic and telephonic system on a cleared circuit. Fig. 5 illustrates a type of my improved system and apparatus whereby telegraphic and telephonic apparatus are adapted to simultaneously operate over main lines in close proximity to each other or bundled together in a cable, some as telephonic and others as telegraphic lines, without damaging induction or interference with each other. Fig. 6 shows a perspective view of one type of my combined undulatory-current and Morse-key telegraphic transmitter. Figs. 7 and 8 show enlarged views, partially

in section, of the undulatory-current telegraphic transmitter embodied in the types of my improved system shown in Figs. 1, 2, 3, 4, 5, and 9 of the drawings. Fig. 9 illustrates a modified arrangement of the electrical connections between the combined undulatory-circuit and the Morse or make-and-break telegraphic transmitting apparatus of my improved system.

Like letters or figures refer to like parts in all the figures.

The principal objects and features of my invention are, first, to provide in a telephonic and telegraphic system operating on the same main line telegraphic transmitting and receiving apparatus and mechanism and telephonic transmitting and receiving mechanism whereby telephonic and telegraphic messages can be simultaneously sent over the same line or circuit without interference with each other; second, to combine and arrange in a combined telegraphic and telephonic system telegraphic apparatus and mechanism embodying the invention and undulatory-current telegraphic system, shown, described, and claimed in my application for Letters Patent of the United States filed October 10, 1887, for a system of telegraphy involving the use therein of undulatory electrical currents; third, to provide and combine in a combined telegraphic and telephonic system and apparatus undulatory-current telegraphic transmitting or receiving mechanism in such manner that telegraphic and telephonic messages may be simultaneously sent and received on the same main line without damaging interference with each other; fourth, to provide a system and apparatus whereby telegraphic and telephonic lines can be simultaneously operated when in close proximity to each other without damaging induction or interference of the telegraph with the telephone wires; fifth, to provide a combined telephonic and telegraphic system wherein the damaging induction and interference of telegraphic with telephonic lines when placed in close proximity with each other, or when telephone and telegraph instruments are simultaneously operated on the same line or circuit, is dispensed with without embodying extra electro-

magnets or gradulators or rendering the telephone-receivers dull by enlarging their diaphragms, or otherwise rendering them less sensitive to acoustic vibrations, and so that telegraphic instruments and the most sensitive speaking telephone-receivers can be simultaneously operated on the same wire or circuit without interference, and as well also on contiguous wires, the damaging inductive effects of the telegraphic wires in this case being entirely eliminated.

The other features and objects of my invention will appear hereinafter in the specification and claims.

It may here be observed that the arrangement of circuits and combinations of mechanism hereinafter described for simultaneously telegraphing and telephoning on the same wire or for eliminating interfering induction between contiguous wires simultaneously used for telegraphy and telephoning is such, as will be hereinafter shown, that the circuit may be used for ordinary telegraphic purposes alone and operated with a common Morse key and ordinary telegraphic sounder mechanism in lieu of my improved telegraphic transmitting mechanism, in which case, however, the telephones along the line will emit rattling sounds due to the induced or direct currents from the telegraphic impulses produced by the make-and-break transmitting-key.

To more fully explain and illustrate my invention by referring to the drawings it will be seen that Fig. 1 shows a circuit in which two telegraphic stations are located on the same line between two telephonic stations, the connections being so made that the telegraph-stations may be operated either on an open or closed circuit. In this system the telephone-stations are the terminal stations. In Fig. 2 the stations are reversed, the telephone-stations being the intermediate and the telegraphic stations the terminals. In Fig. 1 the telephonic apparatus is located in a derived branch or circuit consisting of two portions each having two free ends or terminals, 1 2 and 1' 2', 1 normally contacting with 2 and 1' with 2', making a derived circuit from the main line 3 at 3' through the contact-springs 1 2, wire 4, condenser 4', and by wires 5 and 5' through the extra-current vibrator 6 and by wire 7 to contact-spring 8 and thence by lever 9 and wire 10 to contact-springs 1' 2' and line-connection 11 to main line. When, however, the lever 9 is down upon contact-springs 12 and 13, a circuit is completed from the main line 3 through the connection 3', the contact-springs 2 1, wire 4, condenser 4', wires 5 and 14, induction-coil 15, telephone-receiver 16, wire 17, contact-spring 13, lever 9, wire 10, contact-springs 1' 2', and connection 11 to main line.

Between the contact-springs 1 and 1', connecting the telephonic circuit with the main line 3, I place a switch, 26, which in its normal position, as shown, does not touch either of the

contact-springs 1 or 1'. To the cross-arms 27 and 27' of this switch is connected a ground-wire, 28, so that when the switch 26 is turned to the right, as shown in dotted lines in Fig. 1, the arm 27 presses the contact-spring 1 away from the contact-spring 2, breaking the electrical connection between them and establishing electrical contact between the arm 27 and the contact-spring 1, thereby grounding the current through the wire 28, and, vice versa, if the switch 26 is moved over in like manner to the left, wire 10 is in like manner grounded.

The object of the contact-springs 1 2 and 1' 2' and the switch 26 and its ground-wire 28 is that while the contact-springs 1 2 and 1' 2' normally complete the circuit when a number of derived or branch circuits, each containing telephonic apparatus, as shown in Fig. 1, are located in the same main line, as illustrated in Fig. 4, should station C desire to talk with station E the switch 26 at station C is turned to the left, thereby grounding wire 10, and at station E it is turned to the left, thereby grounding wire 10. Now, as I trace the course of the telephone-circuit from station C to station E, I find that one portion of it goes to ground through the switch 26 and its ground-wire 28, while the other portion passes to line 3 and through the condenser 30 at telegraph-station J, and continuing on main line 3 to station E, and thence through contact-springs 1 2, by wire 4, condenser 4', induction-coil 15, receiver 16, contact-spring 13, lever 9, wire 10, and switch-arm 27' to ground through wire 28. Thus it is obvious that the grounding of the current by means of switch 26 places the resistance of telegraph-station I, as well as the resistance of the telegraph-stations G H, to the left of station C in such shape as to enhance the value of the telephonic currents from station C to station E, the outgoing telephonic currents from station E to station C being also enhanced by reason of and in proportion to the resistance of the telegraphic apparatus located at the telegraph-stations K and L between ground 81' and telegraphic ground 81², and these results so produced by the resistance of the telegraphic apparatus at telegraph-stations, as aforesaid, are reciprocally exerted upon the telephonic current both ways.

The telephonic transmitters and receivers and their intermediate connections at all of the stations shown are of usual and ordinary construction and so well known and understood that further reference thereto is deemed unnecessary. In lieu, however, of the ordinary magneto call-bell, I have provided an extra-current vibrator, 6, the ordinary magneto-currents produced by the bell mechanism ordinarily used for such purpose not being of sufficient tension to pass through the condenser 4' and actuate the ordinary magneto-bell. This vibrator 6, I construct of a permanent magnet, 33, having a coil of wire, 34, around one end thereof, the same as in an or-

dinary telephone-receiver. This magnet and coil I place in a case, 35, which in the drawings is shaped like an ordinary telephone-receiver case, and is provided with a diaphragm, 36, in the usual manner, but somewhat larger than the ordinary telephone-receiver diaphragm. To one side of the case 35, I secure an arm, 37, in which is pivoted a horizontal lever, 38, having on its inner end a contact-piece, 39, which rests on the center of the diaphragm 36, the other end of the lever 38 being provided with a screw-threaded weight, 40, adapted to be adjusted as required. To the sides of the top of the case 35, I also secure an arch, 41, which spans the central portion of the diaphragm 36, and centrally over the contact-piece 39, I place a screw, 42, the lower end of which is provided with a platinum tip adapted to make contact with a platinum button in the top of the contact-piece 39 when the diaphragm 36, upon which the contact-piece 39 rests, is actuated by induced currents or by currents from a primary coil, 43. The local circuit indicated by wires 44 (the remainder thereof not being shown) will be closed, so as to operate a signal-bell or other suitable signaling apparatus (not shown) located in said circuit 44. In the local circuit 45, I place a battery, 45', and also a suitable make-and-break key, 46, for signaling purposes. The telephonic circuit is also provided with a shunt-line, 23 25, having a lightning-arrester, 24, located therein for the purpose of shunting lightning around the condenser 4'.

In connecting the telegraphic apparatus used at separate telegraph-stations to the main line 3, I attach a branch line, 47, thereto, leading to a rheostat, 48, from which a wire, 49, extends to the relay 50, and thence by wire 49' to the key-lever 51 of my improved undulatory-current telegraphic transmitter, and thence by a metallic connection along said lever 51 and metallic electrode 52 and non-conducting medium 53, secured to the lower part of the electrode 52. The lower end of said medium 53 reaches into the semi-conducting fluid 54, being covered with a film thereof, said fluid being in circuit with binding-post 75, thence by wire 56 to insulated contact-point and plate 57 of key 58 and by wire 59 to battery 60. The wire 61 is a shunt-line connecting with the base of key 58, or with the switch-lever 62 thereof, so that when the switch-lever 62 is thrown back into contact with the insulated contact-point and plate 63 it connects with wires 64 and 65 for the purpose of shunting the battery 60, and also for the purpose of preserving the continuity of the line when it is desired to operate on the closed-circuit plan, the continuity being completed when the switch-lever 62 is in contact with the insulated contact-point 63.

One of the important features of my improved systems of simultaneous telegraphy and telephony on the same line or circuit is my improved telegraphic transmitter, en-

larged views of different forms of which are illustrated in Figs. 6, 7, and 8. Referring to Figs. 7 and 8, 51 is the key-lever, pivoted at one end in bearings 51², which bearings are electrically connected with the contact-screw 68' and curved arm 52', on the end of which is secured the metallic electrode 52, and to the metallic electrode 52 is secured a slender strip of glass, ebonite, or any other suitable non-conducting substance. The key-lever 51 is also provided with a finger-knob, 66, and a spring, 51', for raising the key-lever 51 when the pressure is removed therefrom.

The contact-screw 68' serves to make contact with the contact-point 68, and also serves to adjust the downward motion of the key 51.

54³ is a fountain-cup provided with a plunger, 54², operated by means of an adjusting-screw, 54'. This fountain-cup is filled with a semi-conducting fluid, 54, the height of which in the bowl of the cup 54³ is regulated by means of the adjusting-screw 54', so that when in operation the key-lever 51 is depressed the metallic electrode 52 enters the fluid 54, and when the key-lever 51 is up the lower end of the non-conducting medium 53 remains in the fluid 54, which is electrically connected with the binding-post 75, so that at all times there is a continuity of circuit from the fluid to the electrode 52 through a film of the semi-conducting fluid 54 adhering to the non-conducting strip 53.

69 is a switch adapted to connect the contact-point 68 with wire 70 and binding-post 75, and thence by wires 56 and 59 to battery, thus making a metallic continuity of the circuit at the instant the full potential is reached through the semi-conducting fluid 54.

In Fig. 6 I show how I combine my improved undulatory telegraphic transmitter and the ordinary Morse key together to form the telegraphic transmitting mechanism of my improved combined telephonic and telegraphic system, and it may here be observed that the electrical connections in this form of transmitter are substantially the same in arrangement and operation as that shown in Figs. 1, 2, 3, 4, 5, 7, and 8, hereinbefore described, in those figures the parts having been shown detached from each other the better to illustrate and explain their connections.

In the form of telegraphic transmitter shown in Fig. 6 the lever 51 is mounted in the bearings 51², and is provided with a metallic arm, 52', to which a metallic electrode, 52, is fixed, having a slender strip of non-conducting medium, 53, secured to the lower extremity thereof. The free end of the lever 51 operates between adjusting-screws 51⁴ and 51⁵, for limiting its movement. The fountain-cup 54³ is of the construction shown in Figs. 7 and 8 hereinbefore described. The Morse key is here shown as secured on the frame 51³ directly over the lever 51, and is electrically connected therewith, (connections not shown,) substantially as hereinbefore described. In place of a finger-knob, 66, on the

lever 51, I secure to the key 58, directly under the finger-knob thereof, a downwardly-projecting rod, 58', the lower end of which comes into contact with the inclined stud 58², so that when the lever or key 58 is depressed the lever 51 is likewise depressed, a spring, 63', serving to raise the lever 51, this spring being adjusted by a spindle, 63². This device is also provided with a proper number of binding-posts, of which 49² and 75' only are shown. In operation this type of telegraphic transmitter operates in the same manner as those hereinbefore described, producing like effects and results.

In Fig. 2, as has been hereinbefore stated, two telephone-stations are located on the line 3 between two telegraph-stations, while in Fig. 3 these telegraph-stations are located on the line 3 between two telephone-stations. In this type of my system the circuit arranged is the same as that hereinbefore described, except that of the central telegraph-stations. At this station the telegraphic apparatus is located in a derived circuit shunted around a condenser, 73, located in the main line 3.

The arrangement of circuits in Figs. 1, 2, and 3 is such that in telegraphing they may be operated on either open or closed circuit. When it is desired to operate on open circuit, the switch-lever 62 is closed upon contact-plate 63 at the two stations not sending, while at the station sending the switch-lever 62 is open and occupies a position intermediate between contact-plates 57 and 63. Now, when the key 58 is depressed upon the contact-point 57 the current is from battery 60 to said contact-point 57, thence by key 58 to wire 61, and thence by wire 49', relay 50, wire 49, rheostat 48, and wire 47 to main line 3. While receiving, however, the switch-lever 62 is moved upon contact-plate 63. Then the current is from main line 3 through line 47, rheostat 48, wire 49, relay 50, and wires 49' and 61 to switch-lever 62 and contact 63, and thence to ground by wires 64 and 65. If, however, it is desired to operate on closed circuit, the switch-levers 62 are all moved upon the contact-plates 57, which closes the circuit and puts all of the batteries to the main line 3. While the operator is sending, however, he moves the switch 62 of his key to a position intermediate between the contact-plates 57 and 63 and then operates his key in the usual way.

When it is desired to transmit messages by the undulatory current on closed circuit, the switch-levers 62 are closed on the contact-plates 57. The operator sending them manipulates the key-lever 51 by means of the finger-knob 66 in the same manner as he would use the ordinary key-lever, 58. On depressing the key-lever 51 the current is from battery 60 to contact point and plate 57 and to binding-post 75, thence through the semi-conducting fluid 54 to metallic electrode 52, through the key-lever 51 to wire 49', through relay 50, wire 49, rheostat 48, and wire 47 to main line 3. When receiving, the operator closes the switch-

lever 62 on contact-plate 57. The circuit is then from main line 3, through wire 47, rheostat 46, relay 50, and by wire 49', through wire 61, key 58, contact-plate 57, and wire 59, to battery 60, and thence to ground by wire 65.

The type of my improved system shown in Fig. 4 is designed to illustrate my arrangement for operating a telegraphic and telephonic system on a closed circuit. In this arrangement I show how, when telegraph-stations intervene on the same main line between telephone-stations—for example, see telephone-station J, Fig. 4—a condenser forces the telegraph-currents through the telegraphic instruments, this being done by placing the condenser 30 in the main line 3 and the telegraph-instruments on a branch circuit, 3², shunted around the condenser 30. In this type of my system no rheostats are necessary to shunt the condenser; neither is it necessary to use electro-magnetic gradulators in the branch circuit 3²; but a rheostat is placed in each terminal telegraph-station ground-wire 81, and under some circumstances it might be advisable to place a rheostat, 82, at each telegraph-station between the main line 3 and the relay 50, as illustrated at telegraph-station I; but they would be seldom needed. In this arrangement it will be observed that the telegraph apparatus at stations A, B, C, E, and F in Fig. 4 are of the same type shown in Figs. 1 and 3, hereinbefore described. In this system, however, I show stations A, G, B, H, CI, EK, and FL, in which both telegraphic and telephonic apparatus are located, the telegraphic apparatus at these stations also being of the same type as that shown in Figs. 1, 2, and 3, hereinbefore described.

The type of my system shown in Fig. 5 is designed to illustrate an arrangement of telephonic and telegraphic mechanism for simultaneously operating the same over wires in close proximity or when bundled together in a cable, some being telegraph and some telephone wires. In this arrangement the line 3⁴ is shown as in use for telephonic purposes alone. In that case the condenser 4' and also the extra-circuit apparatus 43 to 46 and the extra-current vibrator 6 are eliminated, and an ordinary magneto-bell, 85, in the line 3⁵ used in lieu thereof, the remainder of the telephonic apparatus being the same as that hereinbefore described, the main line 3⁴ being connected thereto and grounded through wire 10 in the usual way or through induction-coil 15 and same wire. The telegraphic apparatus used on the contiguous wires 3⁶ is of the character hereinbefore described, its operation being such that no magnetic gradulators or condensers are necessary for eliminating the inductive interference of the telegraphic with the telephonic mechanism.

In Fig. 9 I show a modified arrangement of the electrical connections between the undulatory-current telegraphic transmitter and the Morse-key mechanism. In this arrangement wire 49' extends to binding-screw 90, and

thence by wire 91 to Morse key, and thence by contact-point 57, while wire 56 is extended to and connects relay 51', contact-point 57 being also connected with wire 56 by wire 92. From binding-screw 90 a wire, 93, extends to battery 94, and thence by wire 93' to binding-screw 90' and wire 95 to ground. By this arrangement of connections I can operate with either key—viz., by opening the Morse key and operating with that or by opening the switch on the undulatory current-transmitter and operating with that, as the operator may desire.

In the description of my improved combined telephonic and telegraphic system hereinbefore given I have shown and referred particularly to an undulatory-current telegraphic transmitting apparatus as part of my system and apparatus. However, it is obvious that the undulatory-current apparatus and system of telegraphy shown and described in my application hereinbefore referred to are applicable to and may be used in and as a part of the combined telephonic and telegraphic system hereinbefore described, the undulatory-current telegraphic instrument in the former case operating to produce and maintain a like type of undulatory and continuous current as is produced and maintained by the undulatory-current telegraphic transmitter described in this case; hence I have not particularly shown or described said undulatory telegraphic mechanism, as its relation to and operation in the combined system herein described are obvious to those skilled in the art to which my said inventions relate; also, in describing my invention, the construction, arrangement, and operation of many of the devices hereinbefore referred to as parts of the mechanism of my improved combined system are so well known to those skilled in the art to which my invention appertains that I have deemed it unnecessary to embody a detailed description thereof in this specification; but I have fully described the novel features of my invention and their combination with such known devices, so as to enable others skilled in the art to which it appertains to construct my combined system and apparatus and operate the same.

Therefore what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a combined telegraphic and telephonic system, the combination of undulatory-current telegraphic transmitting-instruments adapted to operate and maintain a continuous current over a main line, and telegraphic receiving-instruments on said line, with telephonic transmitting and receiving instruments operating over said main line, and condensers between said telephonic instruments and said main line, substantially as and for the purpose set forth.

2. In a combined telegraphic and telephonic system, the combination of undulatory-current telegraphic transmitting apparatus, tele-

graphic relay, sounder, and battery apparatus with telephonic receiving, transmitting, and signaling apparatus, all operating on the same main line, and a condenser through which the telephonic current passes from the main line to the telephonic instruments, whereby both telegraphic and telephonic currents simultaneously pass over the main line to and from the telephonic and telegraphic instruments without interference with each other, substantially as and for the purpose set forth.

3. In a combined telegraphic and telephonic system, the combination, on a main line, of terminal stations having telephonic transmitting, receiving, and signaling instruments operating over said line, and condensers between said instruments and the main line, with intermediate telegraphic stations on said line having undulatory-current telegraphic transmitting-instruments through which a continuous current may be maintained over the main line, and telegraphic receiving-instruments on said line at said intermediate stations, substantially as and for the purpose set forth.

4. In a combined telegraphic and telephonic system, the combination, on a main line, of terminal stations having undulatory-current telegraphic transmitting-instruments through which the currents over the main line can continuously pass, and telegraphic receiving-instruments on said line at said stations, with intermediate telephone-stations having telephonic transmitting, receiving, and signaling instruments operating on said line, and condensers between said instruments and said main line, substantially as and for the purpose set forth.

5. In a combined telegraph and telephone system, the combination, on a single main line, of terminal telephone-stations having condensers between them and the main line, and intermediate telegraph-stations having undulatory telegraphic transmitting mechanism, with condensers located in the main line at some of the telegraph-stations, said telegraph-stations being located in derived lines shunted to and from the main line around said condensers, and rheostats between the relays and main line at each telegraph-station, substantially as and for the purpose set forth.

6. The combination, in a single main-line system, of a closed telegraphic circuit having undulatory-current telegraphic transmitting mechanism, and ordinary relays, and receiving mechanism operating thereon, with telephonic mechanism and condensers at terminal and intermediate stations on said line, and intermediate telegraphic stations located in circuits shunted around condensers in the main line, substantially as and for the purpose set forth.

7. In a combined telegraphic and telephonic system having main-line wires bundled together into a cable and insulated from each other, the combination of undulatory-current transmitting-instruments operating

over some of said wires and adapted to maintain continuous electrical currents over such wires, and telegraphic receiving-instruments on said wires, with telephonic transmitting and receiving instruments operating on other of said wires, and condensers between said telephonic instruments and the main-line wires over which they operate, substantially as and for the purpose set forth.

8. The combination, in a single main-line electrical-circuit system, of telegraphic stations each having undulatory telegraphic transmitting apparatus, relays, and sounders, and located in derived circuits shunted from the main line, and having rheostats therein, with telephonic stations each having a condenser, an induction-coil, a telephone transmitter and receiver, a local-battery circuit, a rapid-discharge signaling apparatus, a switch for putting the telephone induction-coil and local battery into and out of circuit and for putting the extra-current signaling apparatus into circuit when the telephone is not in use, and located in and connected to said circuit each way by means of contact-springs having a grounded switch between said contact-springs, whereby the current on the main line may be grounded from either direction and two classes of messages be simultaneously sent over the main line or circuit without interference with each other, substantially as set forth.

9. The combination, in a single main-line electrical-circuit system, of a closed telegraphic-circuit apparatus having one derived branch at each joint-station containing undulatory-current telegraphic transmitting apparatus, keys, relays, sounders, and rheostats, with another derived branch at each joint-station containing telephonic apparatus consisting of a condenser, induction-coil, telephonic transmitter and receiver, local-battery circuit, rapid-discharge signaling apparatus, and switches, whereby telephonic currents will pass through the condensers and through the undulatory-current telegraphic transmitting apparatus when the undulatory-current telegraphic transmitting apparatus is normally open or when the current is at its lowest potential, substantially as and for the purpose set forth.

10. The combination, in a single main-line electrical-circuit system, of a closed-circuit telegraphic apparatus consisting of undulatory-current telegraphic transmitters and keys, relays, sounders, and rheostats, with an extra or secondary current vibrator control-

ling a signaling apparatus in a local-battery circuit arranged in a branch circuit, shunting the telegraphic branch circuit, and containing a condenser, telephonic apparatus, and grounding-switches, substantially as and for the purpose set forth.

11. In a combined telegraphic and telephonic system, the combination of undulatory-current telegraphic transmitting-instruments through which electrical currents over the main line can continuously pass, telegraphic receiving-instruments on said line, telephonic transmitting and receiving instruments operating over said main line, and condensers between said telephonic instruments on said main line, with extra or induced current vibrators adapted to operate telephonic signaling apparatus, substantially as and for the purpose set forth.

12. In a combined telephonic and telegraphic system, the combination, on the same main line, of telephonic signaling, transmitting, and receiving mechanism with telegraphic receiving mechanism and combined undulatory-current telegraphic transmitting and Morse-key telegraphic transmitting mechanism, substantially as and for the purpose set forth.

13. The combination, in the telegraphic transmitting-instruments of a combined telegraphic and telephonic system operating on the same line, of undulatory-current telegraphic transmitters with make-and-break transmitting-keys, substantially as and for the purpose set forth.

14. The combination, in a telegraphic transmitter for combined telephonic and telegraphic systems operating on the same main line, of an undulatory-current transmitting key-lever operating to immerse a metal electrode in electrical connection therewith into and withdraw the same from a conducting-liquid in circuit, and also to simultaneously immerse a non-conducting medium connected with said electrode into and partially withdrawing the same from said liquid, with a make-and-break key-lever, so that the two key-levers can be simultaneously operated by means of the finger-knob of the make-and-break key, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM BURNLEY.

Witnesses:

C. J. STURGEON,
H. J. CURTZE.