

G. WESTINGHOUSE, Jr.
 Automatic Telephone-Switch for Connecting Local
 Lines by Means of Main Line.

2 Sheets—Sheet 1.

No. 223,202.

Patented Dec 30, 1879.

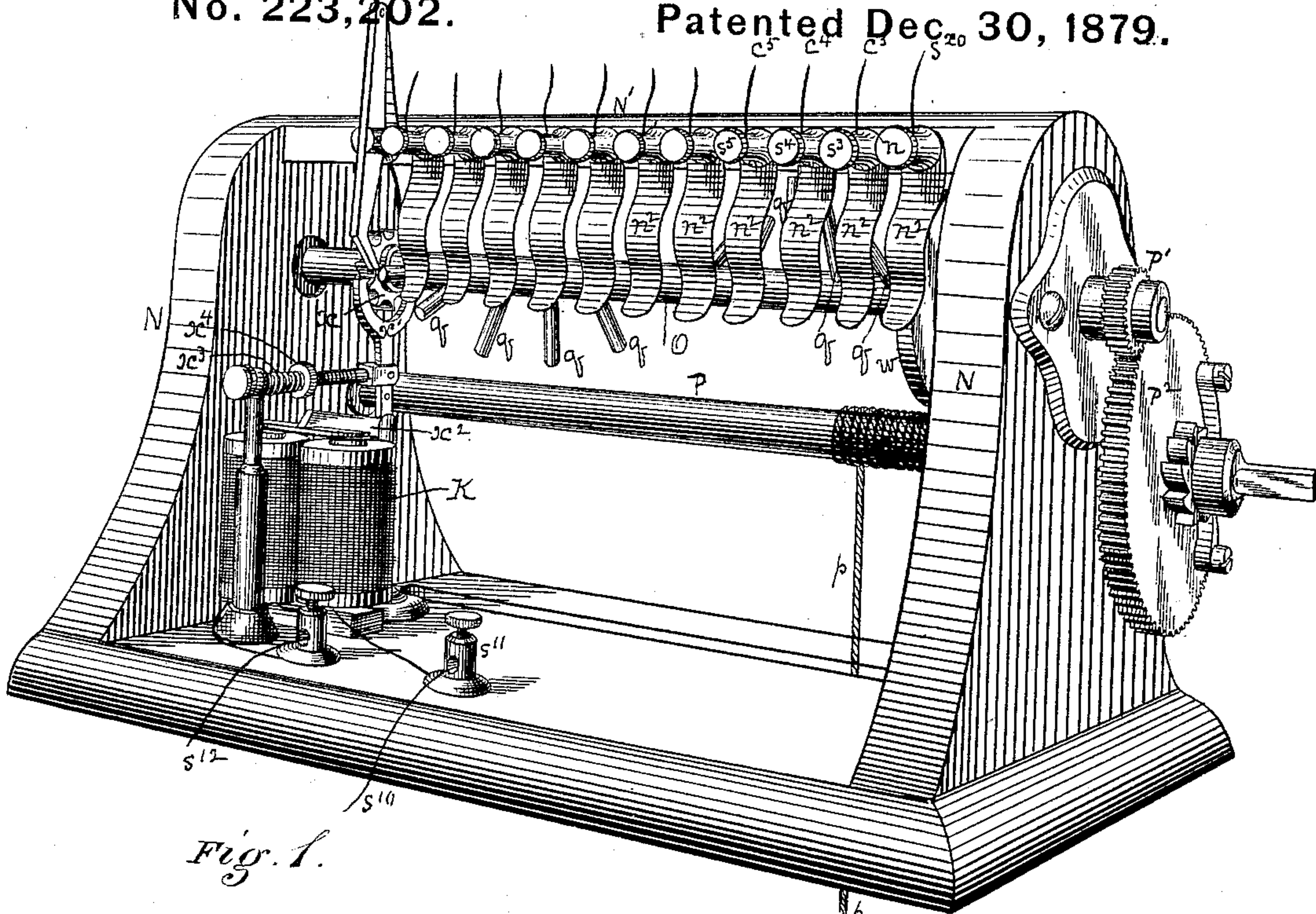


Fig. 1.

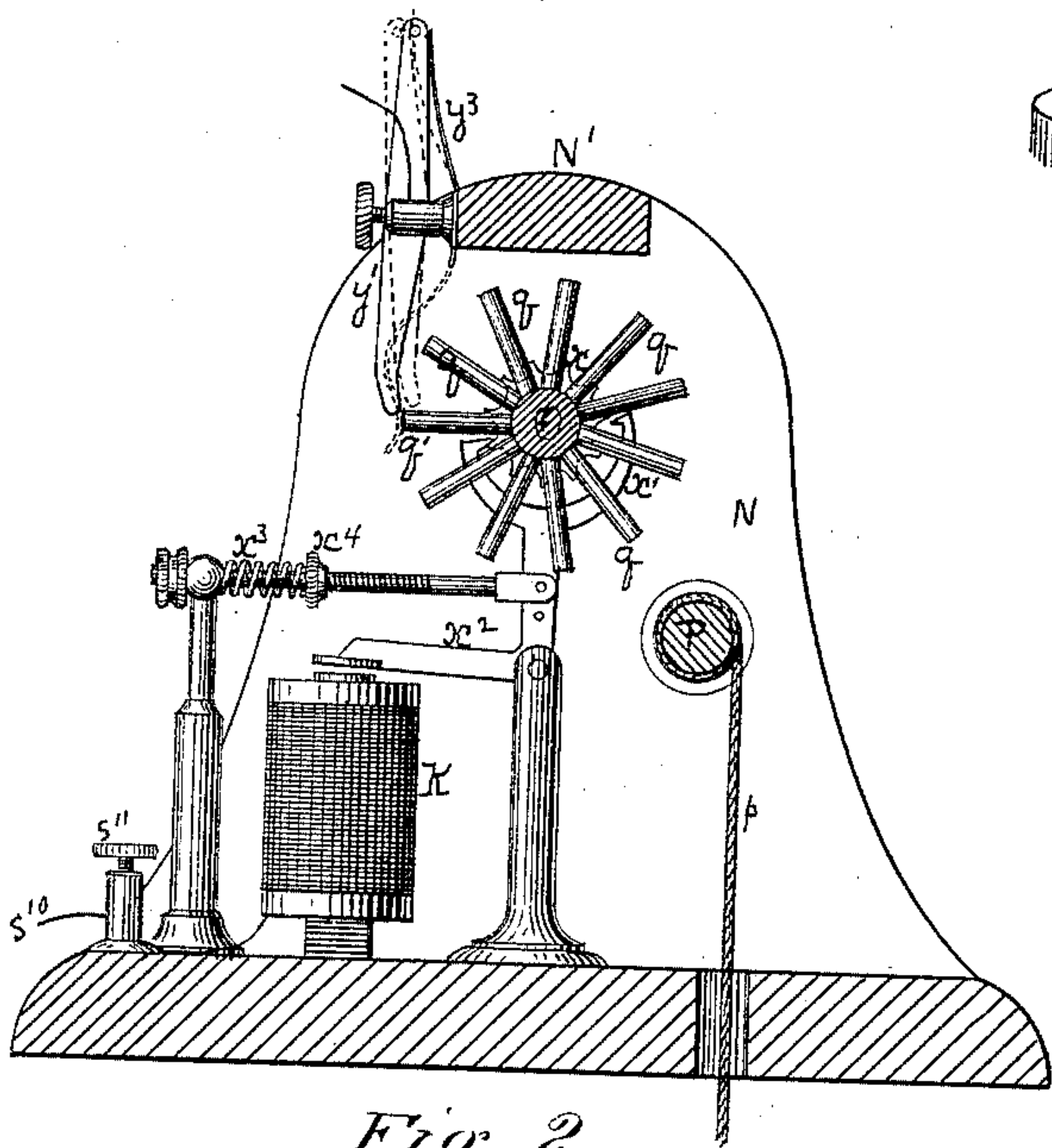


Fig. 2

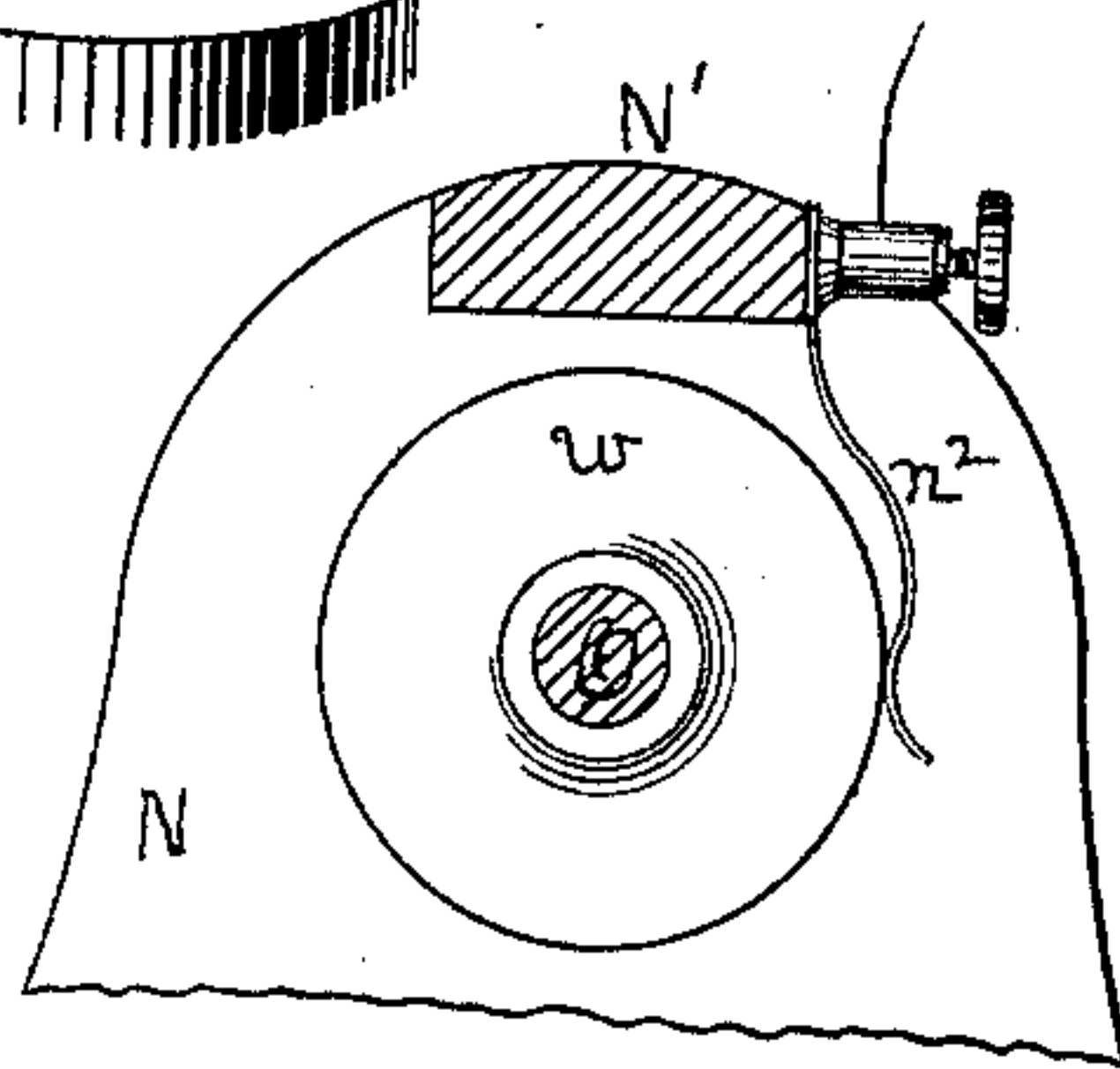
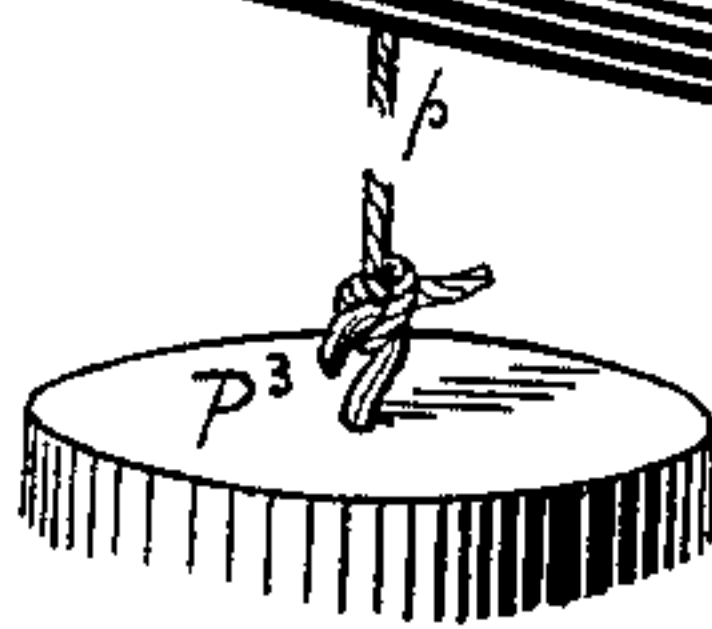


Fig. 3.

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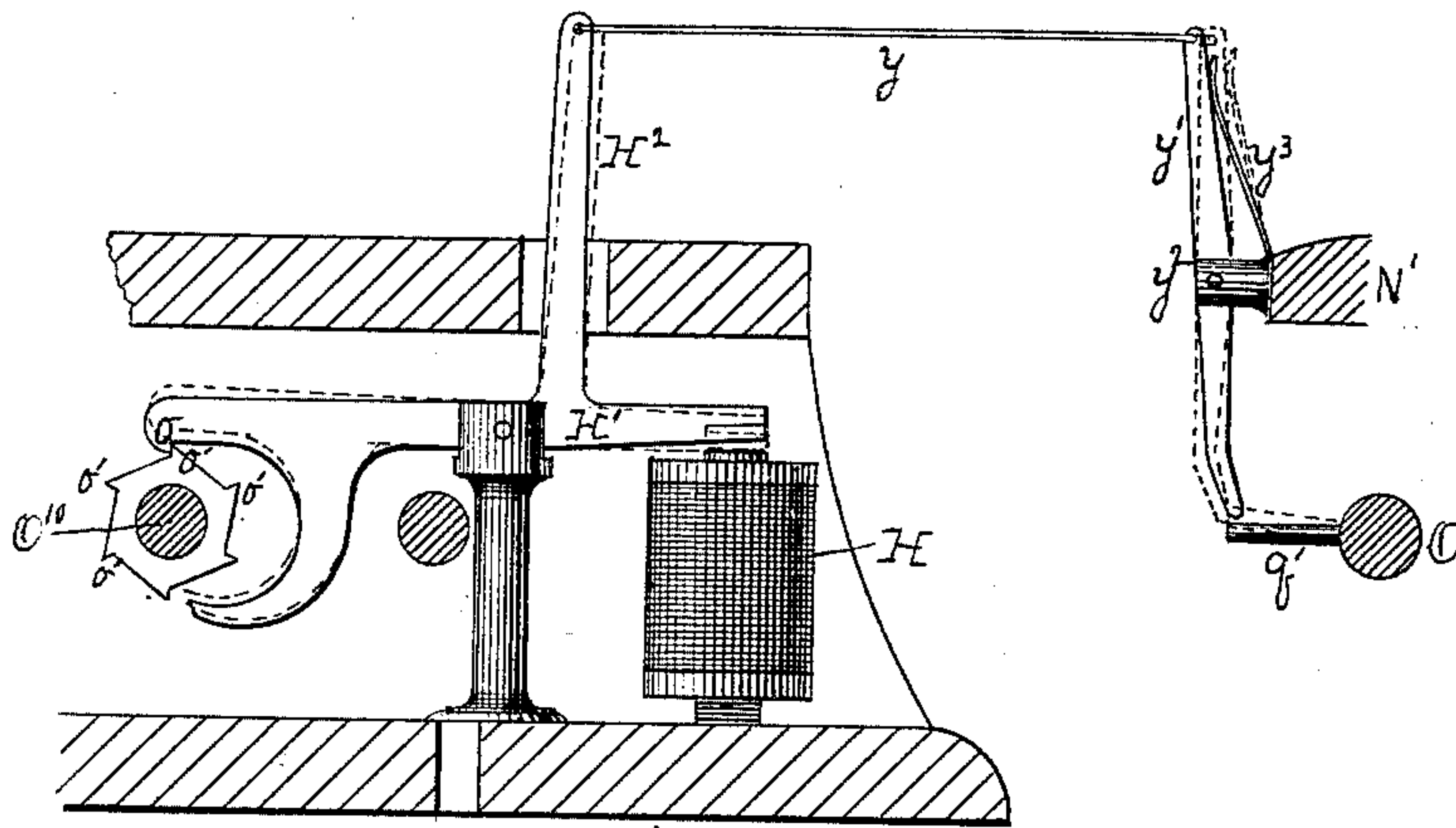


Fig. 4.

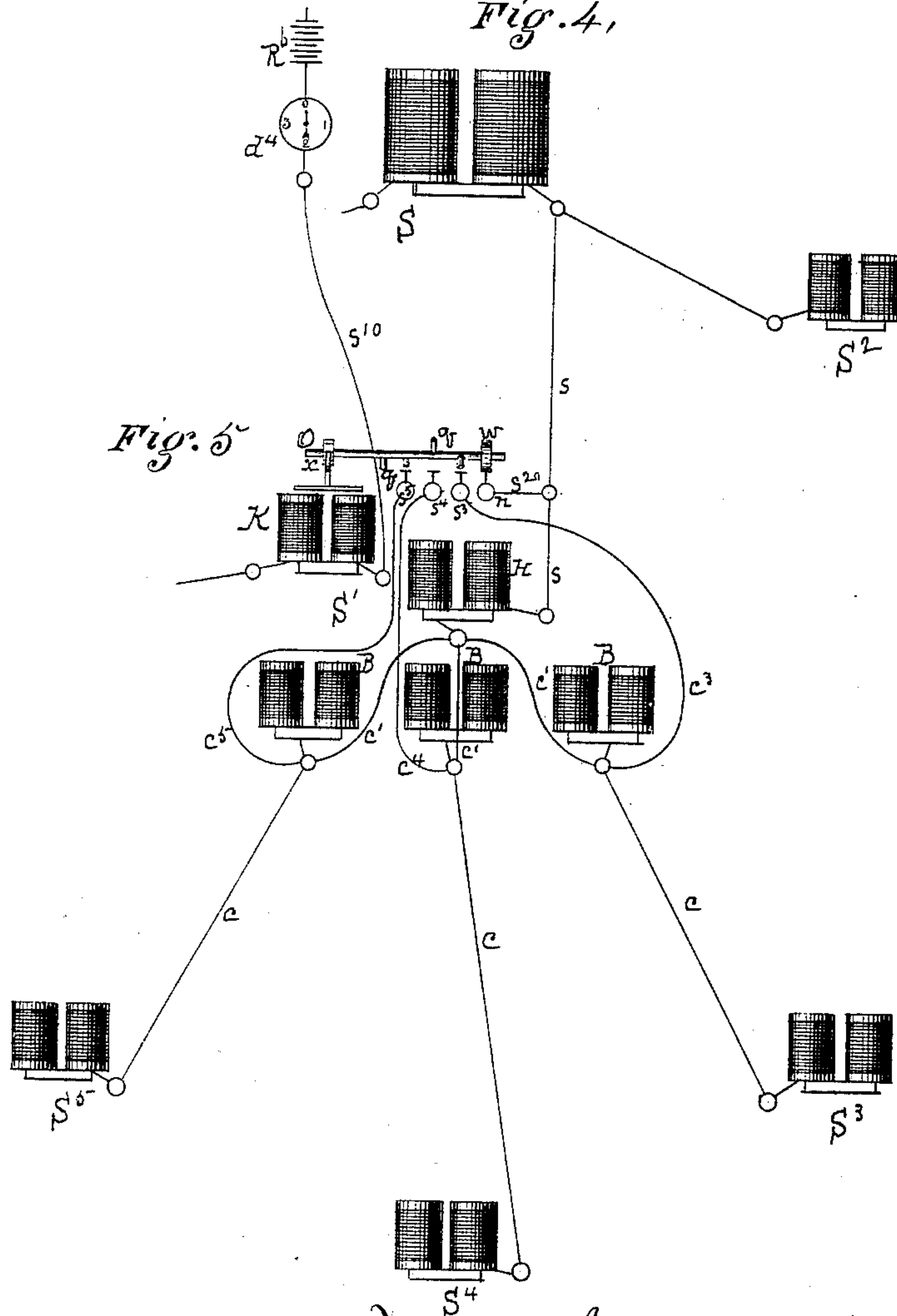


Fig. 5.

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GEORGE WESTINGHOUSE, JR., OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN AUTOMATIC TELEPHONE-SWITCHES FOR CONNECTING LOCAL LINES BY MEANS OF MAIN LINES.

Specification forming part of Letters Patent No. **223,202**, dated December 30, 1879; application filed October 13, 1879.

To all whom it may concern:

Be it known that I, GEORGE WESTINGHOUSE, Jr., of Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Telephonic Apparatus; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1, Sheet 1, is a view, in perspective, of an apparatus illustrative of my improvement. Fig. 2 is a transverse vertical section at the left hand of the disk-wheel *w* of Fig. 1. Fig. 3 is a detached sectional view to the right of said wheel. Fig. 4, Sheet 2, is a detached view of a connection, to be hereinafter explained; and Fig. 5 is an outline or plan view of stations and connections illustrative of the manner of operating the improvement.

My present invention appertains to a use or combination in use of telephonic apparatus and wires, wherein two or more wires leading from the houses or offices of separate users are brought together at what, for convenience, I term an "auxiliary station or exchange," and from which telephonic communication is effected with the central or main office, station, or exchange over a single wire.

In a separate application I have described an apparatus to be located at such auxiliary exchange, by the use of which any one of two or more persons in telephonic connection therewith can at pleasure make for himself a connection by the main-line wire with the central or main exchange, and at the same time shift a locking device, so that while he is using the apparatus no other co-user similarly connected, or, as I have described it, on a parallel circuit, can cut him out or interfere with him. The said apparatus also contains provision by means of which, when such user is through, the operator at the main exchange can restore the auxiliary apparatus to its normal condition, so that it will be ready for use by any other user on a parallel circuit.

My present invention relates to an apparatus, to be also arranged at the auxiliary ex-

change, and to be used in connection with that above referred to, by which the operator at the central exchange can at pleasure call any desired one of the users who have connections with such apparatus at the auxiliary exchange, and converse with him or put him in communication with any one who has a central-exchange connection.

The apparatus also contains provision by which one user having connection with the auxiliary exchange can call the operator at the main exchange to put him in telephonic connection with any desired one of the co-users on parallel circuits, so that the two can converse in the usual manner; and, in the third place, the two instruments may be so connected or consolidated as to become and operate as a single instrument.

In the other application, as also in this, I designate the main or central station or exchange as *S*, and assume it as representing the main office of a city or district telephonic system. *S*² represents the office or residence of a user, connected directly therewith. *S*¹ represents an auxiliary exchange, which may be in a suburban district or an outlying city district, or may be the common place of union of any desired number of local wires in one or more buildings, blocks, or squares, such auxiliary exchange having a main wire, *s*, connecting it with the city exchange.

*S*³ *S*⁴ *S*⁵, &c., may represent the offices or residences of a corresponding number of local or suburban users, all in communication with the auxiliary exchange.

At *B B B* and *H*, I have shown the magnets which belong to the apparatus as set forth in the other application.

The wires *c* from *S*³ *S*⁴, &c., lead to binding-posts on the frame, and the wire *s* goes to the main exchange, as described in said application.

In order now to make provision whereby the operator at *S* may call any one of the users at *S*³ *S*⁴, &c., I provide an additional apparatus mounted in a wooden or other insulating-frame, *N*.

To the top bar, *N*¹, of the frame I secure a series of binding-posts, *s*³ *s*⁴ *s*⁵, &c., equal in

number to the number of local users at S^3 S^4 , &c., having wire-connections with the auxiliary exchange, but add an additional binding-post, n , in which I secure the end of a wire, s^{20} , which branches from or is connected with the main-line wire s ; also branch wires c^3 c^4 c^5 lead from the several wires c to the successive posts s^3 s^4 , &c., on the top rail, N' , of the frame N . Each such binding-post is in electrical communication with a metallic spring, n^2 .

At O and P , I have shown the shafts of a clock-work connected by gearing P^1 P^2 with ratchet and pawl and square stem, for winding up the same as it runs down under the action of weight P^3 , hung from P by rope or cord p .

On the shaft O is a disk-wheel, w , which is always in electrical contact with the first spring n^2 , which is in the line of communication from the wire s^{20} . Also, arranged along and spirally around the shaft is a series of contact-pins, q , one opposite each of the springs n^2 , and of such length and so arranged that in revolving the pins will successively make electrical contact with the springs, and thereby put the wire s^{20} into electrical communication with that wire, c^3 c^4 , &c., whose pin and spring may be in contact.

As shown in the drawings, provision is thus made for ten wires leading from local or suburban stations, though for descriptive purposes three are quite enough.

In order to provide for releasing the clock-work at regular intervals, I arrange a ratchet-wheel, x , on the shaft O , and apply to it an ordinary or other suitable escapement, x' , the stem of which is of bell-crank form, and constitutes an armature, x^2 , for the magnet K .

The making and breaking connection by each motion of the armature x^2 then results in the shaft O making a forward turn sufficient to bring the first pin q against its spring n^2 , where it rests until the armature x^2 is again depressed and released, by which means the next pin q is brought into electrical contact with its spring, and so on in succession.

The upstroke of the armature and backstroke of the escapement are effected by any suitable spring, as at x^3 , held under the desired tension by an adjustable nut, x^4 ; but in order to operate this armature and effect the motions thus described, I provide an additional wire, s^{10} , which leads from a battery, R^6 , at the main or central exchange, S , to a binding-post, s^{11} , thence to the magnet, and by wire s^{12} to the ground.

The first or right-hand end spring, n^2 , it will be observed, has at all times an electrical connection with the main or central exchange by wires s^{20} s , and through the wheel w and shaft O with each of the pins q .

The second spring n^2 is in electrical communication, by wires c^3 c , with a local user at S^3 , and the next spring n^2 is in like communication with the next user at S^4 , and so on in succession through any desired number of like connections. If, now, the operator wishes to

call a user at S^3 , he makes and breaks the circuit on the line s^{10} , with the result of bringing the first pin q into electrical contact with its corresponding spring n^2 , which latter, it will be observed, is in electrical communication with S^3 by means of the binding-post s^3 and wires c^3 and c ; and as the electrical connection of main-line wire s s^{20} is always perfect through wheel w , it follows that the central station or exchange, S , and the user at S^3 are in telephonic communication, and a city user at S^2 may be switched into the circuit; but if the operator desires to call a user at S^4 , he makes and breaks connection twice on the line-wire s^{10} , so as to bring the second pin q into electrical contact with its corresponding spring n^2 . Wires s^{20} and c^4 will then be in electrical connection, so as to form a telephonic circuit from S to S^4 , or, in the manner already described, from S^2 to S^4 . Another motion of the shaft O will bring S into telephonic communication with S^5 , and so on for other local or suburban stations.

The number and arrangement of the pins q are such that after the last contact is made another stroke or motion leaves all the pins free from electrical contact with any spring n^2 ; or a dial, as at d^4 , having been used at the central exchange for making and breaking circuit, a complete revolution is then effected, and the pointer comes again to naught, or zero, that being the assumed starting-point.

No. 1 on the dial gives the station S^3 ; No. 2, S^4 , and so on. The numbers of the dial must, of course, correspond with the number of local or suburban users connected with that auxiliary exchange, so that any one user being called, and the dial-pointer brought around again to zero, the apparatus will be in order for another call. If, now, a user at S^3 desires to communicate with a co-user at S^5 , for example, he makes connection, in the manner described in the application last referred to, by the use of a circuit through magnet B , so as to put himself into a talking-circuit through c , c' , and s with the main exchange. The operator there, at his request, makes and breaks his circuit through s^{10} repeatedly by turning his dial until the pin q and spring n^2 of the corresponding wire c^5 are in electrical contact. A line of telephonic communication then exists from S^3 to S^5 by wires c c' s s^{20} , binding-post n , Fig. 1, spring n^2 , wheel w , shaft O , pin q , spring n^2 , binding-post s^5 , and wires c^5 and c . The parties can then talk freely, after which the apparatus can be rotated around to its normal or zero position again, so as to be ready for another call.

The apparatus above referred to as constituting the subject-matter of a separate application has a magnet, H , Fig. 4, which is not affected by the light electrical currents employed in ordinary telephoning, but is operated, in restoring the apparatus to its normal position, by means of a strong current sent through for that purpose from the main office by the

use of a heavy battery. This magnet H operates an armature-escapement, H'. Now, by combining the two instruments together I am enabled to dispense with this magnet H, convert its armature H' into a regular bell-crank escapement-lever, H², and then operate it by means of a cord, y, and lever y' from the apparatus herein described. This lever y' is mounted in a post, y², of the top rail, N', and its lower end is in such position that as the shaft O makes the motion or stroke which clears the last contact-pin q from the corresponding spring n² a tappet-arm, q', on the same shaft strikes and passes the lower end of the lever y', and in doing so throws its upper end back so as to draw on the cord y, tilt the lever-escapement H², release its hook or detent o from a tooth, o', and allow the latter, operated by a weight, as described in said application, to rotate until the next tooth o' engages the detent o.

As soon as q' passes the lower end of the lever y', a spring, y³, forces its upper end forward, so as to let the bell-crank escapement come into position for engaging the next tooth o'; and for the purposes of the present case this escapement device may be termed an escapement for breaking the main line connection from S to S³, S⁴ or S⁵, and restoring the local circuits of such lines, as described in said application above referred to. In this way the third operation above stated is carried out.

The shaft O¹⁰ in Fig. 4 represents the clock-work shaft lettered O in the application above referred to. It will be within the present invention to arrange the disk-wheel w and pins q on such shaft O¹⁰, as well as the tripping devices belonging thereto, and arrange plates n² in such position with reference to said pins q as to make connection therewith in the manner already described.

The magnet K, with its wire-connections, then takes the place of the magnet H, and performs the function of rotating the shaft O¹⁰, so as to make electrical connection from the main exchange with any local user, and also to close or break the same and bring the apparatus to the zero position, as herein described. The lever y' is then unnecessary.

For the purposes of the present case the shaft O¹⁰ may be considered as a mechanical substitute for and equivalent of the shaft O in the combinations herein described and claimed.

In further explanation of this part of my invention, it may be stated that in the previous application referred to a rotating shaft corresponding to that lettered O¹⁰, with a ratchet-wheel, an escapement, and an armature and magnet for operating the same, substantially as shown in Fig. 4, are employed to restore the apparatus described in said application to a normal or zero position.

In the present apparatus, Fig. 1, a magnet, K, with connections as described, is employed

to bring the shaft O, Fig. 1, with its pins q, to a normal or zero position. Now, by the described devices H², y y', &c., Fig. 4, I am enabled to dispense with the magnet H and bring both sets of apparatus simultaneously to the normal or zero position by the use of the single magnet K; and as O and O¹⁰ then are operated simultaneously in the same direction by a single magnet, the devices which each carry may be arranged on one shaft—say O¹⁰—and the magnet K being combined with that shaft in like manner as in Fig. 1 it is combined with O, the intermediate devices H², y, and y' may be omitted, and the function and operation will remain the same; but of course the spiral arrangement of the pins q must in such modification be preserved, and the springs n², with binding-posts, wire-connections, &c., must have the same relation to the pins q as that already described. The devices H², y y', &c., simply enable me to bring the devices which are actuated from the shaft O, as described in this case, and from the shaft O¹⁰, as described in the previous case, (said shaft there being lettered O,) simultaneously to the normal or zero position by the use of the single magnet K, actuated from the central exchange.

It should be added that as the escapement H² is moved in one direction by battery-power, any suitable spring may be added for giving it a reverse motion.

Other modifications of form or arrangement may be made in the devices described, either separately or collectively, provided the operations in the manner described be substantially retained, and all such I consider as coming within the scope of my invention.

I claim herein as my invention—

1. In a telephone-circuit, a main-line wire having a continuous electrical connection with a revolving shaft, a series of two or more contact-pins, q, spirally arranged along the same shaft, a corresponding number of contact-plates, n², arranged one opposite each pin and in the path of its travel, and an electric wire-connection from each such plate to one of two or more local or suburban stations, S³ S⁴, &c., and an electric circuit for effecting intermittently the rotation of the said shaft, substantially as set forth.

2. A telephonic circuit-wire connection from each of two or more local users at outlying stations S³ S⁴, &c., uniting in a main-line wire, s, leading to the central exchange, a branch wire, s²⁰, leading therefrom and having a permanent electrical connection with a revolving shaft, a series of two or more contact-pins, q, spirally arranged along the same shaft, a corresponding number of contact-plates, n², arranged one opposite each pin and in the path of its travel, and an electric wire-connection from each such plate to one of the local stations S³ S⁴, &c., and an electric circuit for effecting intermittently the rotation of the said shaft, substantially as set forth.

3. In an auxiliary telephone-exchange, a rotating shaft, O, having a series of two or more contact-pins spirally arranged for making connection with any desired one of a series of parallel local circuits, a pin, q' , arranged to actuate a lever, y' , when the apparatus comes to the zero or normal position, in combination, by a suitable connection, with

an escapement, H^2 , substantially as and for the purposes set forth.

In testimony whereof I have hereunto set my hand.

GEO. WESTINGHOUSE, JR.

Witnesses:

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C. L. PARKER.