(No Model.) 4 Sheets—Sheet 1.

H. ETHERIDGE.

INDIVIDUAL CALL SYSTEM FOR AUTOGRAPHIC TELEGRAPHS.

No. 555,938. Patented Mar. 10, 1896.

Fig. 3

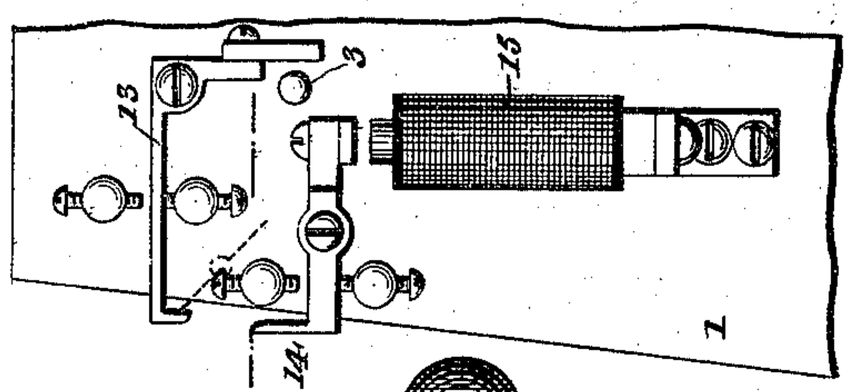


Fig. 4

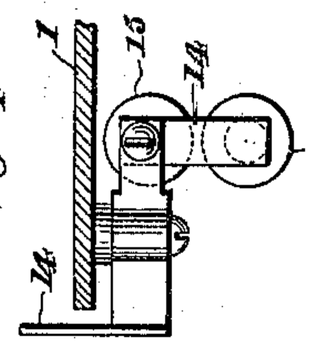


Fig. 2

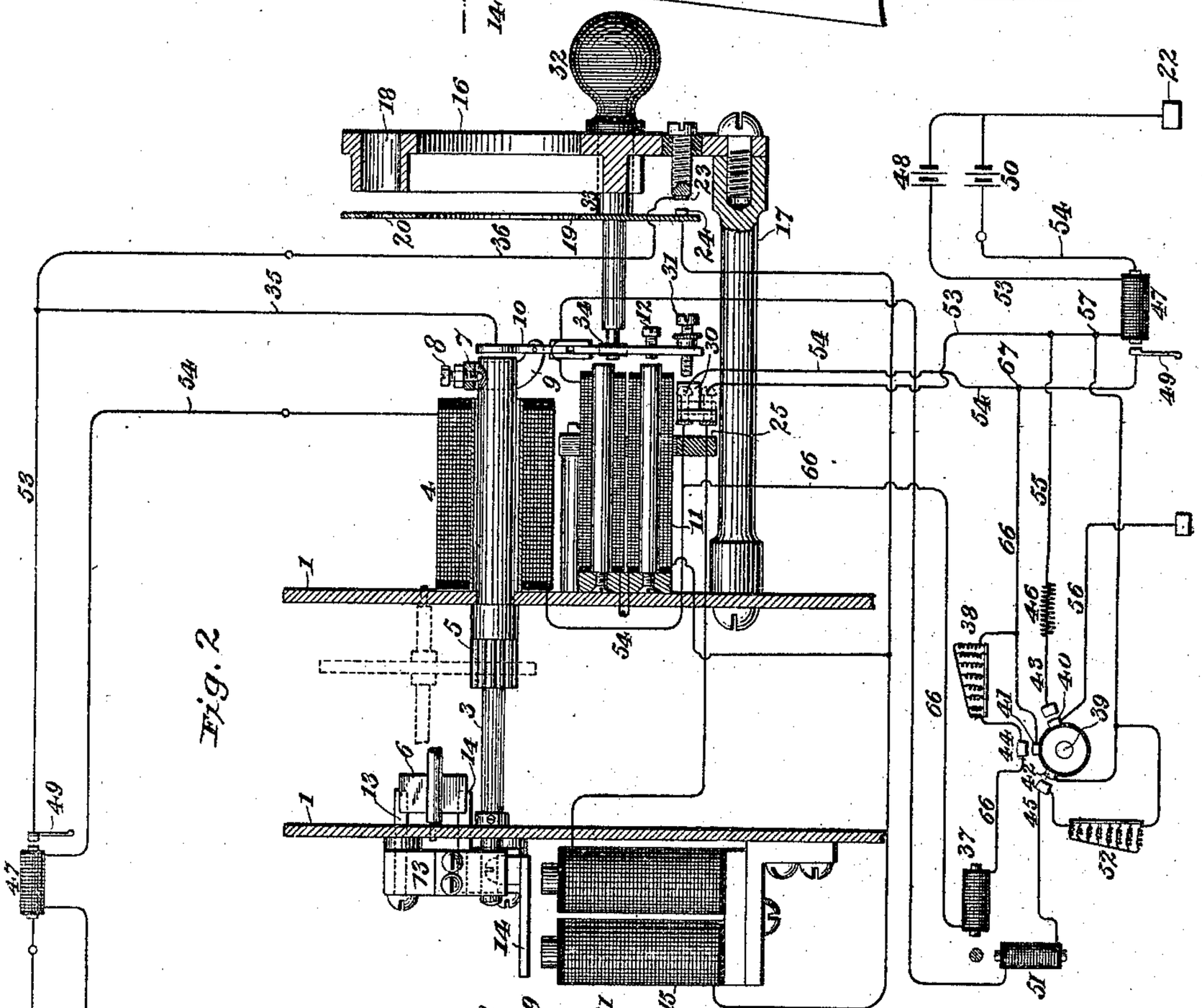


Fig. 1

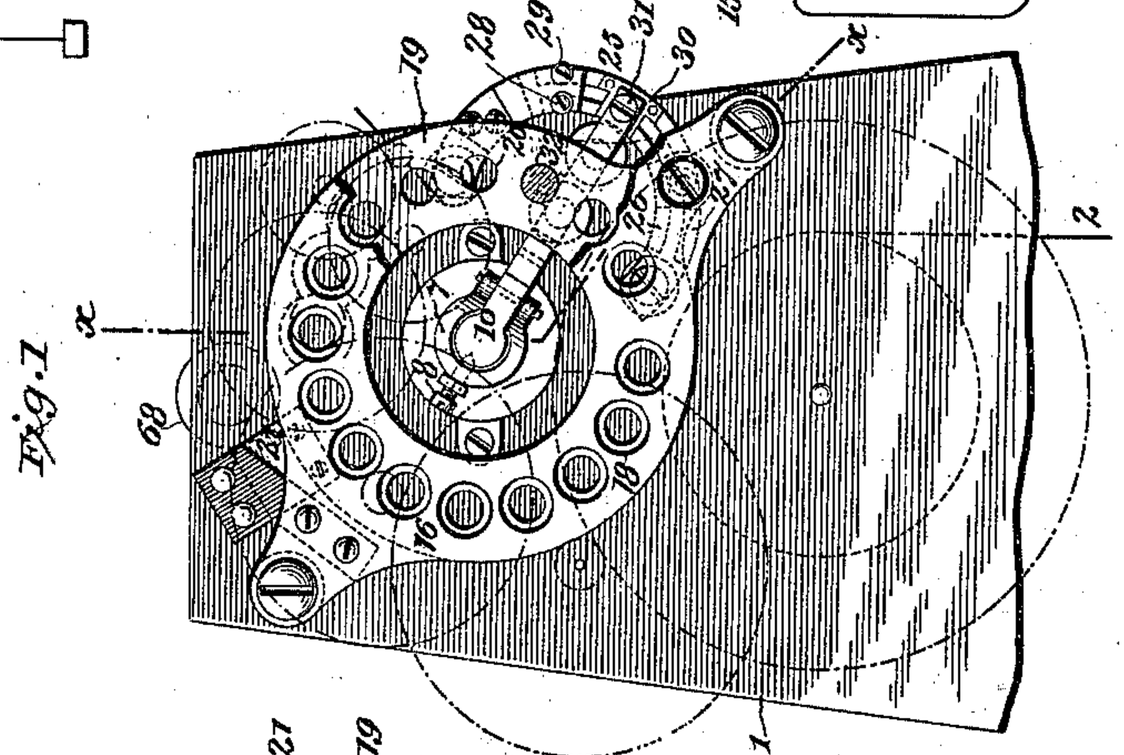


Fig. 5

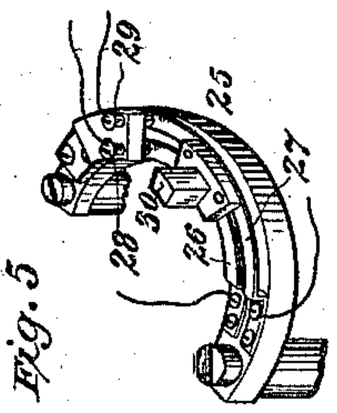
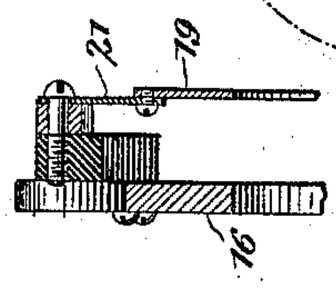


Fig. 6



Witnesses:
Raphael Netter
W. C. Pinckney

Inventor:
Harry Etheridge
by Howson & Sheerens,
Attorney.

(No Model.)

4 Sheets—Sheet 2.

H. ETHERIDGE.

INDIVIDUAL CALL SYSTEM FOR AUTOGRAPHIC TELEGRAPHS.

No. 555,938. Patented Mar. 10, 1896.

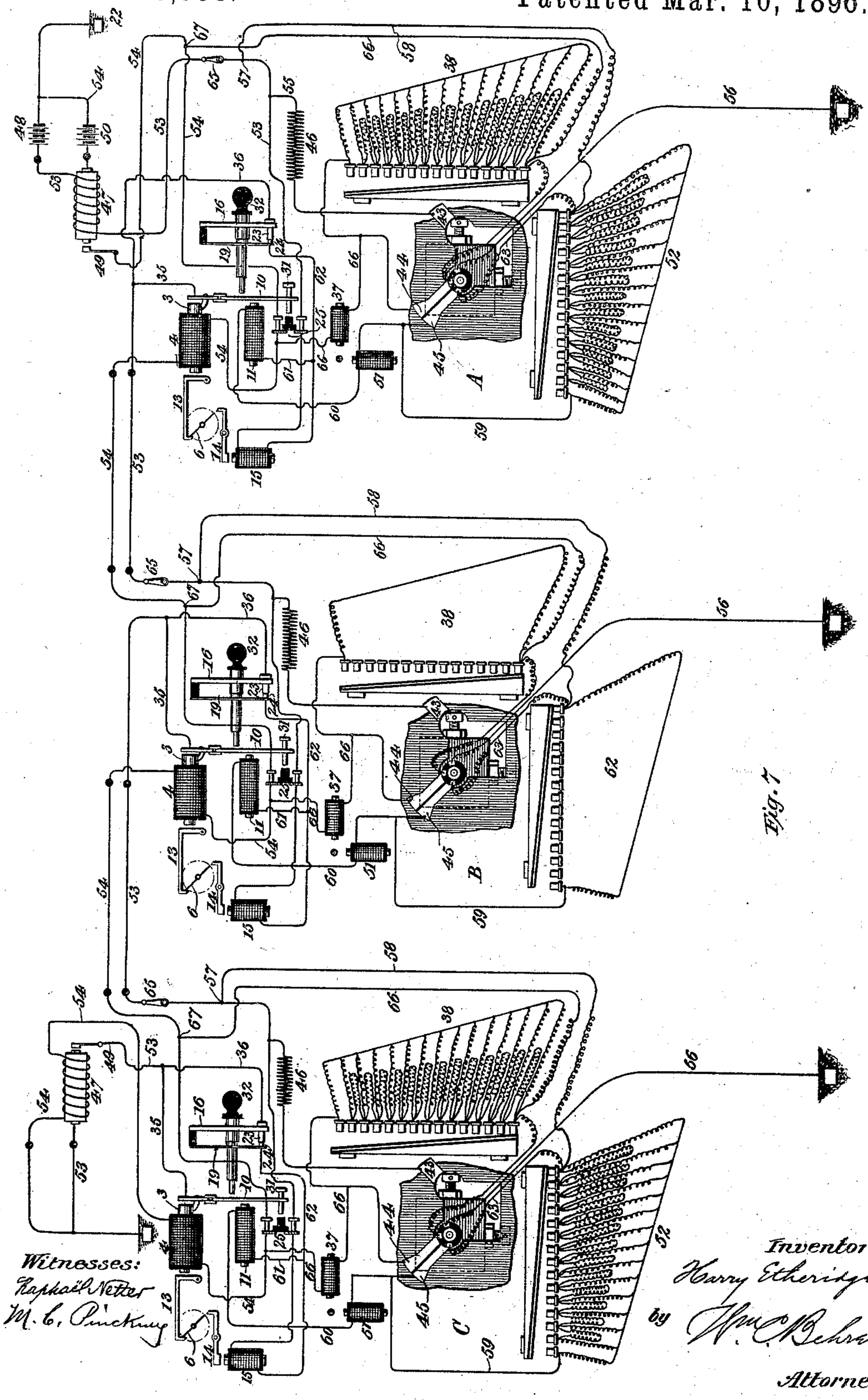


Fig. 1.

Witnesses:
Raphael Netter
M. C. Pinckney

Inventor
Harry Etheridge
by Wm. C. Behrens,
Attorney.

(No Model.) 4 Sheets—Sheet 3.

H. ETHERIDGE.

INDIVIDUAL CALL SYSTEM FOR AUTOGRAPHIC TELEGRAPHS.

No. 555,938. Patented Mar. 10, 1896.

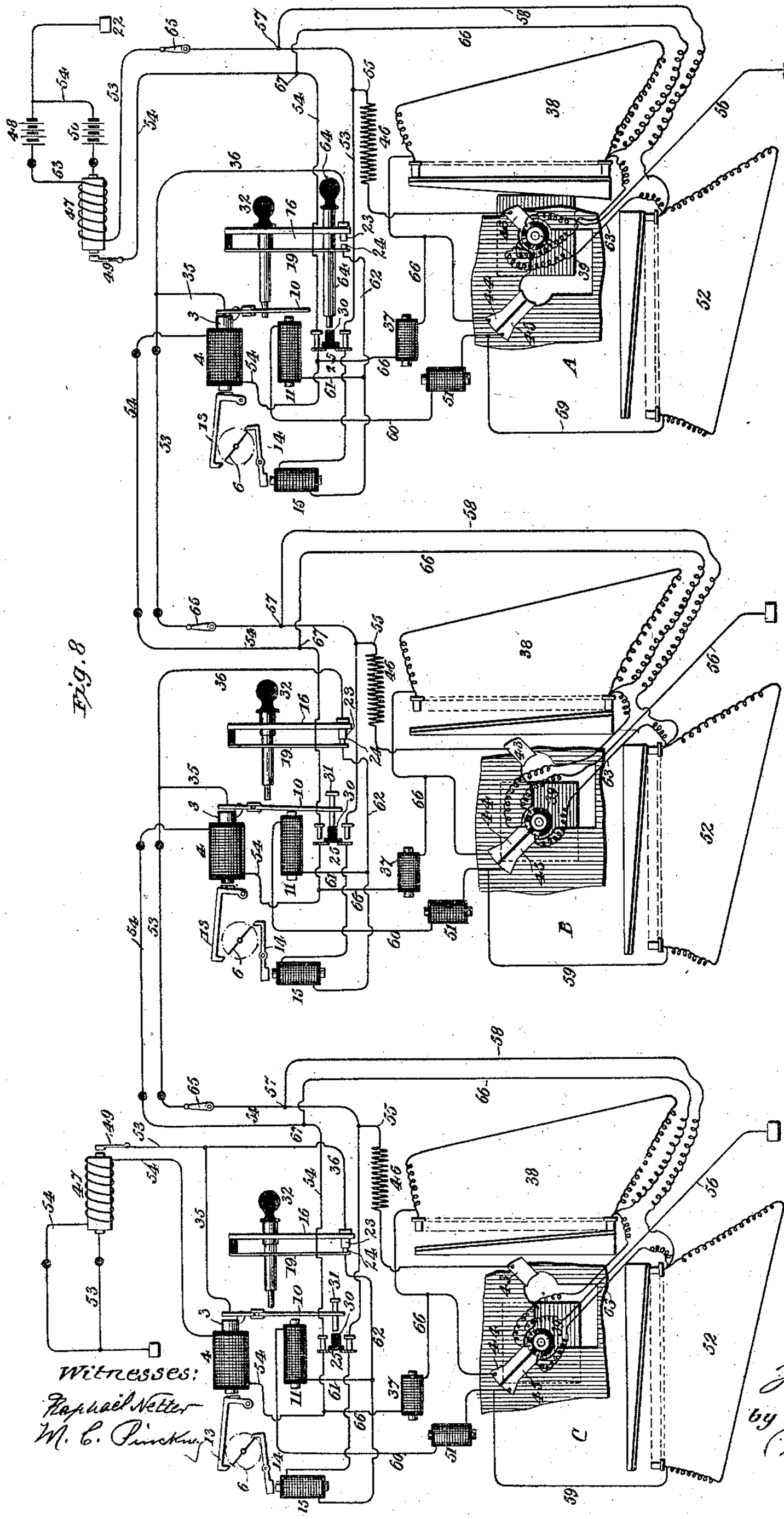


Fig. 8

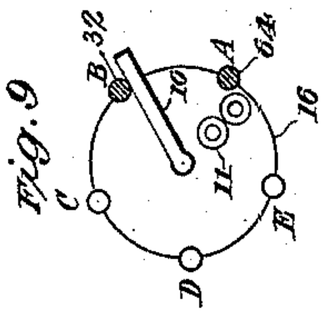


Fig. 9

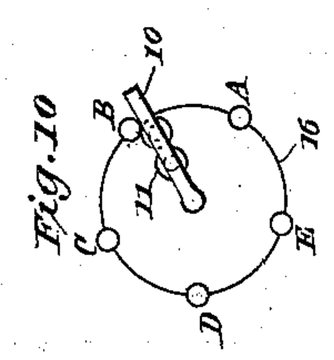


Fig. 10

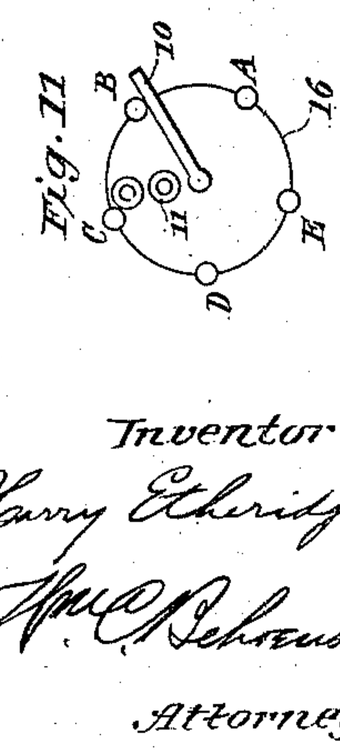


Fig. 11

Witnesses:
Raphael Netter
M. C. Pinckney

Inventor
Harry Etheridge
by Wm. C. Schroeder
Attorney

(No Model.) 4 Sheets—Sheet 4.

H. ETHERIDGE.

INDIVIDUAL CALL SYSTEM FOR AUTOGRAPHIC TELEGRAPHS.

No. 555,938. Patented Mar. 10, 1896.

Fig. 14

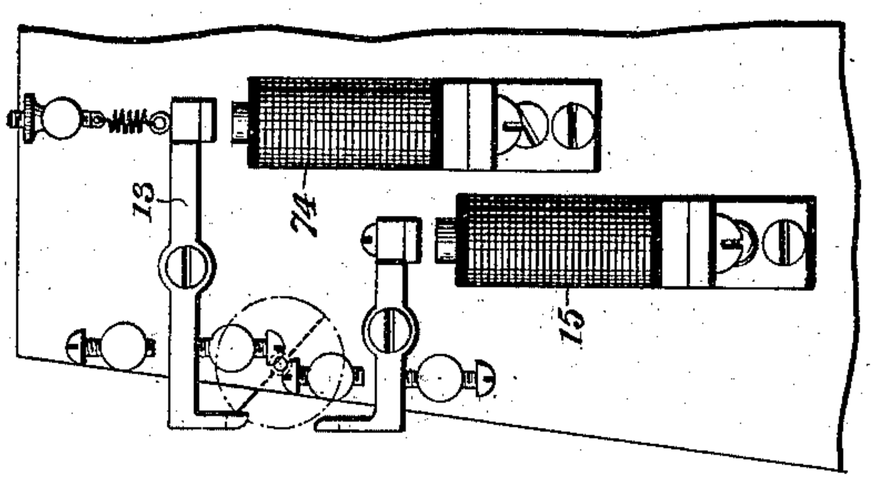


Fig. 12

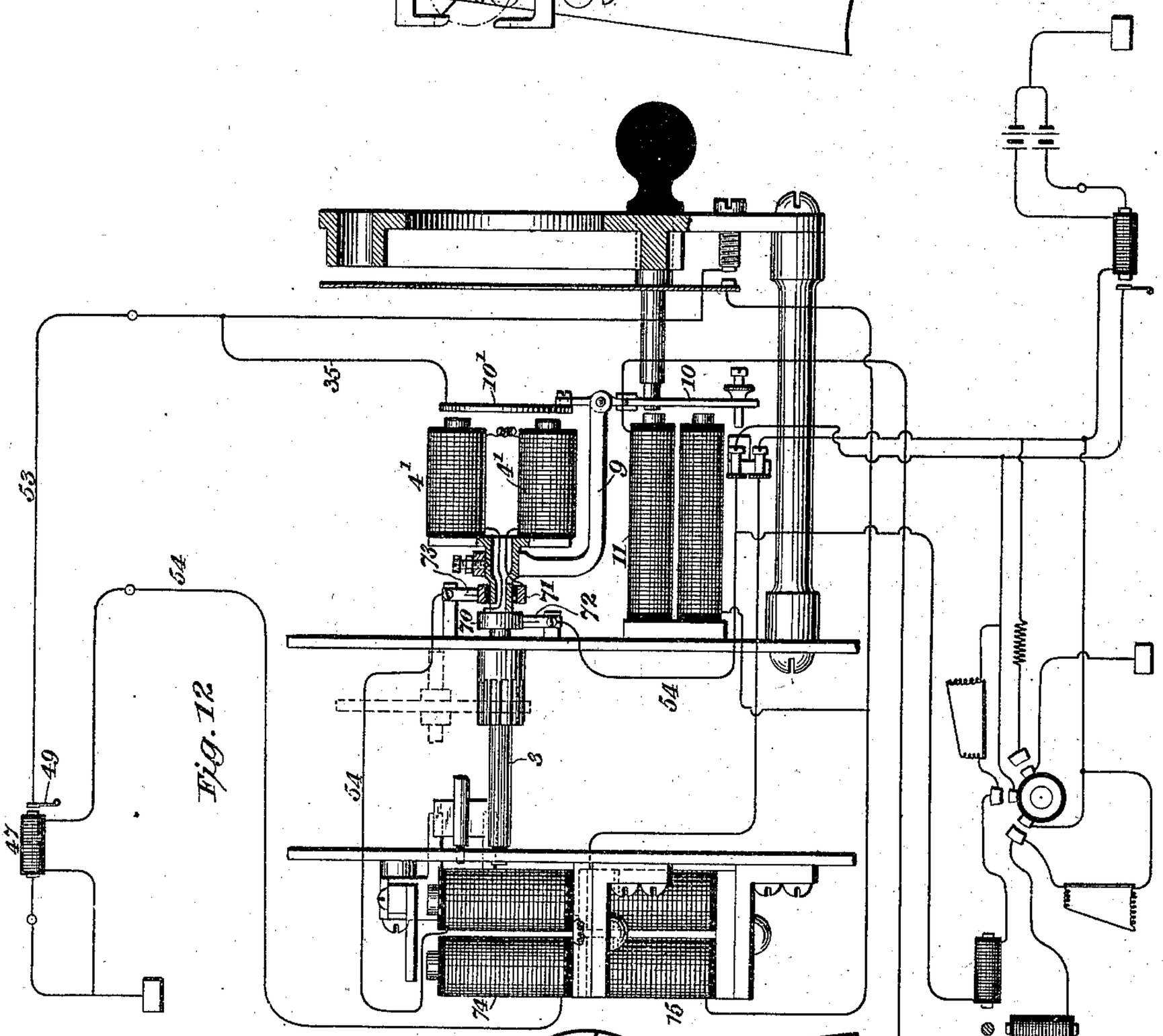
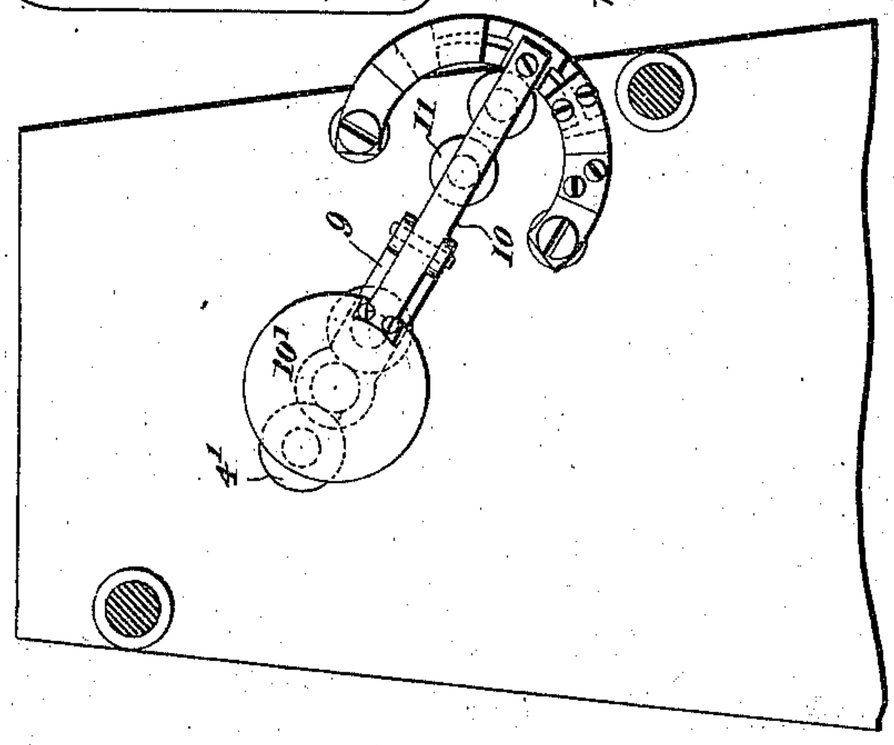


Fig. 13



Witnesses:
Raphael Netter
M. C. Pinckney

Inventor
Harry Etheridge
by Wm. C. Dickens,
Attorney

UNITED STATES PATENT OFFICE.

HARRY ETHERIDGE, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE GRAY NATIONAL TELAUTOGRAPH COMPANY, OF RICHMOND, VIRGINIA.

INDIVIDUAL-CALL SYSTEM FOR AUTOGRAPHIC TELEGRAPHS.

SPECIFICATION forming part of Letters Patent No. 555,938, dated March 10, 1896.

Application filed February 1, 1892. Serial No. 419,861. (No model.)

To all whom it may concern:

Be it known that I, HARRY ETHERIDGE, a subject of the Queen of Great Britain, and a resident of Pittsburg, Pennsylvania, have invented a new and useful Improvement in Individual-Call Systems for Autographic Telegraphs, of which the following is a specification.

My invention relates to an autographic-telegraph system, or what may be termed an "individual-call system for autographic telegraphs;" and the object of my invention is to enable the operator of any one of a series of autographic-telegraph instruments to bring into operation any desired one of the others on the same circuit without establishing communication with the remaining ones. I accomplish this object by the means hereinafter described and claimed.

In the accompanying drawings, forming part of this specification, Figure 1 represents a front view of the mechanism embodying my invention with a part of the front plate of the switchboard broken away to more clearly show the construction in rear thereof. Fig. 2 is a sectional view of Fig. 1, taken on line *x x*, showing also the connection of same with the receiving and transmitting instruments and circuit-closer. Fig. 3 represents a rear view showing the armature-lever detents controlling fly of paper-feeding mechanism. Fig. 4 is a plan view of the lower armature-lever and its attached detent shown in Fig. 3. Fig. 5 is a perspective view of the switch-contacts shown in Figs. 1 and 2. Fig. 6 shows the connection of the disk behind front plate of switchboard to said plate. Fig. 7 is a diagrammatic view of three autographic-telegraphic instruments connected in series, the instruments being shown at rest. Fig. 8 is a similar view showing the action of the mechanism when station A is engaged in establishing communication with station B, the instrument at last station, C, being at rest. Figs. 9, 10, and 11 represent, respectively, in a diagrammatic manner, the switchboards of the three stations shown in Fig. 8, with the armature-pointers in operative position. Figs. 12, 13, and 14 are respectively a side, front and rear elevation of a modification.

Referring to the drawings, 1 represents the supporting plates or cheeks of a clockwork mechamism arranged to be operated by a weight attachable to cord 2. As no claim is made herein to a clockwork mechanism, and as the construction of the same is well understood, a detailed description thereof is unnecessary. I extend its main shaft 3, made of iron, through the front plate, so that it forms the revoluble and magnetizable core of a solenoid 4, which latter is attached to the said plate. The pinion 5 on said shaft gears with the train of wheels of the clockwork mechanism shown in dotted lines in Fig. 1, the shaft of fly 6 being connected to the latter.

Near the front end of core-shaft 3 a sleeve 7 is secured by a set-screw 8, which fits loosely in a circumferential **V**-shaped groove in said core-shaft, so as to allow the latter to turn freely within the sleeve and yet prevent the latter from moving longitudinally thereon. In the forwardly-curved part 9 of this sleeve the armature-pointer 10 is pivoted so as to swing toward and from the core 3. When solenoid 4 is not energized the shaft can revolve without carrying the pointer around with it, the latter remaining in a vertical position. Also arranged on the front cheek 1 is a switch-magnet 11 placed so as to operate on the said armature-pointer, which latter is preferably a double armature—*i. e.*, made in two parts separated magnetically by brass connecting-pieces, as shown. The movement of this armature-pointer toward switch-magnet 11 may be limited or adjusted by set-screw 12. The main shaft 3 also extends rearwardly through the back cheek 1 and acts when magnetized as a magnet on armature-detent 13, which, when the instrument is at rest, holds but when attracted releases the fly of the clockwork mechanism, the latter being arranged to be connected to a paper-feed mechanism similar to that shown in patent to J. H. Robertson, No. 353,593, but not necessary to be shown in this application, as the same forms no part of the in-

vention claimed herein. The said fly can also be arrested in its movement by the armature-detent 14 when the same is attracted by its magnet 15. These two armature-detents with stops are clearly shown in Figs. 2, 3, and 4.

A switchboard 16 is arranged in front of the armature-pointer and is secured to the front plate 1 by posts 17. This switchboard is provided with as many holes 18 as there may be instruments on the line, and the switchboards of all the instruments are alike.

Secured to and arranged on rear of this switchboard is an annular circuit-breaking disk 19, also provided with a series of smaller holes 20 equal in number and arranged opposite to those in the switchboard. This disk 19 is attached at one point only to the switchboard by a flexible connection 21 (see Fig. 6) so as to be capable of a certain amount of movement toward and away from the switchboard. One of the line-wires 36 is connected to the insulated contact-screw 23 on switchboard, and with this contact-screw the contact-block 24 on the circuit-breaking disk makes contact, except when the latter is forced away therefrom, as hereinafter described.

The switch-magnet 11 before referred to occupies a different relative position in each of the series of instruments that may be connected on the same circuit, (see Figs. 9, 10, and 11,) the same showing diagrammatically three switchboards of three instruments arranged at stations a greater or less distance from each other. The switch-magnets 11 are shown in these figures in different positions. The switchboard will contain as many holes as there are instruments on the same circuit, and the magnets 11 will be arranged in as many different positions.

On each instrument is arranged in proper relation to its switch-magnet 11 a switch 25, (see Figs. 1 and 5,) consisting of contact-springs 26 and 27 and contact-screws 28 and 29, which springs are normally in contact with the screws. An ebonite block 30 is riveted to one of the contact-springs and arranged to overlap the other, so that when the armature-pointer 10 is attracted by magnet 11 its adjustable screw projection 31 impinges on block 30, causing the springs 26 and 27 to break contact with screws 28 and 29. The plug 32 for the switchboard is made of conducting material, except that part which comes into contact with switchboard 16, which part is of ebonite and is provided with a shoulder 33, which, when the plug is inserted, forces the disk 19 backward and causes contact to be broken at 23 and 24. This conductor-plug when inserted is also interposed in the path of the armature-pointer, as shown in Fig. 2, the latter being provided with a platinum contact 34 at the point of contact with the plug to secure a good electrical connection. The object of bringing pointer and plug together is to restore the circuit broken by the plug at 23 24 by causing the current to pass from 24 through disk 19, plug 32, armature-pointer 10, conductor 35, to main line 36 and 53.

Connected with the mechanism so far described are the receiver and transmitter of an autographic telegraph—such, for example, as shown and described in patent granted to me February 3, 1891, No. 445,715. I also utilize the automatic circuit-closing means described in my application, Serial No. 364,522, filed September 10, 1890. The transmitting-stylus 39 is provided with three insulated contact-points 40, 41, and 42, the first named directly connected to ground and the last two to the transmitter-resistances and also through the automatic circuit-closing mechanism to batteries and ground. Three stationary contacts 43, 44, and 45 are arranged so that the contact-points on the stylus can make connection therewith. The first-named, 43, is connected through resistance 46, circuit-closing magnet 47, line 53, and battery 48 to ground. Contact 44 is connected to receiver-magnet 37 on the one side and through the transmitter-resistance 38, circuit-closing armature-lever 49, core of magnet 47, line 54, and battery 50 to ground on the other side. Contact 45 is connected to receiver-magnet 51 on the one side and through transmitter-resistance 52, magnet 47, and battery 48 to ground on the other side.

In Fig. 7 I have shown only three instruments connected in series, it being understood, of course, that a large number may be so connected. Only the first and last instruments need to be provided with the automatic circuit-closing means. The two batteries 48 and 50 operate the two lines 53 and 54 connecting the three instruments, and, as explained in the application hereinbefore referred to, I arrange at the first station in line 53 an electromagnet 47, the core and armature of which are included in line 54, while at the last station the magnet 47 is included in line 54 and the armature and core thereof in line 53. The resistances 46 in line from contacts 43 in the several instruments are graduated, gradually decreasing in value as the number of instruments between the same and the battery increases. This graduation is not essential, but it serves to equalize the current in the machines, no matter which instrument "calls up," and thus prevents any violent action of the armature of the receiving-magnet by reason of the latter being unduly charged, (momentarily only, however.)

In Fig. 7 the instruments are represented at rest, the several styluses in normal position and the plugs in switchboards withdrawn from paths of armature-pointers.

In Fig. 8 I have represented the instrument at A in the act of establishing communication with instrument at B, the instrument at C being cut out.

Each subscriber or instrument is known by number or letter, the same appearing on all the switchboards. (See Figs. 9, 10, and 11.)

The operation of the mechanism is as follows: If the operator at A desires to communicate with station B, he inserts his plug 32 in the hole B of his switchboard, so that the end thereof shall be interposed in the path of the armature-pointer and the disk 19 forced back to break the contact at 23 24. He then takes hold of his stylus 39 and brings contact 40 thereof against contact-block 43, the effect of which is to close the circuit from ground at battery 48 through said battery, line 53, magnet 47, branch line 55, resistance 46, contacts 40 43, and conductor 56 to ground. The energizing of magnet 47 causes armature 49 to be attracted, thus closing throughout the whole series of instruments the only break in the line in which armature 49 is included. The circuit is as follows: from ground at 22, line 54, battery 50, core of magnet 47, armature 49, line 54, switch 25 and solenoid 4 of station A to line 54 to station B, where, as the switch 25 has not yet been opened, the circuit is through said switch, solenoid 4 and line 54 to station C, through its switch and solenoid 4 to coil of magnet 47 and by line 54 to ground. The energizing of solenoid 4 in all the instruments has caused the armature-detents 13 to be attracted, releasing the several flies and allowing the clockwork and paper-feeding mechanisms to move and thus to turn the shafts 3. The energizing of the solenoids 4 having magnetized the revoluble cores or shafts 3, the armature-pointers 10 are attracted by and held firmly to the cores and are carried round thereby synchronously in all the instruments. This movement of the armature-pointers continues until the pointer of station A comes into contact with plug 32, when the circuit of line 53, previously broken at 23 24 by the insertion of the plug, is re-established through the medium of disk 19, plug 32, pointer 10, and line 35. The circuit of line 53 through the instruments is then as follows: from ground at 22 to battery 48, magnet 47, line 53, to point 57, where the circuit divides, one division including switch 25, magnet 15, line 62, disk 19, plug 32, pointer 10, and line 35, the other embracing line 58, transmitter-section 52, line 59, receiver-magnet 51, line 60, magnet 11, lines 61 and 62, disk 19, plug 32, pointer 10 and to line 53 by 35, as before. From thence through station B the circuit includes conductors 53 58 63, contact 45, receiver 51, conductor 60, magnet 11, conductors 61 62, contacts 23 24, conductor 36 to line 53. The other circuit at station B through switch 25 is broken by reason of magnet 11 having attracted armature-pointer 10, the circuit through 11 being closed the moment armature-pointer 10 arrives opposite said magnet, the power of magnet 11 being greater than that of solenoid 4. From station B through C the circuit includes line 53 dividing at 57, one portion including switch 25, magnet 15, conductor 62, contacts 23 24, conductor 36, line 53, armature 49 and core of magnet 47 to ground, the other part including conductors 58 63, contact 45, receiver-magnet 51, conductor 60, magnet 11, conductors 61 62 to line and ground, as before. The completion of the circuit of line 53, as just described, has energized the magnets 11 of the three instruments, but the armature-pointer 10 at station B is the only one attracted, because the only one at the time in line with the said magnet, so that it could be attracted, as illustrated in Figs. 9, 10, and 11. The attraction of said armature-pointer at station B has of course opened the switch 25, so that the receiver is cut in and magnet 15 cut out of the circuit, the movement of the paper-feeding mechanism being therefore not arrested; but at stations A and C the said mechanism is brought to rest, as the magnets 15, not being cut out, attract their armature-detents 14 and thus arrest the revolution of the flies, stopping the feeding of the paper. Fig. 8 illustrates the circuits and operation of the mechanism at this point in the process of establishing communication between any two stations. The operator at station A now inserts (see Figs. 8 and 9) another plug 64 in his switchboard (shown only partially inserted in Fig. 8) to open switch 25, and thus cut in his transmitter and receiver and cut out magnet 15 to again start the paper-feeding mechanism of his instrument. Everything is now in readiness for the operator at A to remove his transmitting-stylus from contact with 43 and commence to write the message he wishes to convey to the operator at B, A's communication reaching B only, as C's paper-feeding mechanism is arrested and his receiver practically cut out of the circuit. No message is therefore recorded on C's instrument. When the operator has finished his message he can bring the several instruments again to their normal condition by momentarily opening the hand-switch 65, which breaking the circuit of line 53 also necessarily breaks that of line 54, all the armature-pointers 10 falling back to their original or zero positions.

The resistance of the several magnets may be arranged relatively to each other about as follows: resistance of magnet 47 about two and one-half ohms, solenoid 4 ten ohms, magnet 15 twenty-four ohms, magnet 11 fifteen ohms. I do not, of course, desire to confine myself to the values of the resistances mentioned, as the same may vary to a great extent, nor to precisely the relative values mentioned, as the same may also be varied within considerable limits without affecting the operativeness of the mechanism.

The circuits when operator at A is in communication with operator at B are as follows: from ground at 22, battery 48, magnet 47, line 53, conductor 58, through transmitter-resistance 52, conductor 59, receiver-magnet 51, conductor 60, magnet 11, conductors 61 and 62, contact 24, disk 19, plug 32, pointer 10, conductor 35 to line 53 to 57, station B, thence by conductors 58 63, stylus, contact

45, receiver-magnet 51, conductor 60, magnet 11, conductors 61 62, contacts 24 23, conductor 36 to line 53 to 57, station C, thence by conductors 58 63, stylus, contact 45, receiver-magnet 51, conductor 60, magnet 11, conductors 61 62, contacts 24 23, conductor 36, line 53, armature 49, core of magnet 47, line 53 to ground. The other circuit is from ground at 22, battery 50, core of magnet 47, armature 49, line 54, conductor 66, transmitter-resistance 38, conductor 66, receiver-magnet 37, line 54, solenoid 4 to 67, station B, thence by conductor 66 to stylus, contact 44, conductor 66, receiver-magnet 37, line 54, solenoid 4 to 67, station C, thence by line 54 to switch 25 and solenoid 4 and by line 54 to magnet 47 and to ground. From an inspection of these circuits it will be seen that at station A both receiver and transmitter are in the circuit, at station B the receiver only, and at station C they are both cut out.

In Fig. 1, as heretofore explained, I have shown in dotted lines the train of wheels of a clockwork mechanism connected to and operating the paper-feed mechanism, of which latter 68 is the paper-feed roll, but as no claim is made herein to such feed mechanism I have deemed further illustration of the same unnecessary.

In lieu of a solenoid encompassing shaft 3, as shown in Fig. 2, I may use an ordinary U-shaped electromagnet 4′ and fasten the same by its yoke to the revoluble shaft 3, as shown in Fig. 12, so that said magnet revolves with said shaft. In this case the armature-pointer 10 has its upper armature 10′ of disk shape, so that it may cover the field of revolution of the magnet 4′. It is mounted by arm 9 on shaft 3 in the same manner as shown in Fig. 2. In order to connect the magnet 4′ with the circuit, I mount on said shaft two collars 70 71, insulated therefrom, as shown, and connect thereto the ends of the magnet-coils, passing the same through the hollow center of the shaft in manner well understood in the art. Two brushes 72 and 73 connected with the line-wires are arranged to bear or make contact with said collars, thus completing the connection of magnet 4′ with the line. As in this construction the shaft 3 is not magnetized, it cannot, of course, act on armature 13, and I therefore provide an additional electromagnet 74 connected to the circuit of magnet 4′, as clearly shown in Figs. 12 and 14, the same being arranged to act on said armature. The operation of this mechanism is the same as that illustrated in Fig. 2—*i. e.*, when magnet 4′ is energized and its shaft 3 revolves, the armature-pointer is attracted and carried around with the shaft and magnet, the armature 13 being attracted to release the fly of the clockwork mechanism. I therefore consider this modification the full equivalent of that first described.

Wherever in the claims I refer to the revoluble shaft and the magnet co-operating therewith, it is to be understood as language covering the construction shown in Fig. 12, as well as that shown in Fig. 2.

Having thus described my invention, what I claim, and desire to secure by United States Letters Patent, is—

1. In combination with a clockwork mechanism connected to the feed-roll of a paper-feed mechanism, of a revoluble and magnetizable shaft and a magnet directly co-operating therewith, substantially as described.

2. The combination with a revoluble shaft, of a magnet directly co-operating therewith, and an armature-pointer arranged to be attracted, held and revolved by the action of said shaft and magnet, substantially as described.

3. The combination with a revoluble shaft, a magnet co-operating therewith, and a clockwork mechanism connected to the paper-feed roll, of an armature-pointer arranged to be attracted and revolved by the action of said shaft and magnet, substantially as described.

4. The combination with a revoluble shaft, of a magnet co-operating therewith, and an armature-pointer pivoted to a sleeve loosely mounted on said shaft, and arranged when attracted, to revolve with the same, substantially as described.

5. The combination with a solenoid and a revoluble and magnetizable shaft forming the core thereof, of an armature-pointer arranged to be attracted by and revolved by said shaft, substantially as described.

6. The combination with a clockwork mechanism connected to the paper-feed roll, of a solenoid, a revoluble, magnetizable shaft, and an armature-detent, arranged when attracted to release the fly of the clockwork mechanism, substantially as described.

7. The combination with a revoluble shaft, and a magnet co-operating therewith, of a switch-electromagnet and an armature-pointer arranged to be attracted by said two magnets, substantially as described.

8. The combination with a revoluble shaft and a magnet co-operating therewith, of a switch, a switch-electromagnet, and an armature-pointer arranged to be attracted by said magnets and to open the switch, substantially as described.

9. The combination with a revoluble shaft and a magnet co-operating therewith, of a switch, a switch-electromagnet, an armature-pointer arranged to be attracted by said magnets and to open the switch, an electromagnet with armature-detent to arrest fly of clockwork mechanism, and necessary electrical connections, substantially as described.

10. The combination with a revoluble shaft and a magnet directly co-operating therewith, of an armature-pointer, moved by the joint action of said shaft and magnet, a switch-board, and a plug arranged to be interposed in the path of the pointer, substantially as described.

11. The combination with a revoluble shaft, and a magnet co-operating therewith, of an

armature-pointer, a switchboard, circuit-breaking disk, and a plug arranged to co-operate with said disk and to be interposed in the path of the pointer, substantially as described.

12. The combination with a revoluble shaft, and a magnet co-operating therewith, of an armature-pointer, a switch-electromagnet and switch, a switchboard, a circuit-breaking disk and a plug co-operating with said disk and pointer, substantially as described.

13. The combination with a revoluble shaft, and a magnet co-operating therewith, of the fly of the clockwork mechanism, an armature-detent for releasing the fly, and an electromagnet and armature-detent for arresting the fly, substantially as described.

14. The combination with a revoluble shaft and a magnet co-operating therewith, of a switch-electromagnet, and an armature-pointer made in two parts connected by non-magnetic material and arranged to be operated by said magnets, substantially as described.

15. The combination with the switch-electromagnet, and switch, of the revoluble armature-pointer made in two parts connected by non-magnetic material, switchboard and plug, substantially as described.

16. The combination with the switchboard and the circuit-breaking disk, each provided with a series of corresponding holes, the disk being flexibly connected to the switchboard at one point only of the plug arranged to separate disk from switchboard-contact, substantially as described.

17. The combination with the switchboard and the circuit-breaking disk, of the armature-pointer and the plug arranged to separate disk from switchboard-contact and to be interposed in path of pointer, substantially as described.

18. In a system of autographic telegraphy, the combination with a series of instruments, each provided with a similar switchboard, a switch-magnet and switch, differently located relative to the switchboard in each of the series of instruments, an armature-pointer, a magnet a revoluble shaft and necessary electrical connections, substantially as described.

19. In a system of autographic telegraphy, the combination with a series of instruments electrically connected, of an automatic circuit-closing mechanism, a grounded stylus at each instrument arranged to operate said circuit-closing mechanism, and a series of synchronously-moving switch-opening mechanisms, substantially as described.

20. In a system of autographic telegraphy the combination with a series of instruments electrically connected, of an automatic circuit-closing mechanism, a grounded stylus at each instrument arranged to operate said circuit-closing mechanism, a series of switch-opening mechanisms consisting of a revoluble shaft, a magnet co-operating therewith an armature-pointer, a switch and switch-electromagnet, a switchboard, a circuit-breaking disk, conductor-plug, and necessary electrical connections, substantially as described.

21. The combination with the receiver and transmitter, the latter provided with a stylus having three insulated contacts, one of which is connected to ground, the remaining two to transmitter-resistances and to the automatic circuit-closing mechanism, of three contacts, one connected to said automatic circuit-closing mechanism, the remaining two to the same and also to the receiver-magnets and transmitter-resistances, the automatic circuit-closing mechanism, the switch-opening mechanism, and necessary electrical connections, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 24th day of February, 1891.

HARRY ETHERIDGE.

Witnesses:
JAMES H. PORTÉ,
A. M. HANNA.