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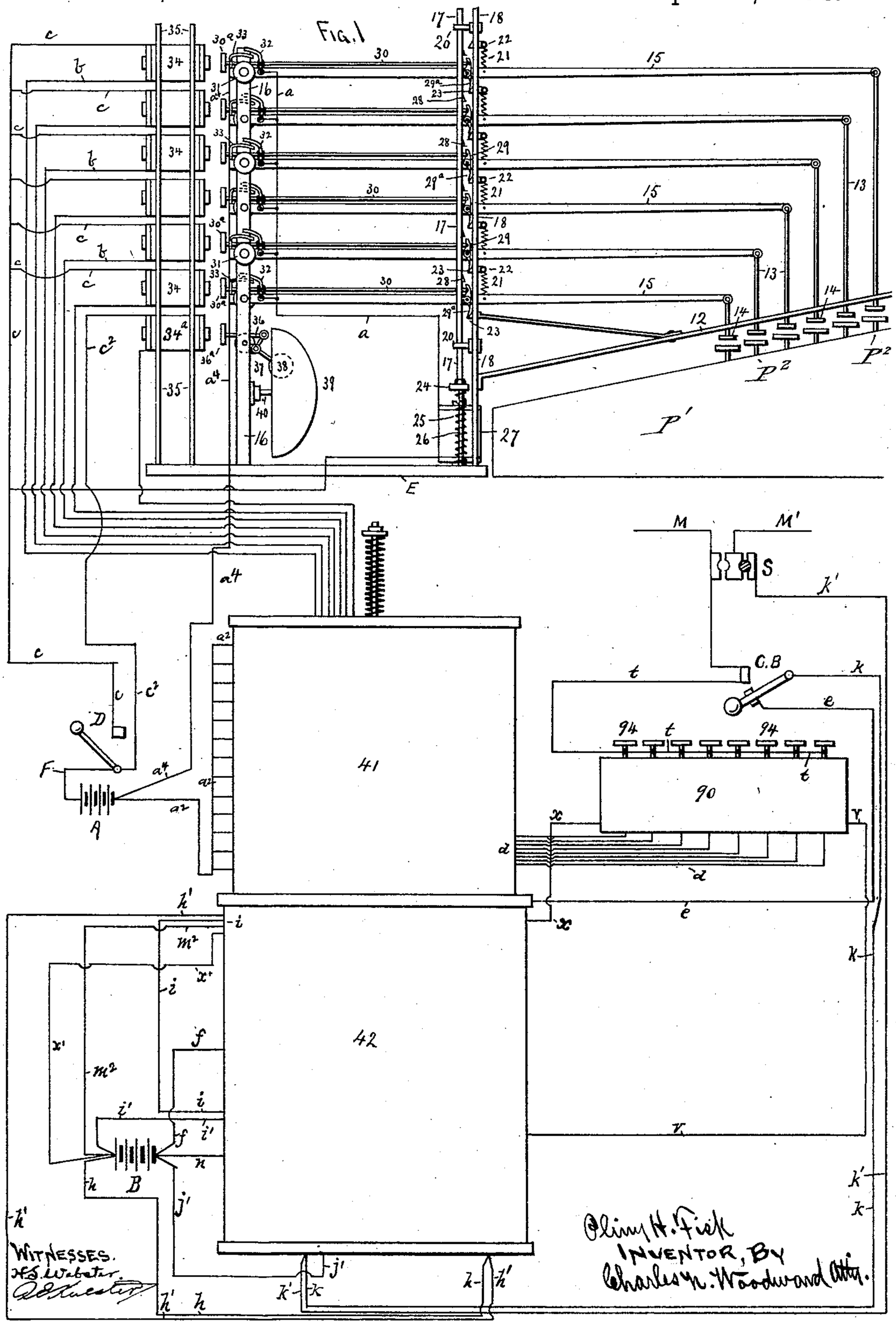
P. H. FISK.

PRINTING TELEGRAPH.

No. 450,228. Patented Apr. 14, 1891.



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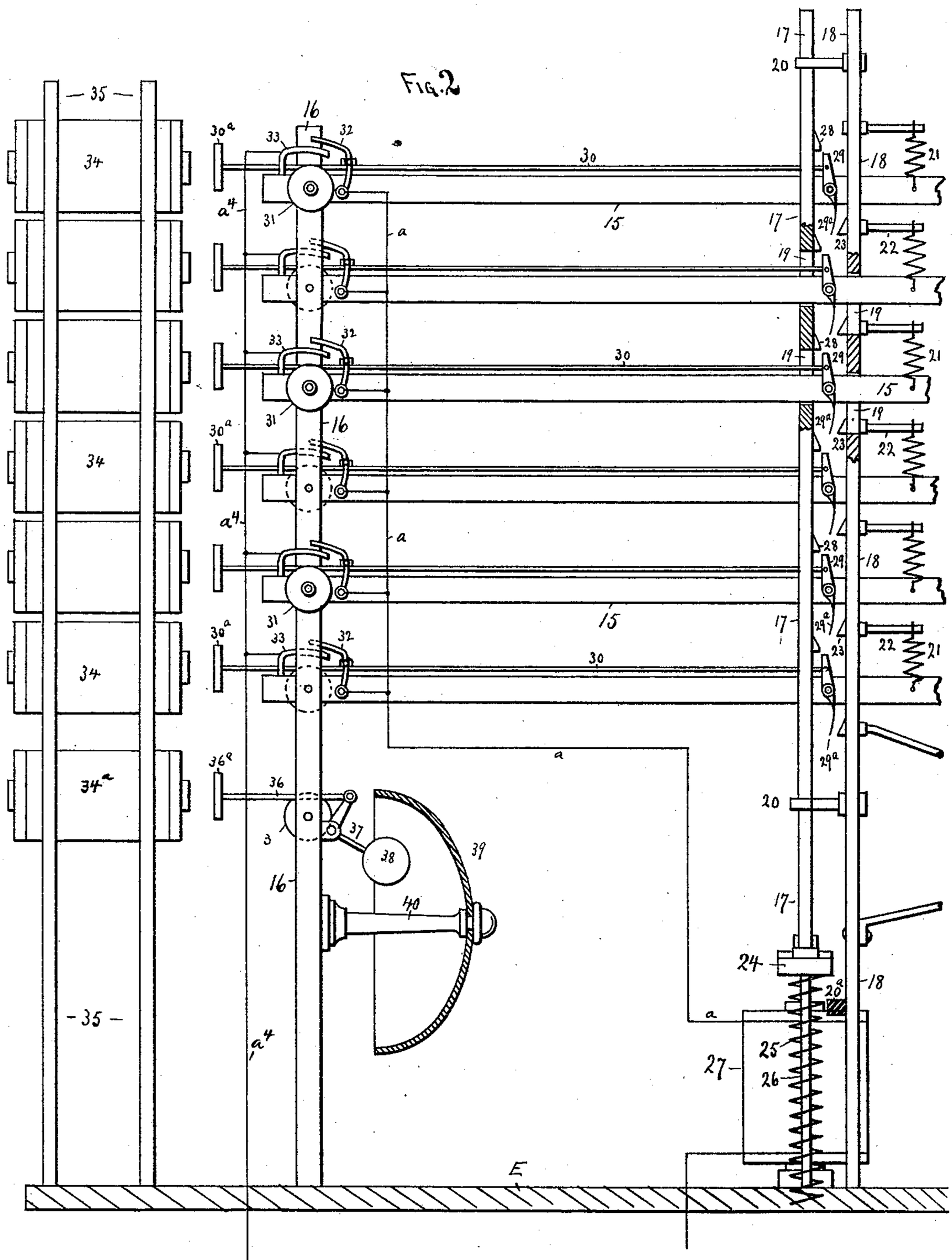
No. 450,228. Patented Apr. 14, 1891.

FIG. 2



WITNESSES.
H. S. Webster.
A. E. Knesteg.

Pliny H. Fisk
INVENTOR, BY
Charles N. Woodward
Atty.

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8 Sheets—Sheet 3.

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Fig. 3

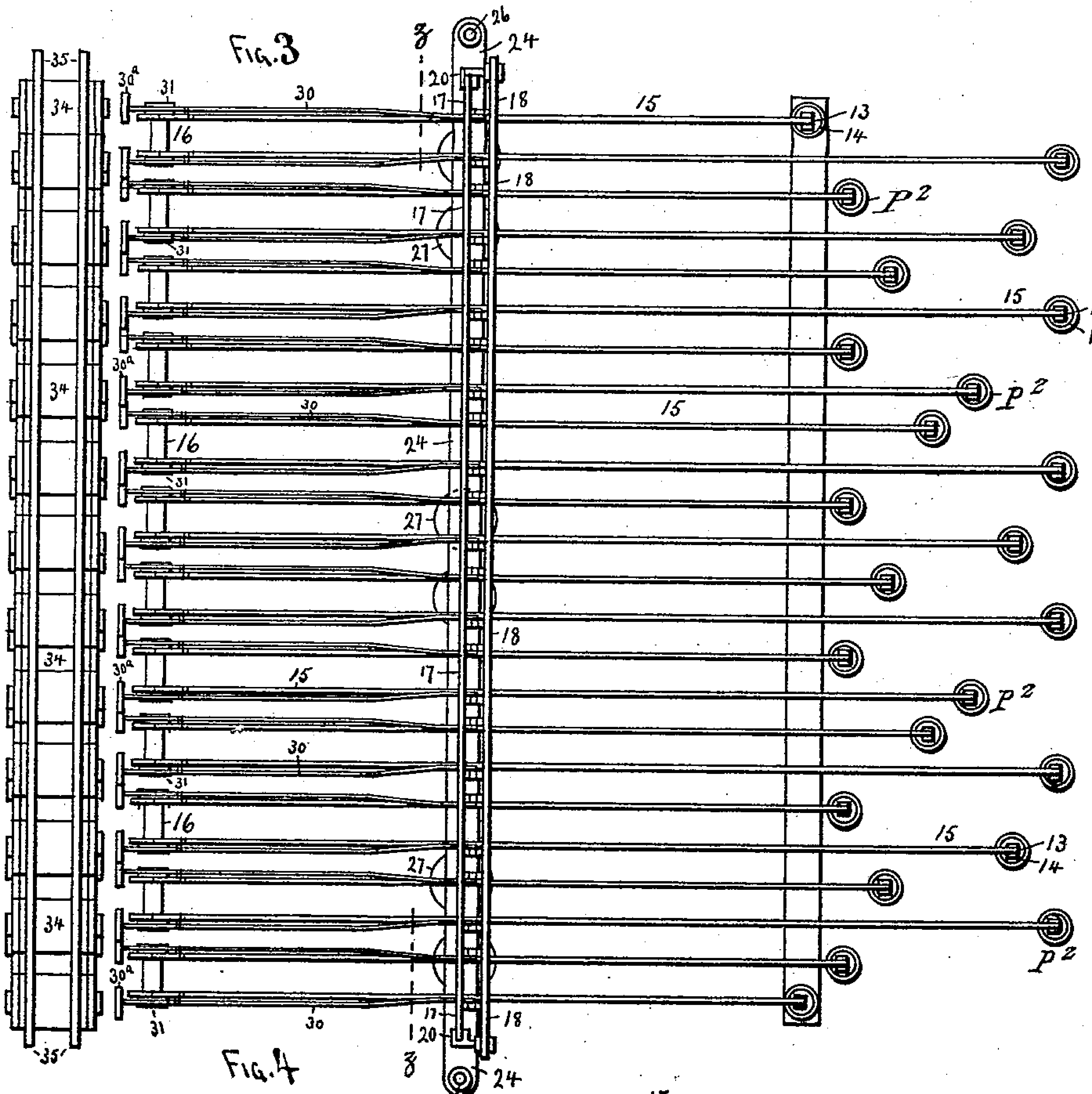
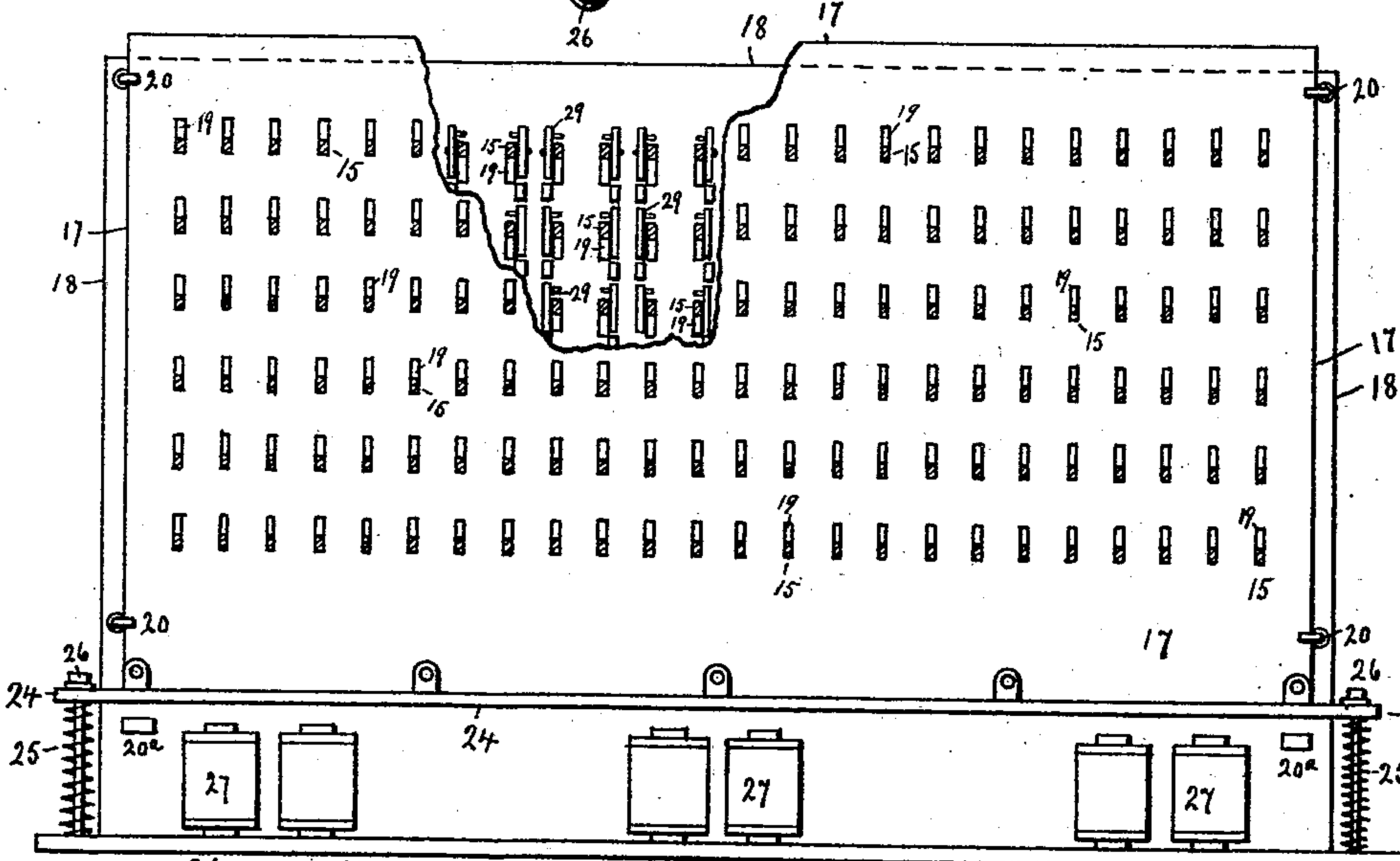


Fig. 4



Witnesses. H. S. Webster.

Pliny H. Fisk Inventor, By Charles N. Woodward atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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No. 450,228. Patented Apr. 14, 1891.

FIG. 5

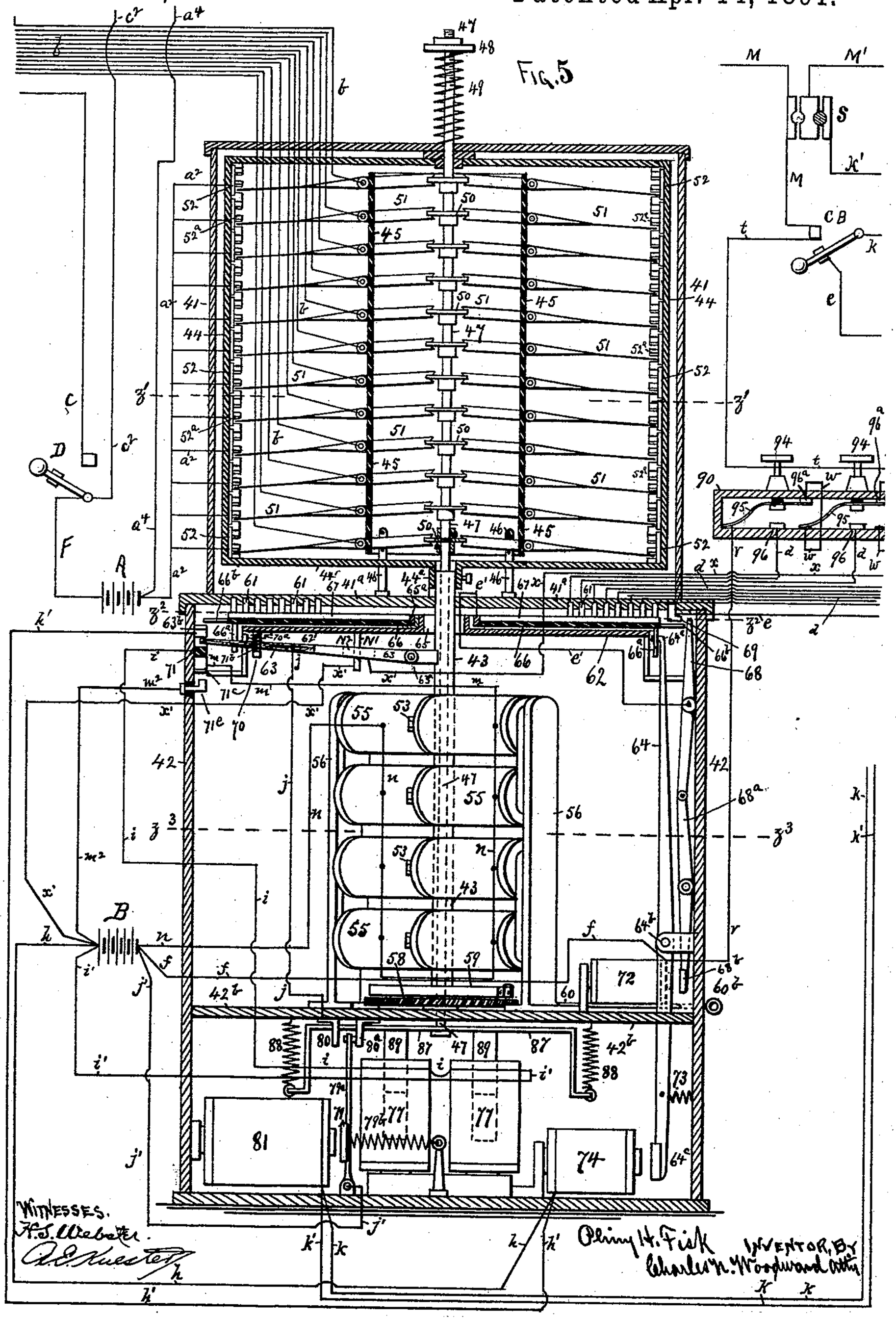

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Fig. 8.

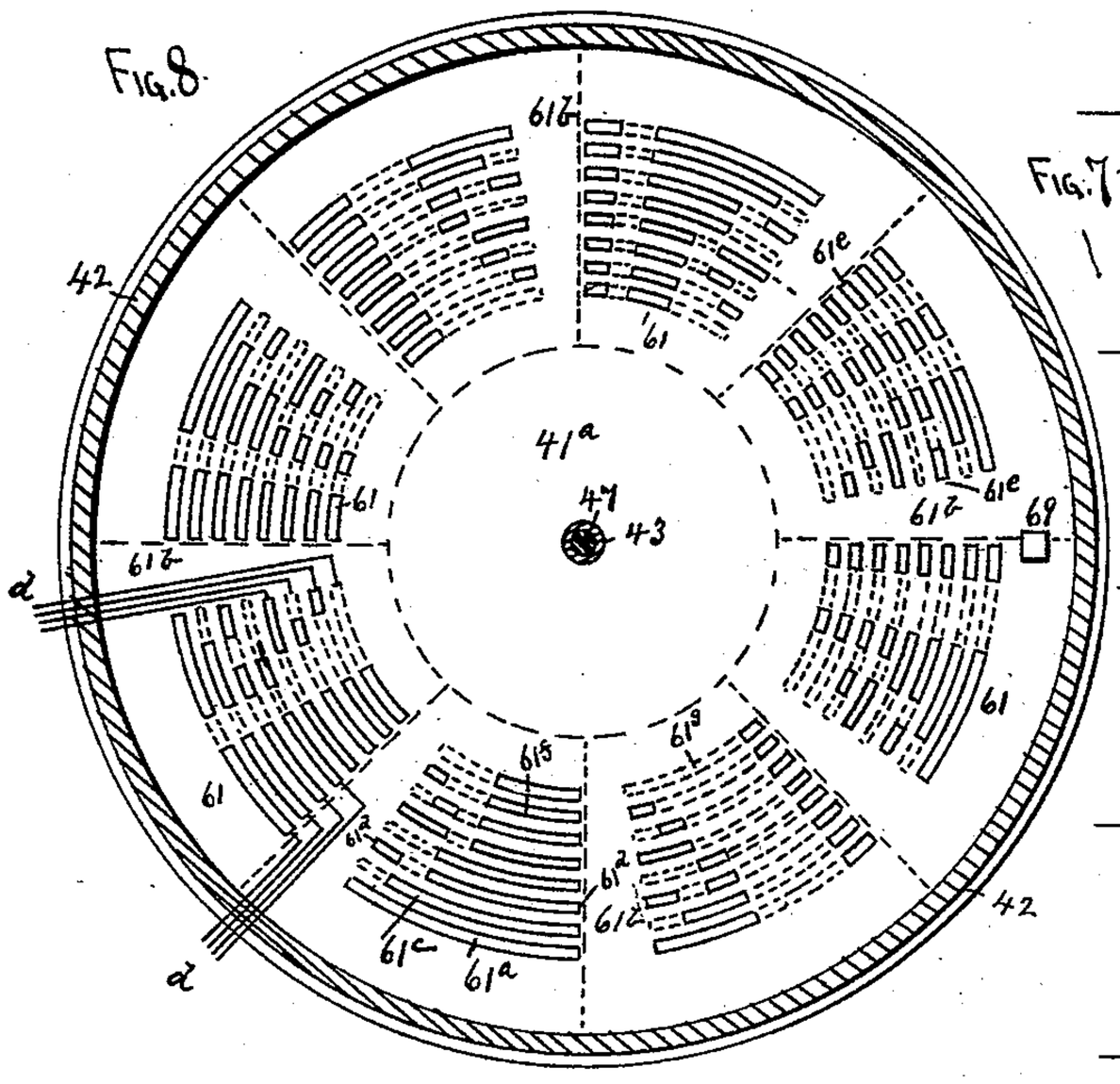


Fig. 7.

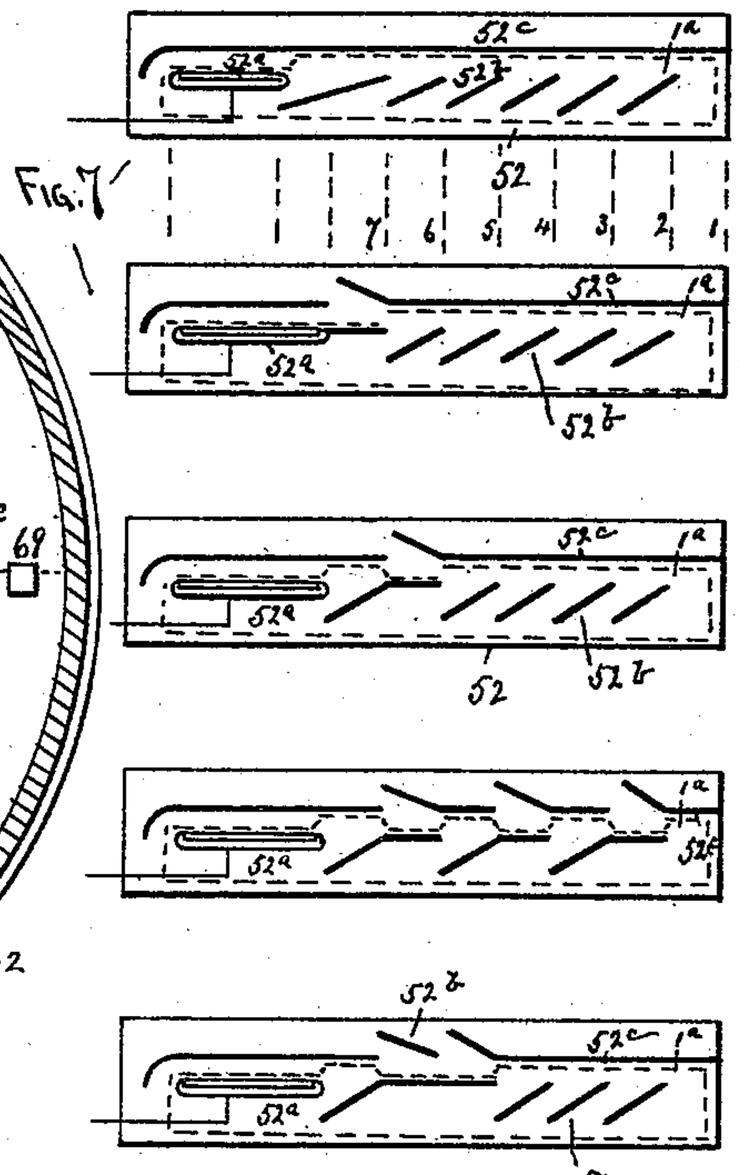


Fig. 6.

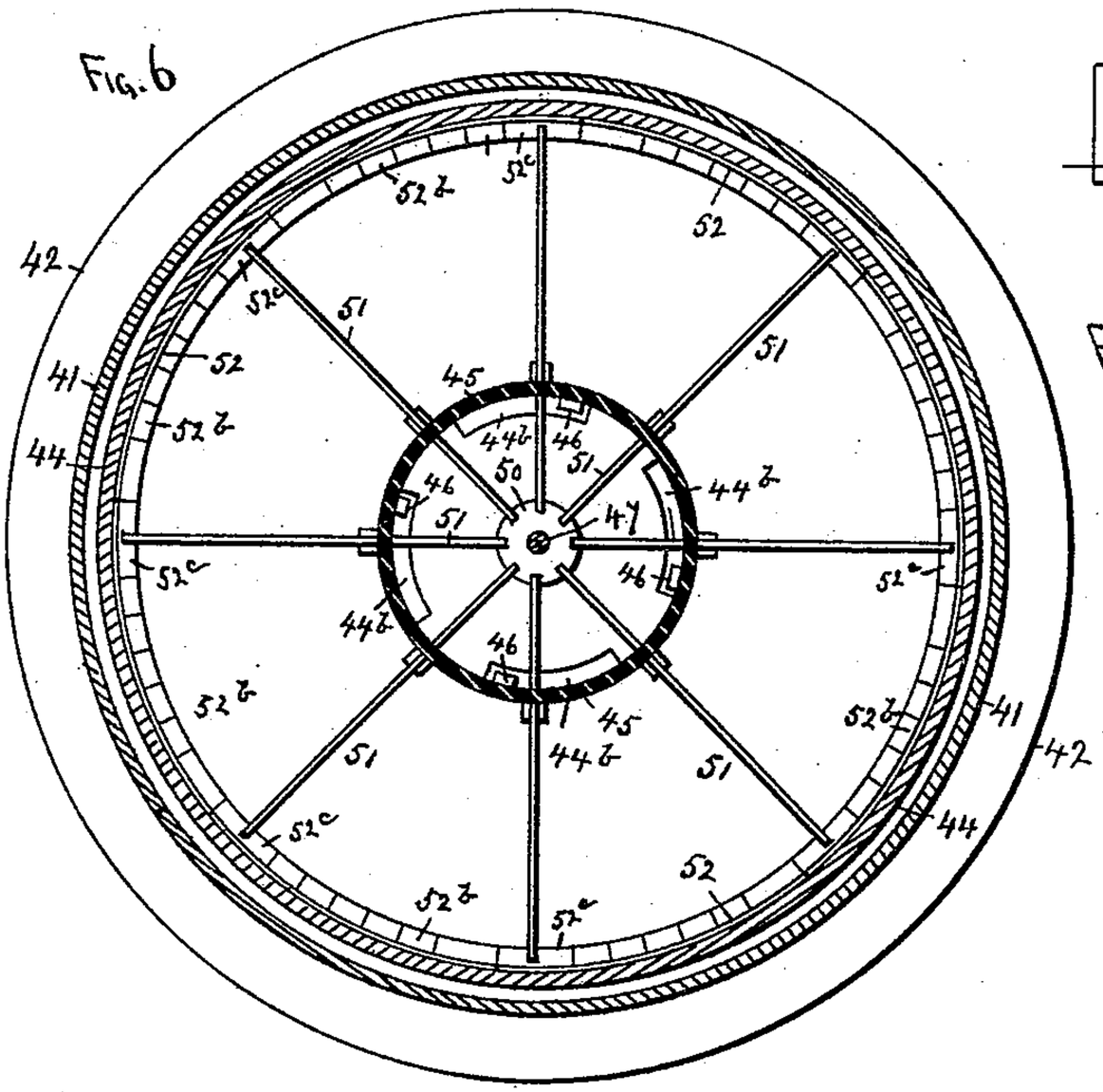
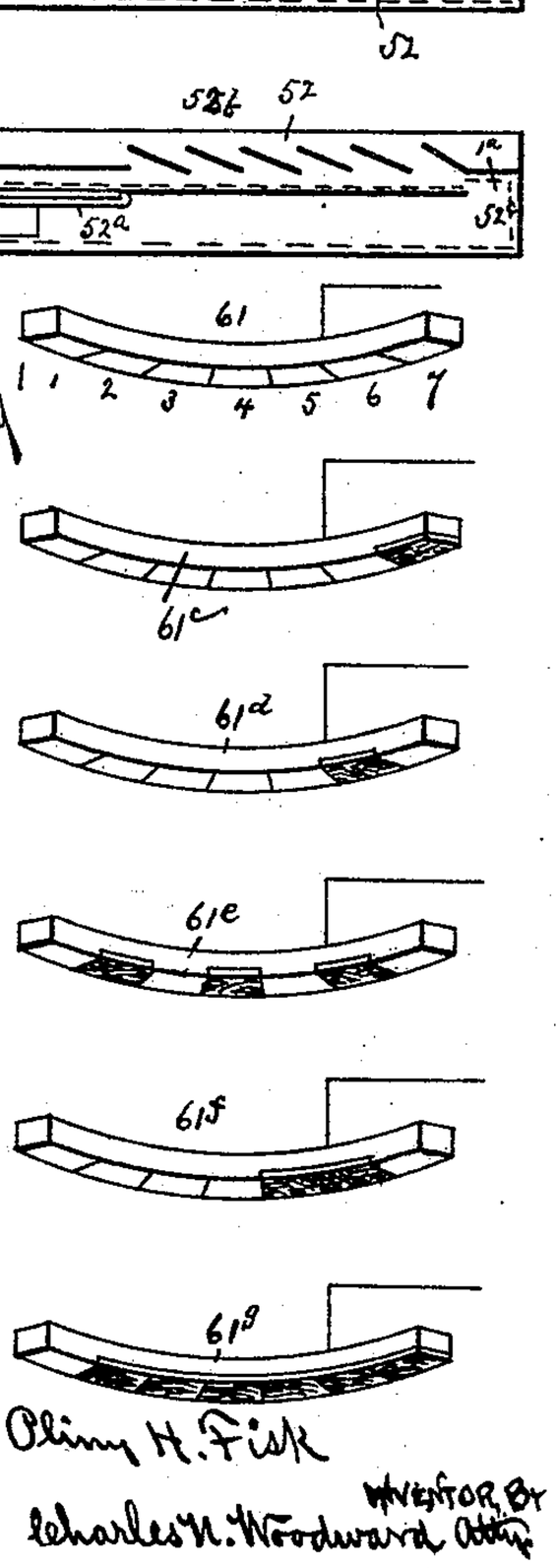


Fig. 9.



Witnesses.
H. J. Webster.
A. E. Hueter.

Olin H. Fisk
Inventor.
By Charles N. Woodward Atty.

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P. H. FISK.

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No. 450,228. Patented Apr. 14, 1891.

Fig. 13

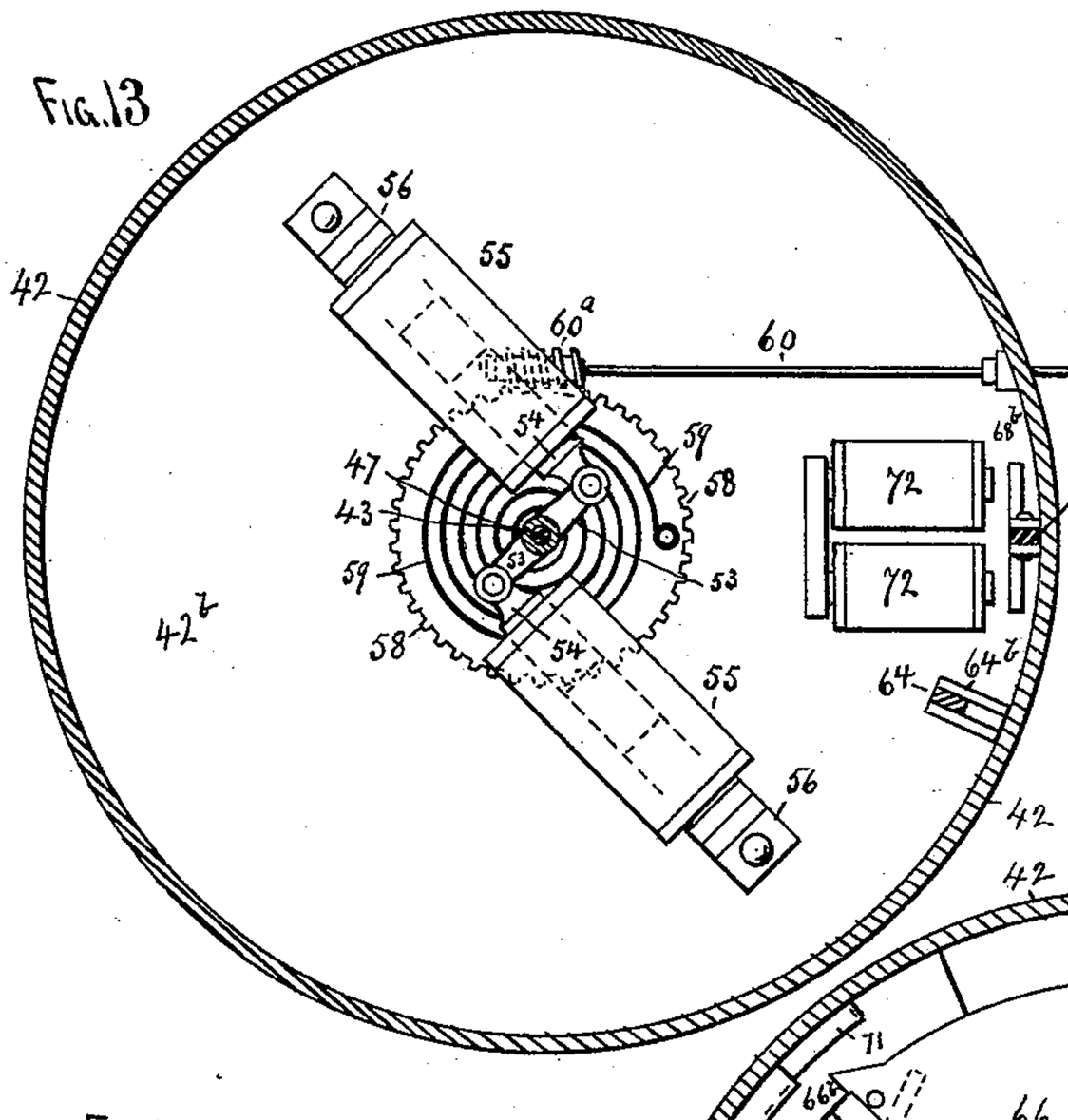


Fig. 14

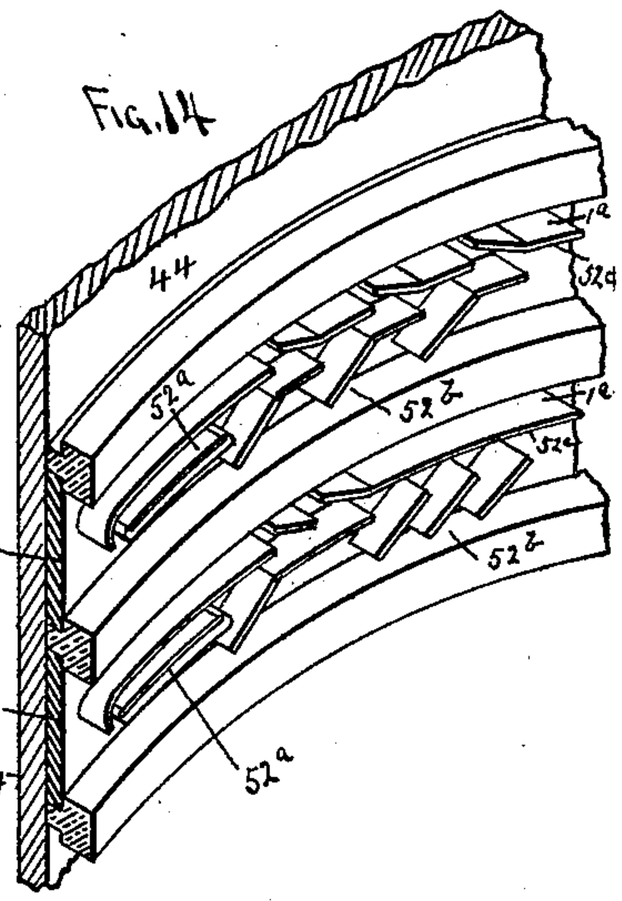


Fig. 10

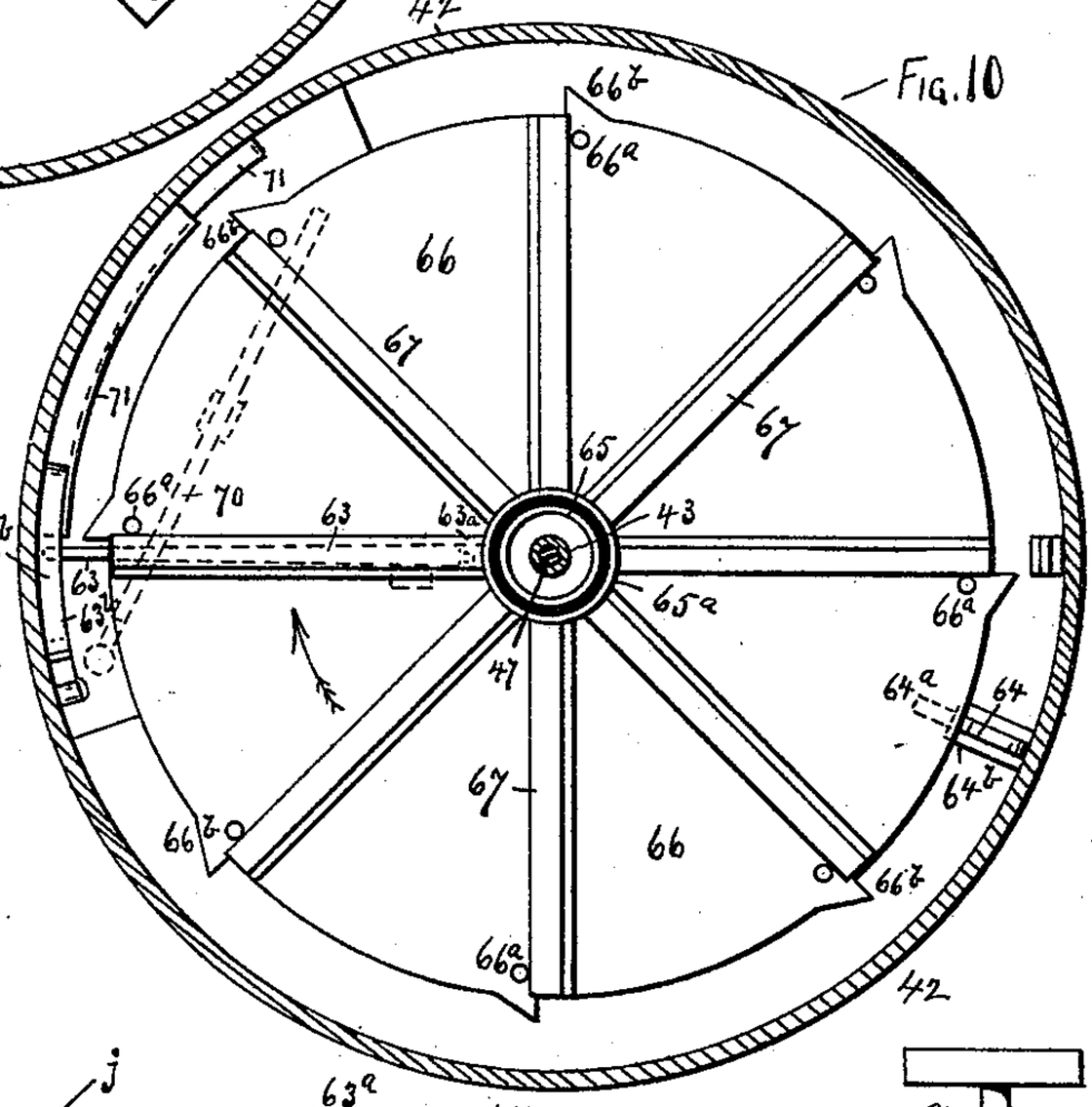


Fig. 11

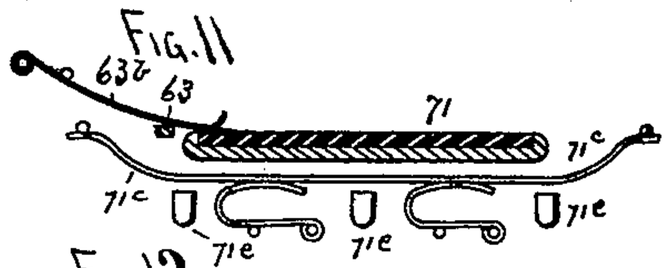


Fig. 12

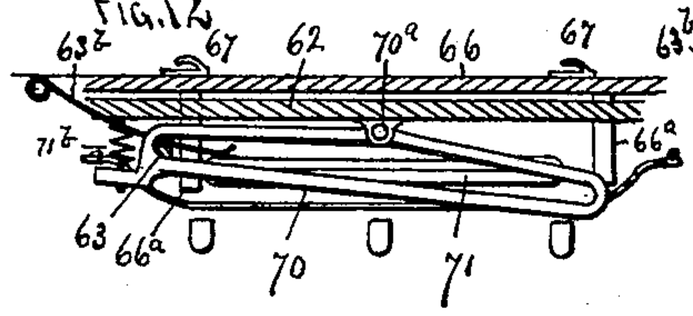


Fig. 15

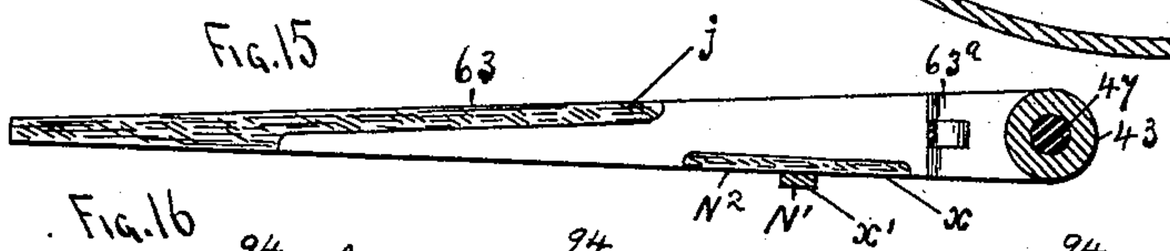


Fig. 16

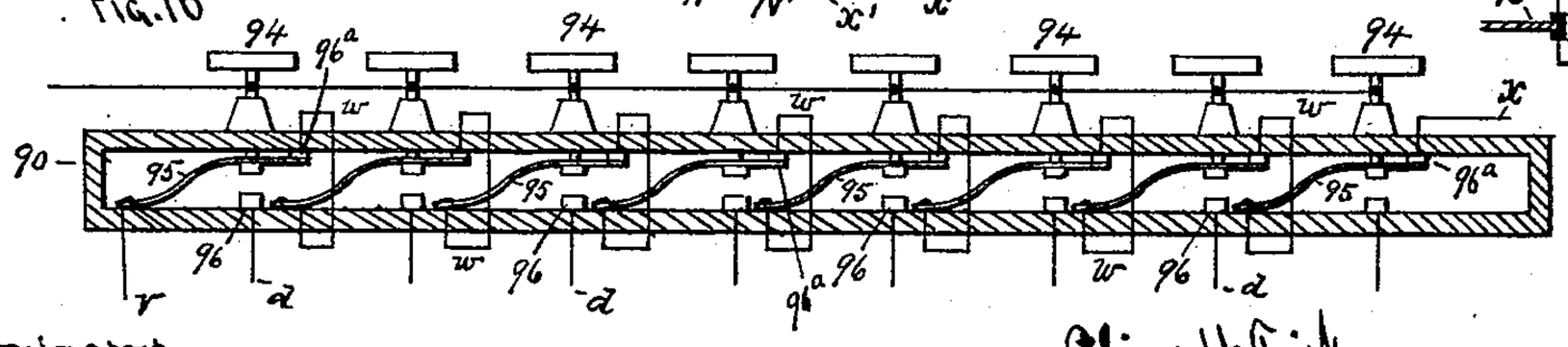
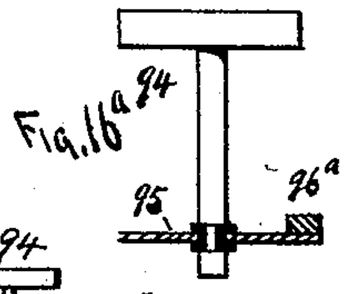


Fig. 16a



WITNESSES.
H. S. Webster
A. E. Chester

Olin H. Fisk
INVENTOR, BY
Charles N. Woodward Atty.

(No Model.)

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P. H. FISK.

PRINTING TELEGRAPH.

No. 450,228. Patented Apr. 14, 1891.

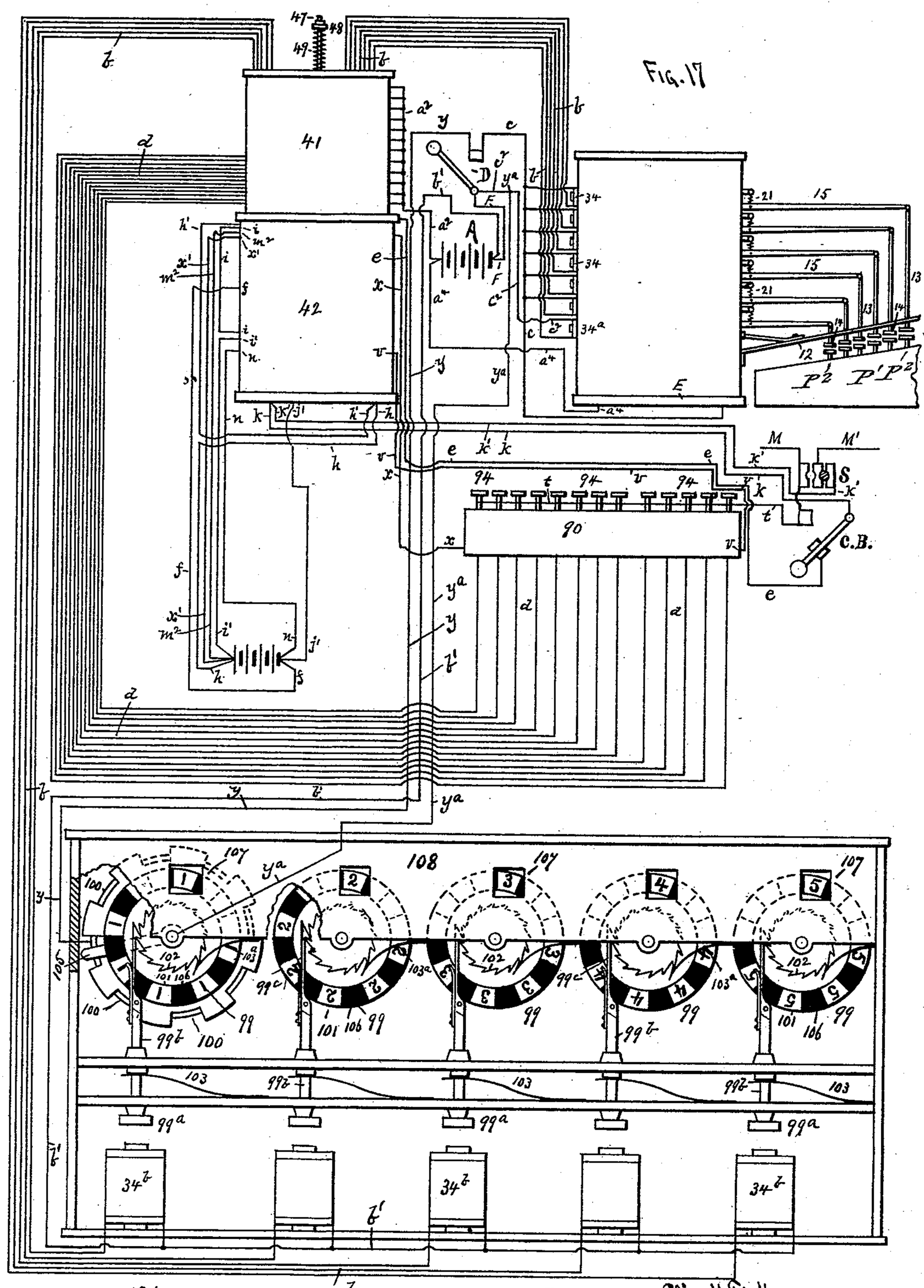

FIG. 17

WITNESSES: H. S. Webster. A. D. Sweet

Olin H. Fisk INVENTOR, BY Charles N. Woodward Atty

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P. H. FISK.

PRINTING TELEGRAPH.

No. 450,228. Patented Apr. 14, 1891.

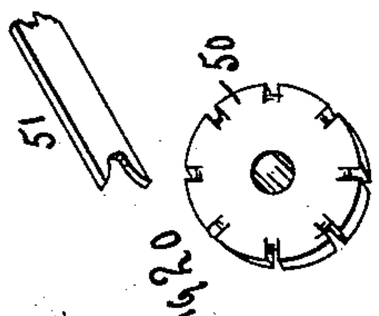

Fig. 20

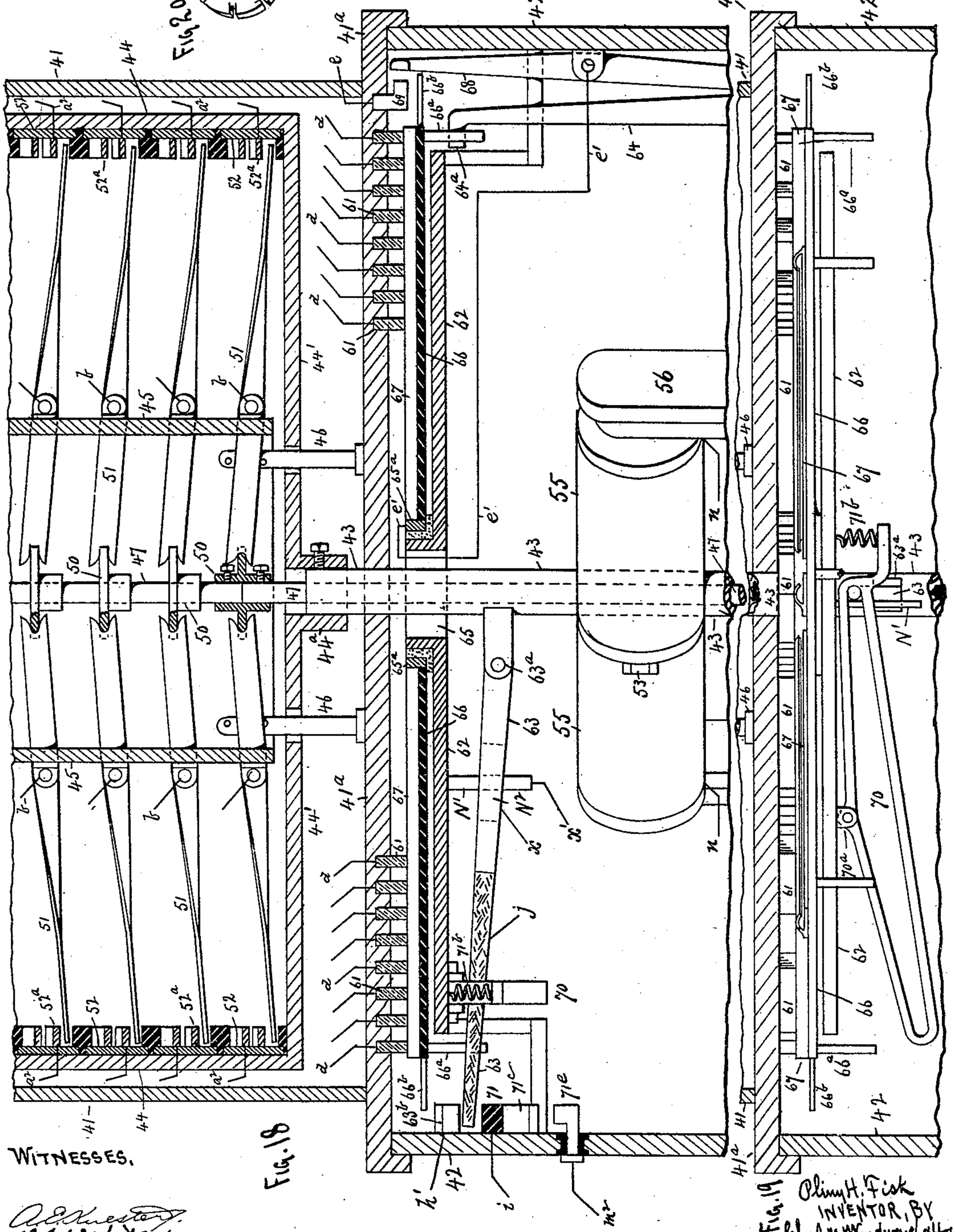

Fig. 18

Fig. 19

WITNESSES.

A. E. Knesten.
H. S. Webster.

Pliny H. Fisk
INVENTOR, BY
Chas. N. Woodward Atty.

UNITED STATES PATENT OFFICE.

PLINY H. FISK, OF NEW RICHLAND, MINNESOTA.

PRINTING-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 450,228, dated April 14, 1891.

Application filed October 17, 1890. Serial No. 368,433. (No model.)

To all whom it may concern:

Be it known that I, PLINY H. FISK, a citizen of the United States, residing at New Richland, in the county of Waseca and State of Minnesota, have invented a certain new and useful Improvement in Printing-Telegraphs, of which the following is a specification.

My invention relates to improvements in printing-telegraphs, and especially to means for electrically operating a series of electrically-connected type-writers and for transmitting the printed messages, and also for use in transmitting signals of various kinds, and for other analogous purposes.

The principal object of my invention is to provide means whereby a series of any number of type-writers in electrical connection and at distant points may be operated from any one in the series and the message recorded by all the type-writers in the series by any person who can operate an ordinary type-writer, thereby rendering the knowledge of telegraphy on the part of the operator unnecessary.

To this end my invention consists in a series of levers pivoted above the key-board of each of the type-writers composing the series, a series of hammers connecting the levers and suspended above each key of each of the type-writers, a series of transmitting-keys upon each of the series of type-writers, and means for electrically operating the levers, and thus striking the type-writer keys. This construction will be hereinafter fully described, and then pointed out in the claims.

In the drawings, Figure 1 is a diagram showing the general arrangement of the various parts of the mechanism. Fig. 2 is an enlarged detail view, in side elevation, of a portion of the receiving apparatus, showing the arrangement of the levers for operating the type-writer keys, the plates in which they are mounted, and the arrangement of the magnets and armatures for operating the levers. Fig. 3 is a plan view of the parts shown in the upper portion of Fig. 1. Fig. 4 is a cross-section on the line $z\ z$ of Fig. 3, showing the movable and stationary plates for carrying the main levers, a portion of one plate being broken away to show the relative positions of the plates; Fig. 5, a vertical section through the two main cases or cylinders of the machine, showing the arrangement and connections of the sending mechanism within the cylinders. Fig. 6 is a cross-section through the upper cylinder on the line $z'\ z'$ of Fig. 5, showing the position of the contact-levers. Fig. 7 represents side elevations of a series of the slides of the upper cylinder, showing the contact-points and guards thereon, whereby electrical connection is made with one of the contact-levers, and showing also the guides for the levers, representing six different letters. Fig. 8 is a cross-section through the upper part of the lower cylinder on the line $z^2\ z^2$ of Fig. 5, showing the contact-plates between the upper and lower cylinders and the arrangement of the contact-blocks thereon. Fig. 9 represents a series of six of the contact-plates removed from the disk, as shown in Fig. 8. Fig. 10 is a cross-section through the lower cylinder on the line $z^3\ z^2$ of Fig. 5, showing the oscillating plate carrying the flexible commutators for contact with the blocks of the contact-plate. Figs. 11 and 12 are detail views of the spring-loop and contact-plates which guide the arm for operating the oscillating disk. Fig. 13 is a cross-section through the lower cylinder on the line $z^3\ z^3$ of Fig. 5, showing the mechanism for oscillating the upper cylinder. Fig. 14 is a perspective view, enlarged, of a section of the oscillating cylinder, showing two of the slides in place thereon. Fig. 15 is an enlarged view of the arm for operating the oscillating disk. Fig. 16 is a sectional view showing in elevation the arrangement of the transmitting-keys. Fig. 16^a is an enlarged detail of one of the transmitting-keys, illustrating its construction. Fig. 17 is a diagram illustrating the mechanism by which the series of type-writers may be connected into and disconnected from the circuit. Fig. 18 is an enlarged sectional view of the central portion of Fig. 5, illustrating more fully the construction of some parts of the mechanism. Fig. 19 is a cross-sectional view on the line $z^4\ z^4$ of Fig. 18. Fig. 20 is a perspective view of one of the notched collars and a portion of one of the actuating-arms of the transmitting mechanism detached.

As shown in Fig. 1, P′ is the key-board of a type-writer, which may be of any desired construction, and P^2 are the keys, which are

arranged thereon in the usual manner, so that when struck they will operate the type-levers and print a character.

The key-board P′ is covered by a guide-plate 12, which is suitably supported in place, and extending vertically through the plate and mounted loosely therein are rods 13, one being arranged above each of the keys P^2, the lower ends of the rods being provided with small disks or hammers 14, adapted to strike the keys, and the upper ends of the rods being pivotally connected with the main levers 15, the free ends of which extend horizontally above the key-board A. The levers 15 are fulcrumed near the ends opposite the type-writer on posts 16 and extend through slots 19 in vertical plates 17 18. These slots 19 are alike in both plates; but those in the plate 18 are a little lower than those in the plate 17, so that when the levers are at the bottom of the slots in the plate 17 they will be at the top of the slots in the plate 18. The plates 17 and 18 are parallel, and the plate 18 is made stationary by being fixed to a suitable base E. The plate 17 is vertically movable, it being guided by the keepers or stays 20, which extend from the plate 18 and clasp the sides of the plate 17, and the movement of this plate is determined by the length of the slots 19 in the plate 18 and stops 20^a on the plate 18.

The levers 15 are held normally in an elevated position by the springs 21, which are attached to each lever and to the arms 22, which project from the blocks 23, said blocks being fixed in the plate 18, so as to project through the same, and the parts of the blocks between the plates are beveled upwardly to relieve the catches on the main levers, as hereinafter described.

The lower edge of plate 17 is attached to a strip 24, which serves as an armature, (it being suitably insulated from the plate 17.) The plate 17 is held normally in an elevated position by the springs 25, which encircle the guide-rods 26, secured in the base on which the magnets rest and passing upward through the outer ends of the armature 24. A series of magnets 27 is arranged beneath the armature 24, which, when energized, depress the armature 24 and plate 17. The plate 17, when depressed, does not affect the levers 15, by reason of the presence of the slots 19; but mechanism is connected to the levers and the plates 17 and 18 whereby the lever 15, which actuates the required letter of the type-writer, may be connected to the plate 17 and be drawn down by it, which mechanism I will now describe.

A stop 28, having a horizontal lower surface and a beveled upper surface, is fixed to the plate 17 alongside of but just above each of the slots 19 and in alignment with the blocks 23 on the plate 18. A pawl 29 is pivoted on each lever 15 between the plates 17 and 18, said pawl having a curved flexible lower end 29^a curved away from the blocks 23. The pawls 29 hang normally in an upright position, as shown in Fig. 2, so that they pass the projections 23 and 28 when the plate 17 is depressed and are not affected by them. A rod 30 is pivoted to the upper portion of each pawl 29, said rods extending along the tops of the levers 15 and having their ends, which project beyond the fulcrumed ends of the levers, provided with armatures 30^a. The rods 30 extend over pulleys 31, which are pivoted on the levers 15 at the fulcrum-point of the levers to facilitate the easy operation of the rods, and each rod is provided with a curved contact-arm 32, which arms are connected with the magnets 27 by the wire *a*. Each lever 15 is also provided with a contact-arm 33, adapted to engage the contact-arm 32 to close the circuit through the magnets 27, with which they connect, as hereinafter described. These contacts are connected to each other and to an electric battery A by wire a^4.

Fixed in supports 35, opposite the armatures 30^a, is a series of magnets 34, there being a magnet for each of the armatures 30^a. The magnets 34 are connected with the battery A by wires *c* F, as shown in Fig. 1, and as hereinafter more fully described, and when one of the magnets is energized it attracts the armature 30^a opposite it, thus moving its corresponding rod 30 and bringing the upper end of its respective pawl 29 beneath one of the beveled stops 28. At the same time the contact-arms 32 and 33 meet, and the circuit is closed through the wires *a* and magnets 27, thus energizing the magnets 27 and causing them to attract the armature 24 and depress the plate 17. As the plate 17 descends it moves freely on all the levers 15, except the one carrying the pawl, which is in engagement with its respective stop 28, and this lever 15 is forced downward, and the hammer 14 at the end of the lever strikes a key of the type-writer and prints a character. The blocks 23 are arranged upon the plate 18 in such relation to the levers 15 that at about the time the character is printed the curved lower end 29^a of the pawl of the lever which is being operated strikes the beveled portion of its corresponding blocks 23. When the downward motion of the armature 24 is checked by the stops 20^a, the momentum of the levers 15 causes them to continue their downward motion to a limited extent, which causes the flexible ends 29^a of the small pawls 29 to be acted upon by the inclined stops 23 and release the upper ends of the pawls from stops 28, and thus release the lever 15 and permit it to be returned to its normal position by the action of the spring 21. When pawls 29 are moved by stops 23, the circuit through 32 33 is broken and breaks the current through magnet 27 and permits springs 25 to throw plate 17 upward to its normal position. The stop-blocks 20^a limit the downward movement of the armature 25, and will be arranged either upon the stationary plate 18 or the base E, on which the magnets 27 rest. A magnet

34ª is fixed in the supports 35 below the magnets 34 (this magnet having electrical connection, as hereinafter described) and loosely mounted in one of the posts 16. Opposite the magnet 34ª is a rod 36, having at the end next the magnet an armature 36ª, the opposite end of the rod being pivoted to a bell-crank 37, carrying a hammer 38, which is arranged adjacent to the gong 39, said gong being fixed to a suitable support 40, so that when the magnet 34ª is energized it attracts the armature 36ª, moves the rod and crank, and sounds the gong.

In order to actuate any desired lever or part of the machine by electrical means, it is necessary to transmit to the receiving-machine a distinct and uniform series of electrical impulses for each lever or part to be operated, and these series of electrical impulses are produced by the arrangement of a system of contact-blocks, whereby an electrical circuit is alternately broken and closed, each lever or part having its own distinctive series of electrical impulses. It is also necessary to provide a device whereby each of the series of the impulses can be caused to take effect upon its own respective lever or part to be operated without affecting the other levers or parts, as hereinafter described. This device consists, primarily, of a transmitting-key board 90, a cylindrical case 41, mounted on a larger cylindrical case 42, both cases being stationary and containing the mechanism whereby the signals are transmitted. The cylinder 41 has an opening at the center of its top plate, from the center of which a collar depends for holding a cylinder 44 within the cylinder 41 in position and allowing it to rotate as may be desired. The lower plate 44′ of cylinder 44 has a socket 44ª depending from its center, into which fits the top of a hollow shaft 43, the latter being firmly secured to the socket by a set-screw, as shown, and passing down through the cylinder 42. Thus any rotation or oscillation of the shaft 43 carries the cylinder 44 with it. At the lower end of the shaft 43 is a coiled spring 59, the inner end of which is secured to the shaft, and the outer end is riveted to a worm-gear 58, which moves freely about shaft 43 and rests by a shoulder upon a partition 42ᵇ, which extends across the lower cylindrical case 42.

The worm-gear is adapted to be actuated by a worm 60ª, which may be turned from the outside of the case by a rod 60, extending through the cylindrical case 42 and terminating in a thumb-screw 60ᵇ. If shaft 43 be held stationary, the tension of the coiled spring may be easily adjusted by the above-described arrangement of parts.

An approximate uniformity of tension of the springs 59 in all the instruments used on a given line is necessary to secure synchronism of movement, as will be hereniafter shown. When the worm-gear 58 is held stationary, the tendency of the coiled spring 59 is to rotate the shaft 43.

An upright shaft 47 extends throughout the whole length of the interior of the shaft 43, and also through the cylinder 44 and upward through a collar depending from the top of the cylinder 44, the upper end being provided with a collar 48, and between the collar and the top of case 41 is a spiral spring 49, which normally holds the shaft 47 in an elevated position, and also throws the shaft 47 upward and depresses the outer ends of the levers 51 to close the circuits through the mechanism governing the signaling apparatus, as hereinafter shown and described. The collar 48 also serves as an adjusting screw or nut for regulating the tension of spring 49. At regular intervals upon the shaft 47, within the cylinder 44, are fixed a series of collars 50, of insulating material, which serve as bearing-disks for the inner ends of the flexible radiating contact-levers 51, the latter having notches in their inner ends fitting into corresponding notches or cavities in the disks or collars 50, as shown in Fig. 20. These radiating levers are fulcrumed near their centers to a stationary cylinder 45, extending centrally through the cylinder 44 and supported by posts 46, which rest on the top 41ª of the lower case 42, and which project through the curved slots 44ᵇ in the bottom of the cylinder 44, so as not to interfere with the motions of said cylinder.

The shaft 47 is divided into two parts near the lower end of the cylinder 45 and with the adjacent ends coupled by the lowermost of the collars 50, as shown, so as to provide for the separation of the parts for convenience in repairs or the removal of the cases 44 45 when necessary.

Fixed to the lower end of the shaft 47, beneath the partition 42ᵇ, is a yoke 87, which extends horizontally above two magnets 77, and is provided at the ends with springs 88, attached to the partition 42ᵇ above, and which assist in supporting the weight of the yoke and of the shaft 47, the yoke thereby forming a flexible step to the shaft. Fixed centrally to the under side of the yoke and depending therefrom are the armatures 89, which are drawn into the hollow cores of the magnets 77 when the latter are energized, and thus depress the shaft 47. This draws the converging ends of all the levers 51 in the cylinder 44 downward, and of course causes a simultaneous elevation of the free outer ends of the levers 51. The levers 51 extend to points near the slides 52, which constitute the principal part of the interior of the cylinder 44, there being one of the slides for each of the contact-levers 51. Each slide is provided with an elongated contact-point 52ª, situated toward one end of the slide. These contact-points 52ª of all the slides are connected electrically with each other and with the battery A by the wires a^2. They project

inwardly from the inner surface of the slides 52 far enough to render a contact with the ends of the levers 51 certain. Each of the levers 51 has a separate electrical connection by wires *b* with one of the magnets 34, which operate the keys of the type-writer. These magnets 34 are connected by short wires *c* to a contact-plate, the latter adapted to be connected to the battery A by a wire F through the medium of a switch-bar D, connected thereto, as shown in Figs. 1 to 5 and 17, the wire F being connected with battery A at the pole opposite to that to which the wires a^2, proceeding from the contact-points 52^a, are connected. A partition 62 is secured rigidly in the upper part of the case 42, and with an insulated collar 65 surrounding an opening through its center. Journaled loosely around this collar 65 as a center is a disk 66, the disk being insulated from the partition 62 and collar 65 by a rubber or other suitable ring, as shown more clearly in Figs. 18 and 19. Downward from the lower surface of the disk and near its outer margin project at regular intervals a series of stop-pins 66^a, extending lower than the partition 62 and moving just outside of it.

An arm 63 projects from the cylindrical shaft 43 just below the partition 62 and passing outward beyond the stop-pins 66^a and just above the level of their lower points and terminating near the side of the case 42. This arm is rigid horizontally, but has a vertical hinge 63^a, which permits its outer end to be lowered so as to clear the points of the stop-pins 66^a. The arm 63 extends through a slotted pivoted trip-guide 70, (see Fig. 12,) which is pivoted at 70^a to the lower surface of the partition 62 at right angles to the arm 63. This guide hangs in a slanting position, the elevated end being connected with the lower surface of the partition 62 by a spiral spring 71^b. By this arrangement when the shaft 43 is oscillated the arm 63 will be moved with it, and, striking against one of the pins 66^a, will carry the disk 66 around with it.

A stationary horizontal guide 71 projects from the inner surface of the case 42 and with its middle point directly opposite the middle or pivotal point 70^a of the slot in guide 70, the length of the guide 71 being a little less than the distance between two of the stop-pins 66^a. The end of the lever 63 rests normally at the elevated end of guide 70 above guide 71 and in contact with one of the stop-pins 66^a, and also with a contact-spring 63^b, fixed just above one end of the guide 71. (See Figs. 11 to 18 and 19.)

The rotation of the disk 66 under the pressure of the arm 63 against the stop-pin 66^a is prevented by the bent end 64^a of a vertical lever 64, which is pivoted at 64^b to the side of the cylindrical case 42 and normally engages one of the stop-pins 66^a, as above mentioned. It is held in this position by a spring 73, connecting the lower end of the lever with the side of case 42 and tending to draw the former outward. Upon the lower end of this lever is an armature 64^c, and opposite this is a magnet 74, which when energized draws the lower end of the lever inward and releases the upper end from its contact with the stop-pin 66^a.

The shaft 43 is provided on opposite sides with laterally-extending arms 53, having hinged to their outer ends armatures 54, which extend at right angles to the arms and oppositely to each other, and arranged opposite the armatures are the hollow magnets 55, which are supported from the standards 56, and which when energized draw the armature 54 into the hollow portion of the magnet-drums, and thus oscillate the shaft 43 and the cylinder 44, connected therewith, in one direction, while the coiled spring 59 returns them to their normal position when the current in the magnets is broken by the lever 63 running off from the plate 71. The magnets 55 and armatures 54 are arranged to oscillate the shaft 43 enough to turn the cylinder about the distance of one of the slides 52 therein, as hereinafter shown. The above arrangement is best shown in Figs. 5 and 13. The spring 59 will thus have a tendency to turn the shaft 43 in one direction, and it is arranged to turn it in a direction opposite to that imparted to it by the magnets 55, so that when the magnets are energized they will turn the shaft in one direction, and when the circuit is broken the spring will turn the shaft in the opposite direction.

When the shaft 43 is moved under the influence of the coiled spring 59, the arm 63 passes along the upper surface of guard 71, carrying one of the stop-pins 66^a with it and turning the disk 66. When it reaches the end of guard 71, the pressure of the trip-spring 71^b in the trip-guard 70 pushes it downward below the guard 71. The shaft 43 is then rotated in the opposite direction by the action of the magnets 55, as will be further explained hereinafter. During this return motion the end of the arm 63 is below the guard 71; but when it has reached the end of that guard the upward pressure of the trip-guard causes it to rise and take its place behind the next succeeding stop-pin 66^a ready to repeat the movement when the disk is again at liberty to move. Thus the disk 66 is revolved intermittently, while shaft 43, with the arm 63 and the cylinder 44 in the case above, is oscillated alternately backward and forward.

In making the above-described movement the end of the arm 63 comes in contact with the contact-spring 63^b, and immediately after passing that runs upon the conducting portion of the upper surface of guard 71, and during its return movement it presses the contact-plate 71^c into contact with the pins 71^e, which are insulated in the side of the case 42. This action makes and breaks certain electric circuits to produce certain effects upon the parts, as hereinafter more fully described. I do not wish to limit myself to this specific mode of making this connection, as other methods may be found preferable.

On the upper surface of plate 66 is a series of radiating commutators 67, which connect electrically with each other by means of a central ring 65^a, encircling the rim 65, and have upwardly-projecting flexible flanges to facilitate electrical contact with the contact-blocks 61 in the plate 41^a above, as hereinafter described. The conformation of these commutators is shown more clearly in Figs. 10 and 12, consisting of a system of contact-blocks set into the lower surface of the lower plate 41^a of the upper case 41 and having their exposed surfaces projecting downward, so as to be passed over by the radiating commutators 67, before described. These contact-blocks correspond in number with the slides 52 and levers 51 of the cylinder 44 and are curved in form and placed so as to form segments in rows or banks for convenience of arrangement, the blocks composing each respective bank beginning and ending on a common radius of the circles of which the blocks are the segments, as indicated by the dotted lines in Fig. 8, the blocks thus decreasing in length from the outer toward the inner set. An open space 61^b intervenes between each pair of the banks of the contact-blocks, so that there will be an interval in which the radiating commutators 67 on plate 66 as the latter rotates beneath them will not be in contact with any of the aforesaid contact-blocks, and so that the initial end of each and all of the contact-blocks will be reached by the radiating commutators simultaneously. The function of these vacant spaces is to break the circuit in the magnets controlling the movements of the shaft 47 and permit the return movement to be made by the coiled spring 59, as hereinafter more fully set forth.

The number of the radiating commutators is not arbitrary, but eight is found to be a convenient number; but the number must be the same as the banks of contact-blocks 61.

The contact-blocks 61 are made up of a series of alternating conducting and non-conducting surfaces, as shown more clearly in Fig. 9, which represents a number of these blocks detached. Each block has its complement in one of the plates 52, as before mentioned and as hereinafter described. All of the conducting-points of each of the blocks 61 are electrically connected together, and each of the contact-blocks is electrically connected by wires *d* with one of the contact-points 96, situated below the ends of the keys 94 in the transmitting-key board 90, each contact-block 61 thus having a separate key connected to it.

The transmitting-keys bear upon their upper surfaces the same letters or characters as the corresponding keys of the type-writer to be operated. The pressure of a transmitting-key brings it into contact with the contact-point 96 immediately below, which contact-point, as above mentioned, is connected electrically and separately with one of the contact-blocks 61. Thus it will be seen that if the keys 94 be connected with a main circuit on one side of the switch S, and if then a transmitting-key be depressed and at the same time the plate 66 be rotated a distance equal to an interval between a pair of the commutators 67, each commutator will traverse the entire length of all of the contact-blocks 61 in the particular bank of the same above which for the time being it happens to be. The commutators will thus pass beneath all the contact-blocks 61 at each intermittent motion of the disk 66; but as the main current is closed through the block connected with the depressed key that specific block only will be affected, while the remainder of the blocks will remain out of the circuit and unaffected. If now the exposed surface of the contact-block be made of alternating conducting and non-conducting sections, as before mentioned, and as shown in Fig. 9, a series of impulses will be imparted to the main circuit, the characters of which will be determined by the length and arrangement of the conducting-sections of the contact-block. For the purpose of illustration the exposed surfaces of these contact-blocks are shown divided into seven sections, (see Fig. 9,) the first of which is preferably somewhat longer than the others of the same block and is always a conducting-surface. The arrangement of the remaining six sections of the contact-blocks into conducting and non-conducting portions is not alike on any two blocks. Consequently no two blocks will impart the same series of impulses to the main circuit.

By slight variations in the arrangement of the sections of the contact-blocks an almost unlimited number of characters may be represented. I have shown in Fig. 9 a series of six of these blocks to illustrate the method of construction and in Fig. 7 a series of six of the slides 52, corresponding thereto, as hereinafter described. The corresponding sections of each contact-block 61 are of the same length as measured in degrees and fractions of a degree of a circle, as shown in Fig. 8.

At the bottom of case 42 is a relay-magnet 81, through which the main electrical current passes to energize the magnets controlling and actuating the shaft 47 and the attachments and other portions of the transmitting mechanism. An armature 79 is supported in front of this magnet on a lever 79^a. The upper end of lever 79^a is normally held against a spur 80^a by a spring 79^b, thus holding the local circuit open, or "broken;" but when magnet 81 is energized the end of the lever 79^a is thrown in contact with the contact-point 80 and closes the local circuit.

A contact-point 69 is suspended from the plate 41^a outside of the series of contact-blocks 61 and near the side of the case 42. A contact-lever 68 is pivoted to the inner side of the case 42 and extending vertically, its upper end adjacent to the contact-point 69 and its lower end pivoted to the upper end of a similar lever 68^a.

at the lower end of lever 68^a is an armature 68^b, arranged opposite a magnet 72, which is supported upon the partition 42^b in the case 42. The effect of energizing magnet 72 is to produce a contact between the upper end of the contact-lever 68 in contact with the point 69, which contact remains until broken in the following manner: A series of beveled contact-breakers 66^b projects from the outer rim of the disk 66, so that as the latter rotates these contact-breakers will push the end of lever 68 away from its contact with the point 69.

The contact-breakers 66^b, the stop-pins 66^a, the radiating commutators 67, and the "banks" of contact-blocks 61 must correspond in numbers, and each of them, respectively, must be placed at uniform intervals about the disk 66, and they are placed in such an order that the contact-breakers push the contact-lever 68 away from the contact-point 69 at the instant that the commutators 67 are passing over the vacant intervals between the banks of contact-blocks 61, and the end of the lever 64 engages a stop-pin 66^a at the instant that the radiating commutators 67 reach the initial points of the contact-blocks, and also at the moment when the arm 63 ceases to act on the stop-pin 66^a and drops below guard 71, so as to permit the magnets 55 to act upon the shaft 43 and cylinder 44 to return the slides 52 to their normal position, and also to carry the arm 63 back to its normal position and in contact with spring 63^b.

From the inner surface of each of the slides 52 project a series of guides made of insulating material and extending inward far enough to engage the end of the levers 51. The function of these guides is a very important feature of the invention, and to understand them clearly their arrangement in several different cases is shown in Fig. 7. As before stated, each of the slides 52 has a complement in one of the contact-blocks 61 on the plate 66, and each slide is provided with a contact 52^a, with which the free end of the lever 51 is adapted to come in contact, each lever 51 therefore having one of the contacts 52^a corresponding to it, and with which it engages. As before stated, also, each of the contact-blocks 61 is divided for convenience into sections of seven spaces each, and the slides 52 are likewise divided into similar and corresponding sections. The sections are indicated by dotted lines in the uppermost slide in Fig. 7 and the uppermost contact-block in Fig. 8 and numbered from 1 to 7. Projecting from each of the slides 52 is a horizontal guard-strip 52^c, each beginning at the extreme end of the slides opposite to the contacts 52^a and ending above the contacts, and are curved downward, as shown, and stopping short of the end of the slide, so as to leave room for the end of the lever 51 to fall down between them and the corresponding guard of the next slide. Projecting from the slides 52, with their upper sides on a line even with the upper surfaces of the contacts 52^a, are a series of guards 52^b, being horizontal between the sections corresponding to the non-conducting portions of the corresponding contact-block 61 and inclined between the sections corresponding to the conducting-sections of the corresponding contact-blocks, leaving horizontal channels between the lower guards 52^b and contacts 52^a and the upper guards 52^c, as shown in Figs. 7 and 14. The guards 52^c will also be provided with inclined openings above each of the horizontal sections, as shown, to form a means for the passage of the ends of the levers 51 out to the space above the guards 52^c, as hereinafter shown. The levers 51 are formed of metal, thin and spring-like at their outer ends, so that they will readily bend upward and downward, so that the inclined portions of the guards 52^b and 52^c will readily run upward or downward over or under the ends of the levers and bend them upward or downward, as the case may be, and as hereinafter described.

To illustrate the construction more fully we have selected for representation in Figs. 7 to 9 and 14 a series of the slides 52 and their corresponding contact-blocks 61 from different parts of Fig. 8. For instance, the upper plate shown in Fig. 7 corresponds to the contact-block marked 61^a in Fig. 8 and the uppermost block in Fig 9, (as that contact-block 61 only has a continuous conducting-surface,) while the lowermost plate in Fig. 7 corresponds to the opposite arrangement of block or to the one shown at 61^g in Fig. 8, (and the lowermost block in Fig. 9,) wherein the whole surface is non-conducting. The second slide in Fig. 7 corresponds to the second block in Fig. 9, which represents block 61^c in Fig. 8. The third slide in Fig. 7 corresponds to the third block in Fig. 9, which represents the block shown at 61^d in Fig. 8. The fourth slide in Fig. 7 corresponds to the fourth block in Fig. 9, which represents the block shown at 61^e in Fig. 8. The fifth slide in Fig. 7 corresponds to the fifth block in Fig. 9, which represents the block shown at 61^f in Fig. 8. These blocks and slides have been selected as representing the greatest variation in the arrangement and as best calculated to illustrate the operation.

Suppose, for illustration, that the key 94, corresponding to the block 61^e, (see Fig. 8,) be depressed. Then at once the circuits are closed, which draws the shaft 43 downward, and thus elevates the outer ends of all of the levers 51 against the under surfaces of the guards 52^c, as shown by dotted lines in Fig. 7. The magnets 55 being likewise energized, the shaft 47, with its attached arm 63, cylinder 44, and the slides 52, begins to turn, which action also turns the disk 66 (by means of the arm 63 acting on one of the pins 66^a) and causes the commutators 67 to traverse the surface of the contact-blocks 61. When the commutators pass over the first section of the energized block 61^e, the circuits remain

unbroken; but just as soon as the commutator crosses the first non-conducting surface the circuits are broken and the springs 49 and 88 throw the shaft 47 upward and depress all the outer ends of all the levers 51. All of the slides 52, corresponding to the blocks 61, which have a non-conducting section next to its first conducting-section, will have one of the horizontal guards 52^b in its second section, or next to the entering end for the lever 51, as in the fourth slide of Fig. 7, so that all the levers 51 working in slides of that construction will be stopped by the horizontal guards, and the slides will be moved along past the ends of the levers through that section, while in all the other slides having the inclined guards 52^b in the second section the ends of the levers 51 will pass down into the space between the inclined guards and will be thrown down beneath the guards by the movement of the slides and will not rise again, as all the inclined guards running in one direction will prevent it. When the commutators 67 come in contact with the next conducting-section of the block 61^e, (whose action we are now following,) the outer ends of the levers 51 will all be thrown up again against the guards 52^c of all the slides; but in all the slides (corresponding to blocks 61^e, in which the third section is a non-conducting section) the guard 52^c of that slide 52 will be formed with an inclined opening above the third section—as, for instance, in the sixth slide in Fig. 7. In all such slides the levers 51 will, when thrown upward, pass up through such inclined openings and be carried along over the tops of the guards 52^c and down over the downwardly-curved ends and not come in contact with the contact-plates 52^a. In all the slides 52, corresponding to the blocks 61^c, in which the third section is a conducting-section, the levers 51 will be thrown up against the solid portion of the guards 52^c corresponding thereto, which always occurs above the sections corresponding to those of the blocks 61 formed with conducting-surfaces. The conducting and non-conducting surfaces of the blocks 61^e being alternately arranged, as shown, the lever 51 of the slide corresponding thereto will make a regular zigzag motion, as shown by dotted lines in Fig. 7, while all the other levers will have been carried either above the guards 52^c or beneath the guards 52^b, and thus prevented from coming in contact with the contacts 52^a. The guard 52^c of the slide 52, corresponding to the blocks 61^a, (the upper slide in Fig. 7,) has no openings, as the surface of the block 61^a is a continuously-conducting one. Hence the outer ends of all the levers 51, when the block 61^a is energized, will be held upward during the whole stroke of the cylinder 44 and will fall only when the commutators 67 pass beneath the vacant spaces 61^b on the disk 66; but all the guards 52^c of all the other slides 52 will be provided with one or more openings. Hence all the other levers 51 will be carried up through the guard 52^c and thence over the contacts 52^a without touching them. On the other hand, all the guards 52^b of the slide 52, corresponding to the block 61^g, will be inclined, as shown in Fig. 7, so that at the first downstroke of the outer end of the lever 51 of that particular slide when a block 61 other than the one 61^a is energized, the lever will pass down beneath the guard and be carried past the contact 52^a of that slide 52. The guard 52^c of the slide 52, corresponding to the block 61^g, (see lower slide in Fig. 7,) is formed with its guard 52^b wholly of inclined sections, while its guard 52^c is wholly of horizontal sections, as the motion of the lever 51 of that guard is first upward (through the action of the first conducting-section of block 61^g) and then downward, and remains downward during the remainder of the stroke of the slide (as all the sections of blocks 61^g are non-conducting except the first one) until it reaches the contact 52^a; but as all the other slides 52 have one or more inclined sections in their guards 52^b all the other levers 51 will pass through the first one of these inclined openings which occurs and pass beneath the contacts 52^a of all the other slides. When once a lever 51 passes upward above its guard 52^c or downward beneath its guard 52^b, as before described, it cannot get back again into the space between the guards 52^c and 52^b, but must pass over or beneath the contacts 52^a, the springy nature of the levers 51 enabling the constant rising and falling of the levers to permit the levers above and below the guards to be bent upward and downward to enable them to perform the desired motion.

As a further illustration, suppose the key 94, corresponding to the contact-block 61^d, (see Fig. 8,) being also shown in the third block from the top in Fig. 8, with its complementary slide 52 shown in the third from the top in Fig. 7, to be in use. The first impulse when the commutator 67 strikes its first conducting-section is to energize the operating parts, so as to elevate the outer ends of all the levers 51, which, as before stated, is always the first effect produced. Then as the first, second, third, fourth, and fifth sections of this particular block are conducting the outer ends of all the levers 51 will be held up and will run along beneath the upper guards 52^c until the commutator 67 reaches the next non-conducting section in block 61^d, when, the current being broken, the springs 49 and 88 will throw the outer ends of the levers 51 downward, which in the case of the lever we are considering prevents it from passing out through the opening in the guard 52^c, (see Fig. 7;) but the lever will be caught by the horizontal section of the guard 52^b, beneath the open section in the guard 52^c and be thus prevented from falling below the contact 52^a. When the commutator 67 comes in contact with the next section of the block 61^d, which is a conducting one, the outer ends of the levers 51 will be again elevated, and then when

the commutator passes over the vacant space 61^b the circuit will again be broken and the outer end of the lever 51 will be thrown down in contact with the contact 52^a and a circuit closed through the magnet 34, connected with that particular lever 51, and the signal thereby transmitted, as before described. In the meantime all the other levers 51 will have been thrown up and down in precisely the same manner; but, as before stated, each of the other levers has been thrown into one of the inclined openings in the guards 52^c or 52^b and been carried over or under the contacts 52^a, so that the contact 52^a on the slide which corresponds to the block 61^d is the only one touched by one of the levers 51. Thus it will be seen that by forming no two of the guards 52^c and 52^b with the same relative arrangement of the alternating inclined and horizontal sections every one of the outer ends of the levers 51, except the one whose corresponding block 61 is energized, will be carried either over or beneath the contact 52^a on its corresponding slide 52.

The shafts of the transmitting-keys 94 are of conducting material and are electrically connected by wire *t* to a circuit-breaker C B, and thence to the main line. The shafts of the keys 94 pass downward through sockets of insulating material set in the key-board 90 and rest upon the springs 95, from which they are insulated in any suitable manner.

For the purpose of illustration I have shown in Fig. 16^a an enlarged view showing an approved method of insulating the keys 94 from the springs 95, consisting of a socket of hard rubber or other suitable non-conducting material between the spring and key-shaft, so that while the currents can freely pass through the key-shaft or spring they will not pass from the key-shaft to the spring, or vice versa. The springs 95 are of conducting material and are insulated upon the casing of the key-board 90. The free ends of the springs 95 rest normally beneath points 96, which are contact-points insulated in key-board 90 and projecting downward. The springs 95 and contact-points 96 are electrically connected as follows: Beginning with one of the springs 95 it is connected with the contact-point 96 of the next spring by a wire *w*, and this spring is in turn connected with the contact-point 96 of a third spring 95 by another wire *w*, and so on for all the springs of the key-board, so that the pressing of any one key 94 breaks the circuit, which runs through all the springs and points, and thence by the wires *x*, plate N^2 on arm 63, contact N′, and wire *x′* to battery B, and also by wire *v*, magnet 72, and wire *t* to battery B, as hereinafter explained.

Suppose one of the commutators 67 be in contact with the first section of the upper block in Fig. 9. The transmitting-key 94, having its contact-point connected with this particular contact-block, is supposed to be held down, so that contact is continued through its spring 95 and the contact-point 96 beneath. Lever 68 is in contact with contact-point 69. The main current now passes in the following circuit: from main line M through switch S, wire *t*, key 94, contact-point 96, wire *d*, contact-block 61, commutator 67, wire *e′*, lever 68, contact-point 69, wire *e*, circuit-breaker C B, wire K, relay-magnet 81, and wire K′, switch S to main line again. The relay-armature lever 79 is brought in contact with the contact-point 80, and a local circuit is closed from battery B through wire *j′*, lever 79, contact-point 80, wire *j*, arm 63, spring 63^b, wire *h′*, magnet 74, and wire *h* to battery B again. Magnet 74 being thus energized operates lever 64 and withdraws it from behind the stop-pin 66^a, where it had been held by spring 73. The disk 66, being now released, is carried forward by the action of the coiled spring 59, which turns shaft 43, and this again swings arm 63, carrying forward the stop-pin 66^a, against which it was lodged. Three results now follow: First, disk 66 is rotated, carrying the commutators 67 over the contact-blocks 61; second, the cylinder 44 is rotated through the same portion of a complete revolution as the commutators and in precisely the same time, and, third, the end of arm 63 will pass from under the end of spring 63^b and will come in contact with the conducting-surface of the guard 71. By this means first the circuit through the magnet 74 will be broken, the lever 64 will be returned to its normal position ready to engage the next succeeding stop-pin 66^a, and, second, the circuit will be renewed *via* guard 71, wire *i*, magnets 77, and wire *i′* to battery B. This causes the depression of armatures 89, the downward pull of the converging ends of the levers 51, and the consequent elevation of all their free outer ends, including the one above mentioned, and the transmission of the given character or signal.

The portions of the slide 52 numbered from 1 to 7 are exactly the portions passing before the outer point of lever 51 while the commutator 67 is passing over the section of the contact-blocks. These portions are called "spaces" in the case of the slides and "sections" in the case of the contact-blocks. Then while the commutator 67 is passing section 1, (see Fig. 7,) the circuit being closed through the magnets 77 and the shaft 47 drawn downward, lever 51 will be raised while passing space 1. Then since the series of impulses is carried throughout the entire main line it will produce the same effect in every similar machine connected in a like manner with the line.

When the transmitting-key 94 is raised and its spring 95 restored to contact with its respective point 96^a, a circuit is closed as follows: beginning at battery B, through line *x′*, contact-point N′, contact N^2 on arm 63, wire *x* through each of the contact-points 96^a and the springs 95 in succession, wire *v*, magnet 72, and wire *f* to battery B again. The effect of this current is to energize magnet 72 and cause it

to operate levers 68 and 68[a], so as to bring the latter into contact with the point 69 and close the main circuit at that point, and thus connect the keys 94 electrically with the contact-blocks 61. This contact was broken by the action of the circuit-breakers 66[b] during the rotation of disk 66, as before described. When the end of the arm 63 has reached the end of guide 71 and dropped below it, it comes in contact with the spring 71[c] and presses it against the contact-pins 71[e] and forms a new circuit, passing now from the battery B, through wire *n*, magnets 55, wire *m*, plate 71[c], points 71[e], and wire m^2 to battery B again for the purpose of restoring cylinder 44 and its attachments to its normal position.

The function of switch S is to detach the entire apparatus from the main line.

The circuit-breaker C B when closed allows the main circuit to pass directly to the relay-magnet 81 and back without interruption and without passing through the operating mechanism of the key-board of the receiving-instrument. When open, as shown, the main current can only reach the relay when a key is depressed and the circuit closed through 94 and 96, as described.

The circuit-breaker D enables each operator to control his instrument, so as to cut out the printing part when not required.

Magnet 34[a], which operates the signal-gong, is not cut out by break D nor the signal-disks, as shown in Fig. 17.

The sending or transmitting mechanism which controls the impulses to be sent over the wires is energized by the battery B, as hereinafter described.

Battery B energizes magnet 74 for the purpose of actuating lever 64, as before described, the circuit being through wire *h*, magnets 74, wire *h'*, contact-spring 63[b], arm 63, wire *j*, point 80, lever 79[a], and wire *h'* to battery B again. Battery B also energizes magnet 77 for the purpose of actuating shaft 47, the circuit being through the wire *i'*, magnets 77, wire *i*, guards 71, arm 63, wire *j*, point 80, lever 79[a], and wire *j'* to the battery B again. The operation is repeated and a letter or character transmitted every time a key 94 is depressed, so that any person who can read the characters on the keys can operate the device.

The battery A energizes the magnets 34 and the magnets 27, which depress the plate 17 to actuate the type-writer levers 15, the circuit being through wires a^2, contact-points 52[a] on slides 52, lever 51, one of the wires *b*, corresponding magnet 34, wire *c*, break D when closed, and wire F to battery A again. The current also passes from battery A by wire a^4 through the contact-arms 32 and 33, wire *a*, magnets 27, wire *c*, break D when closed, and wire F to battery A again, when armature 30[a] is drawn toward the magnet 34 for the purpose of actuating the mechanism for setting the levers 15 in motion. Battery A also energizes magnet 34[a] for producing the call-signal, the circuit being through wire a^2, one of the levers 51, which is connected to and adapted to be operated by the bell-signal key, wire *b*, magnet 34[a], wire c^2, and wire F to battery A again. The battery A is also connected into the mechanism whereby the different instruments on the line are thrown into and out of circuit, as shown in Fig. 17, and is hereinafter more fully described, the circuit being through wires a^2, levers 51, wires *b*, magnets 34[b], and wires *b'* to battery A again.

The transmitting-key board has a bell-key thereon, which is connected by a mechanism similar to that above described with a magnet 34[a], so that by depressing the bell-key a gong 39 is sounded.

If preferred, the spring 59 may be replaced by a set of magnets similar to 55, arranged to act upon the opposite side of shaft 43 from them and energized alternately therewith to produce the requisite oscillation of the shaft.

It will be observed that the impulses or pulsations caused by the making and breaking of the circuit between the contact-plates and contact-blocks will be sent through the magnets 77. As said magnets are included in the circuit, they insure the proper motion to the levers 15 through the plate 17. For instance, when a certain key connecting with the block 61[a] (see Fig. 8) is depressed and a contact-plate passed over this contact-block, as that particular block is conducting throughout its length, the magnets 77 hold down the shaft 47 during the entire interval that the block and plate are in contact, and the corresponding lever 51 travels the length of the slide 52, which is opposite it, as indicated by the dotted lines in Fig. 7, and when the lever 51 reaches the contact-point 52[a] and is thrown down in contact therewith by the action of the spring 49, as before described, the circuit is closed through the appropriate magnet 34, thereby actuating the armature 30[a] and closing the circuit through the magnet 27, which when energized depresses the plate 17, and actuates the appropriate lever 15, thereby causing it to strike a key of the type-writer corresponding with the depressed transmitting-key 94, and print the desired character.

When the key 94, connecting with the contact-block 61[c], (see Figs. 8 and 9,) is depressed, the circuit is broken near the end of the block, as said block is shorter than the block 61[a], and the shaft 47 is instantly raised by the springs 88 and 49, thus causing the lever to drop in its slide 52, as shown in Fig. 9 in dotted lines, and as the blocks are all of different configuration, and as each is connected with a different key 94, it will be seen that each will impart a different series of impulses to the wire, and that the levers 51 will be dropped at different points, so that all the levers but the appropriate one will be guided by the guards 52[b], so that only the proper lever can reach its contact-point and thus close the circuit through the printing mechanism. In other words, the function of the guards 52[c] 52[b] is to protect all the contact-points 52[a] from

contact with the levers 51, except the one connected with the depressed key.

The combinations of blocks are all different from each other, as shown, and the arrangement of the guards 52^c and 52^b on the slides 52 is not arbitrary; but they are different on each slide, and may be arranged in any convenient manner, so as to guide the appropriate lever to its contact-point.

When the commutators 67 reach the space between the banks of the contact-blocks 61, one of the lugs 66^b on the edge of the disk 66 strikes the lever 68 and forces it from the contact-point 69, thereby breaking the main-line circuit. At the same time the arm has reached the end of the spring-guide 70 and is forced by the guide beneath the guard 71 ready to return with the return oscillation of the shaft 43.

It has been shown that the circuit-breaker D serves to disconnect the magnets 34 from the battery A. The object of this is to allow the levers 15 to remain at rest while the mechanism in the cylinders 41 42 continues in operation, thus preventing needless wear of the type-writer when its use is not desired in printing the messages that are passing over the line; but it is important that signals and other devices be in operation when the type-writer is not. The magnets which operate these signals and other devices receive their currents through the slides 52′ 52^a and levers 51 and are operated in every way precisely the same as the magnets 34, which operate the levers of the type-writer. Each magnet, whether used to operate the lever of the type-writer or a signal or other special device, responds to the pressure of its own respective transmitting-key and to no other; but the magnets used for signals and other special purposes are not cut out by the circuit-breaker D, as the magnets 34 are, and hence must continue in readiness to respond to the pressure of their respective transmitting-keys as long as the mechanism of the cylinders 41 and 42 is connected with the main current. One of these magnets 34^a operates the signal-gong 39, as before described. Besides this one 34^a there is a series of similar ones 34^b connected with each instrument and equal in number to the number of instruments connected in the line. Each of these magnets 34^b rotates a signal-disk 99 by an armature 99^a, attached to a rod 99^b. This rod has a spring-pawl 99^c at the free end, which engages ratchet-teeth 102 on the signal-disk 99, and when the armature is drawn toward the magnet 34^b the pawl turns the disk 99 the distance of one tooth 102. When the armature is released, the rod is lifted by spring 103, the disk being prevented from a backward movement by a catch-spring 103^a. These signals are numbered in consecutive order, and the various instruments on the line are numbered to correspond to the signal-disks. The margin of the exposed side of each signal-disk is divided into alternate light and dark sections 101 and 106, equal in number to the ratchet-teeth 102. The number of each disk is placed upon each of the light sections of that disk. A screen 108 is placed before the signal-disks, having a small opening 107 large enough to reveal one of the sections 101 106 of the disk. Thus it will appear that when a magnet 34^b connected with any disk 99 is energized the disk will be turned far enough to cause one of the sections to appear through the opening 107 in the screen 108. At each instrument on the line the signal-disk corresponding in number to that instrument is surrounded with a series of electrical contact-points 100, there being one contact-point for each of the light or numbered sections of the signal-disk. A commutator 105 is attached to the disk surrounded by the contact-points and extending far enough to pass over the contact-points in succession as the disk rotates. It is so placed as to be in contact with one of the contact-points at the time that a light section 101 is visible through the opening 107 in the screen 108 and to be over an interval between the contact-points when a dark section 106 of the disk is in view. The contact-points 100 are electrically connected with each other and with the magnets 34, which operate the levers of the type-writer, which is connected with the instrument under consideration by wires *y* passing through one point of the breaker D and wire *c*. The commutator 105 is connected with the battery A by wire y^a, so that when it is in contact with one of the contact-points 100 the magnets 34 are connected with the battery A the same as if the circuit-breaker D were closed, and the type-writer will proceed to print the message that is being transmitted to the line.

As the signal-disk 99 in any instrument bearing any given number is affected in the same way and at the same time that the same numbered disk is in each instrument on the line, each operator can be sure by a glance at his signal-disk which numbered instrument on the line is in circuit, and if the circuit-breaker D be left open in all instruments any operator on the line can place any type-writer on the line, whether his own or a distant one, in circuit or out of circuit, at pleasure by pressing the transmitting-key corresponding to the magnet, which operates the signal-disk having the number of the instrument to be thrown into circuit, each alternate pressure of the key serving to throw the type-writer into circuit, and the alternate pressure throwing it out again, the section of the signal-disk visible showing constantly when the type-writer is in circuit and when it is out of circuit, as described.

Having thus described my invention, what I claim as new is—

1. The shaft 47, having levers 51 pivoted thereon and held normally upward by spring 49, magnets 77, adapted when energized to draw said shaft downward, casing 44, having

slides 52, with contacts 52^a and guards 52^c, shaft 43, connected to said casing and having spring 59, adapted to hold said shaft and cylinder normally in one position, magnets 55, connected to said shaft and adapted to turn it against said spring 59, a series of contact-plates 61, corresponding to said contacts 52^a and guards 52^c, a series of transmitting-keys 94, a series of contact-points 96, corresponding therewith and in electrical connection with said plates 61, commutators 67, adapted to move in contact with said contact-plates 61, a series of magnets 34, corresponding to said contact-plates 61 and 52^a, and means for connecting said keys and contact-plates 61 into one or more main electric circuits, whereby the electric impulses imparted by said contact-plates will be transmitted through said main electric circuit and the signaling apparatus, substantially as set forth.

2. A series of transmitting-keys 94 in electrical connection with a main-line circuit, contact-points 96, adapted to be placed in electrical connection with said keys when they are actuated, contact-plates 61 in electrical connection with said points 96, plate 66, adapted to be revolved and carrying commutator 67, relay-magnet 81 in electrical connection with said commutator, lever 79^a, having armature 79, adapted to be actuated by said relay-magnet to connect it with contact-point 80, a shaft 47, carrying levers 51 and adapted to be held normally elevated by spring 49 and drawn downward by magnet 77, a plate 71 in electrical connection with said magnets 77, jointed arm 63, adapted to be oscillated and in electrical connection with said point 80, pivoted spring-trip 70, adapted to elevate and depress the free end of said arm 63, plate 52 having contact-points 52^a and guards 52^c and adapted to be placed in electrical connection with said levers 51 and connected with an electric battery, magnets 34 in electrical connection with said levers 51, a type-writer, and a series of levers 15, adapted to be actuated by said magnets 34, to operate the keys of said type-writer, whereby by pushing down one of the keys 94 a series of electrical impulses will be imparted to the main line corresponding to the length and arrangement of the exposed sections of the contact-plates 61, bringing one of the levers 51 in contact with its corresponding contact-point 52^a and energizing the corresponding magnet 34 and actuating the signal corresponding to the operated key 94, substantially as set forth.

3. A series of transmitting-keys 94, connected into a main-line electric circuit, a series of corresponding contact-points 96, a series of contact-plates 61, corresponding in number with said transmitting-keys and connected electrically with said points 96, a series of electrically-connected commutators 67, adapted to be brought into contact with said plates 61, a magnet 72, a compound lever 68 68^a, adapted to be actuated by said magnet, relay-magnet 81, a lever 79^a and point 80, adapted to be electrically connected when said relay is energized, a hollow shaft 43, carrying cylinder 44 and having jointed arm 63, stationary plate 71, having its upper surface of conducting material, shaft 47, adapted to be held normally upward by spring 49, magnet 77, adapted when energized to draw said shaft 47 downward, lever 51, pivoted on said shaft 47 within said cylinder 44, plates 52, having contact-points 52^a and guards 52^c, corresponding to said plates 61, a series of magnets 34, corresponding in number to said points 52^a, and contact-plates 61, said keys and contact-plates 61 being connected electrically, whereby a series of different electrical impulses are produced which actuate said levers 51, and by them a current from a local battery is transmitted through said points 52^a and the magnets 34, which correspond to the keys actuated, resulting in the formation of the character or signal represented by the key 94, substantially as and for the purpose set forth.

4. In a printing-telegraph, upper casing 41 and lower casing 42, having central shaft 47, supported normally upward by spring 49, magnets 77, adapted when energized to draw said shaft downward, cylinder 44, supported within said casing 41 and connected to a shaft 43 and adapted to be oscillated thereby and provided with plates 52, a spring 59 upon the lower end of said shaft 43 and adapted to hold it normally in one position, and magnets 55, connected to said shaft 43 and adapted when energized to revolve said shaft 43 in the opposite direction to said spring 59, and a series of levers 51, pivoted upon said shaft 47 within said cylinder 44 and with their free ends adjacent to said plates 52, whereby said levers 51 and cylinder 44 are actuated, substantially as and for the purpose set forth.

5. In a printing-telegraph, a casing 42, having shaft 43 supported therein and carrying cylinder 44, spring 59, adapted to hold said shaft and cylinder in one position, magnets 55, connected to said shaft 43 and adapted to turn it in the opposite direction from said spring, a worm-gear 58 upon said shaft, and a worm-pinion 60^a engaging therewith and journaled in or on said casing, whereby the tension of said spring may be regulated to secure the synchronism of motion of the various shafts 43 and cylinders 44 in the series of connected instruments.

6. A shaft 47, having levers 51 pivoted thereon and held normally upward by spring 49, magnets 77, adapted when energized to draw said shaft downward, cylinder 44, having slides 52, with contacts 52^a and guards 52^c, shaft 43, connected to said cylinder 44 and having spring 59, adapted to hold said shaft and cylinder normally in position, magnets 55, connected to said shaft 43 and adapted to turn it against said spring 59, a series of contact-plates 61, corresponding to said contacts 52^a and guards 52^c, insulated disk 66, having

electrically-connected commutators 67, adapted to connect electrically with said plates 61 and said disk 66, having pins 66[a] projecting therefrom, arm 63, having joint 63[a] projecting from said shaft 43 behind said pins 66[a] and supported at its free end by spring-trip 70, and stationary plate 71, over which said arm travels when said shaft 43 is moved in one direction and beneath which said trip causes it to travel when said shaft is moved in the opposite direction, whereby said shaft 43 is oscillated and said disk 66 and commutators 67 are revolved intermittently, substantially as set forth.

7. In a printing-telegraph, a shaft 43, having a spring 59, adapted to hold it normally in one position, magnets 55, connected to said shaft 43 and adapted when energized to turn it in the opposite direction from said spring, a disk 66, having pins 66[a], a jointed arm 63, connected to said shaft and supported at its free end by a spring-trip 70, a plate 71, over and beneath which said arm is adapted to be moved by said trip when said shaft is oscillated, contact-plate 63[b], against which said arm connects at one point in its movement, pivoted lever 64, adapted to engage one of said pins 66[a] and provided with armature 64[c], magnet 74, adjacent to said armature and in electrical connection with said contacts 63[b], and an electric battery, whereby when said arm 63 is electrically connected to said contact 63[b] said magnet 74 will be connected into the circuit and energized to release the lever 64 from the pin 66[a] and permit the plate 66 to be revolved, substantially as set forth.

8. The combination, with a type-writer, of a series of pivoted levers 15, having hammers 14, corresponding to the keys of said type-writer, a stationary plate 18, having slots 19, through which said levers pass, and with stops 23 and springs 21 for supporting said levers upward, a movable plate 17, having slots through which said levers 15 pass, and with stops 28, and adapted to be held normally upward by springs 25, one or more magnets 27, adapted when energized to draw said plate downward, pawls 29, pivoted to said levers 15 between said plates 17 and 18 and adapted to remain normally disconnected from said stops 23 and 28, a series of magnets 34, corresponding to said levers and pawls, a series of rods 30, having armature 30[a] adjacent to said magnets 34 and connected to said pawls, stationary contact-points 33 upon each of said levers 15 and in electrical connection with each other and with an electric battery, and a series of contact-points 32, pivoted upon said levers 15 adjacent to said contact-points 33 and adapted to be actuated by said rods 30 and electrically connected to each other and to said magnets 27, whereby when one of the magnets 34 is energized its corresponding armature 29 and rod 30 will be actuated and its corresponding pawl 29 drawn beneath its corresponding stop 28, so that the levers 15, corresponding to the energized magnet 34, will be depressed by the movement of the plate 17, while all the other levers remain unaffected, substantially as set forth.

9. A series of transmitting-keys 94, adapted to be held normally elevated by springs 95, said springs being insulated from the keys and in electrical connection with points 96[a], a magnet in electrical connection with said springs 95, and an electric battery in connection with said magnet 72, a shaft 43, having spring 59, adapted to hold it normally in one position, magnet 55, connected to said shaft 43 and adapted when energized to turn said shaft in the opposite direction from said spring 59, a jointed lever 63 on said shaft 43 and having contact-plate N[2] in electrical connection with said contact 96[a], a stationary contact-plate N′ in electrical connection with said battery and against which said contact N[2] is moved, a stationary contact-point 69 in electrical connection with the main-line circuit, a disk 66, having inclined lugs 66[b] and pins 66[a] and adapted to be intermittently revolved by said lever 63, and compound lever 68 68[a], adapted to be thrown into electrical connection with said point 69 by said magnet 72 and be disconnected therefrom by said lugs 66[b] when said disk is revolved, substantially as set forth.

10. A cylinder 44, adapted to be oscillated and provided with plates 52, having contacts 52[a] and guards 52[c], a series of levers 51, pivoted to a shaft and adapted to be vibrated in conjunction with said cylinder, a series of magnets 34 in electrical connection with said levers 51, a type-writer, a series of levers 15, corresponding to the keys of said type-writer and having hammers 14, adapted when depressed to operate said type-writer keys, stationary plate 18, having stops 23, movable plate 17, having stops 28 and armature 24, magnets 27, adapted when energized to actuate said plate 17, pawl 29 upon said levers 15 adjacent to said stops, rods 30, connected to said pawls and having armatures 30[a] within the electric influence of said magnets 34, contact-plates 33 upon said levers and in electrical connection with an electric battery, contact-plates 32, pivoted upon said levers 15 and adapted to be connected to said contacts 32 when said magnets 34 are energized and in electrical connection with said magnet 27, substantially as set forth.

11. In a printing-telegraph, a transmitting-key 94, connected into the main-line circuit, a contact-point 96, with which said key is adapted to connect electrically when actuated, a contact-plate 61, a disk 66, having commutators 67, adapted to connect electrically with said plates and connected electrically into the main-line circuit, cylinder 44, having plates 52, with contact-points 52[a] and guards 52[c], shaft 47, carrying levers 51, adapted to be vibrated in conjunction with said plates 52, magnet 34[a] in electrical connection with an electric battery and said levers 51, and rod 36, having armature 36[a] and connected to a

gong-striking mechanism, said armature being in electrical connection with said electric battery, substantially as set forth.

12. A cylinder 44, adapted to be oscillated and provided with plates 52, having contacts 52^a and guards 52^c, a series of levers 51, pivoted to a shaft 47 and adapted to be vibrated in conjunction with said cylinder, a series of magnets 34 in electrical connection with said levers 51 and adapted when energized to actuate signals, a series of transmitting-keys 94, adapted to be connected electrically with said point 52^a, a series of graduated disks 99, equal in number with the signaling-instruments in the circuit and each provided with a ratchet 102, a pawl 99^b for each of said ratchets, and each pawl provided with an armature 99^a, magnet 34^b in electrical connection with said levers 51 and adapted when energized to attract said armature 99^a and actuate said disks, a series of electrically-connected contact-plates 100 adjacent to one of the said disks 99 and in electrical connection with said magnets 34 of the printing mechanism, a commutator 105, attached to said disk and adapted to be electrically connected to said contact-plates 100 and in electrical connection with an electric battery, whereby any one or all of the type-writers in the circuit may be thrown in or out of circuit by any operator at any one of said connected instruments, substantially as set forth.

13. A series of transmitting-keys 94, connected in a main-line circuit, a series of contact-plates 61, adapted to be electrically connected to said keys when said keys are actuated, a series of plates 52, corresponding to said contact-plates 61 and having contact-plates 52^a and adapted to be oscillated, a series of levers 51, corresponding to said plates 52 and adapted to be vibrated in conjunction therewith, a series of magnets 34 in electrical connection with said levers 51, and means whereby the electrical impulses transmitted from said contact-plates 61 may be utilized to transmit signals through said magnets 34, substantially as set forth.

14. In a printing-telegraph, the combination, with the revolving disk having commutators 67, as shown, and provided with depending pins 66^a, of the shaft 43, radial arm 63 for moving the said disks, a lever 64, carrying an armature 64^c and adapted to normally engage à pin 66^a and hold the disk stationary, a magnet arranged opposite the said armature, and electrical connections whereby the magnet is energized by the depressing of a transmitting-key, substantially as set forth.

15. In a printing-telegraph, the combination, with a hollow shaft 43, connected with the cylinder 44 and with the disk 66, carrying the commutators 67, of a spring mechanism for turning the shaft in one direction, armature carried on opposite sides of the shaft, and magnets opposite the armature for turning the shaft in the opposite direction, and means for closing the circuit through said magnets, substantially as set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

PLINY H. FISK.

Witnesses:
C. N. WOODWARD,
H. S. WEBSTER