

(No Model.)

3 Sheets—Sheet 1.

A. R. ROE.
ELECTRIC SWITCHING APPARATUS.

No. 502,104.

Patented July 25, 1893.

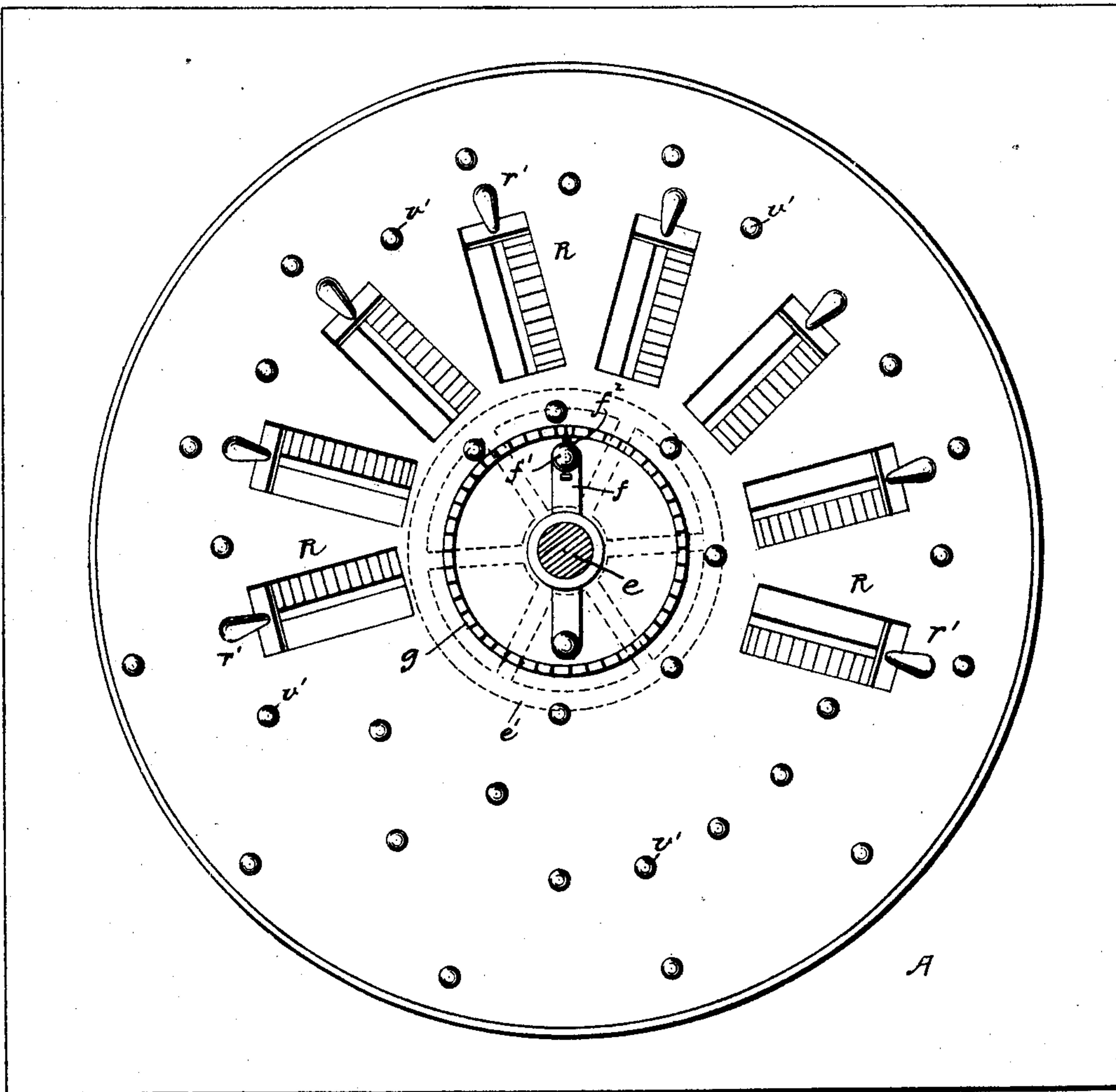


Fig. 1.

WITNESSES:

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Jos J. Mhl

INVENTOR

Arthur R. Roe

BY

Wm. Rosenbaum
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(No Model.)

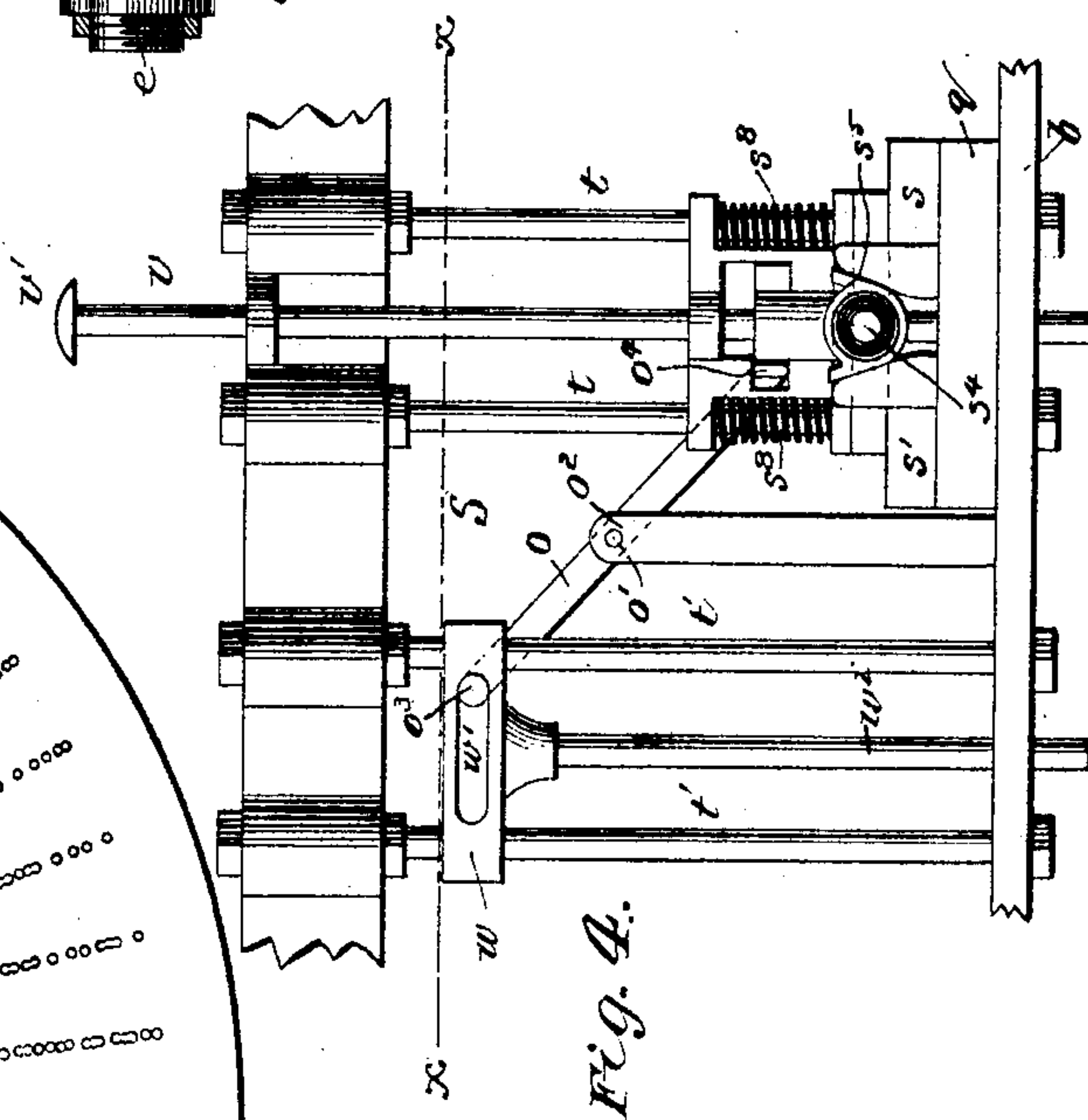
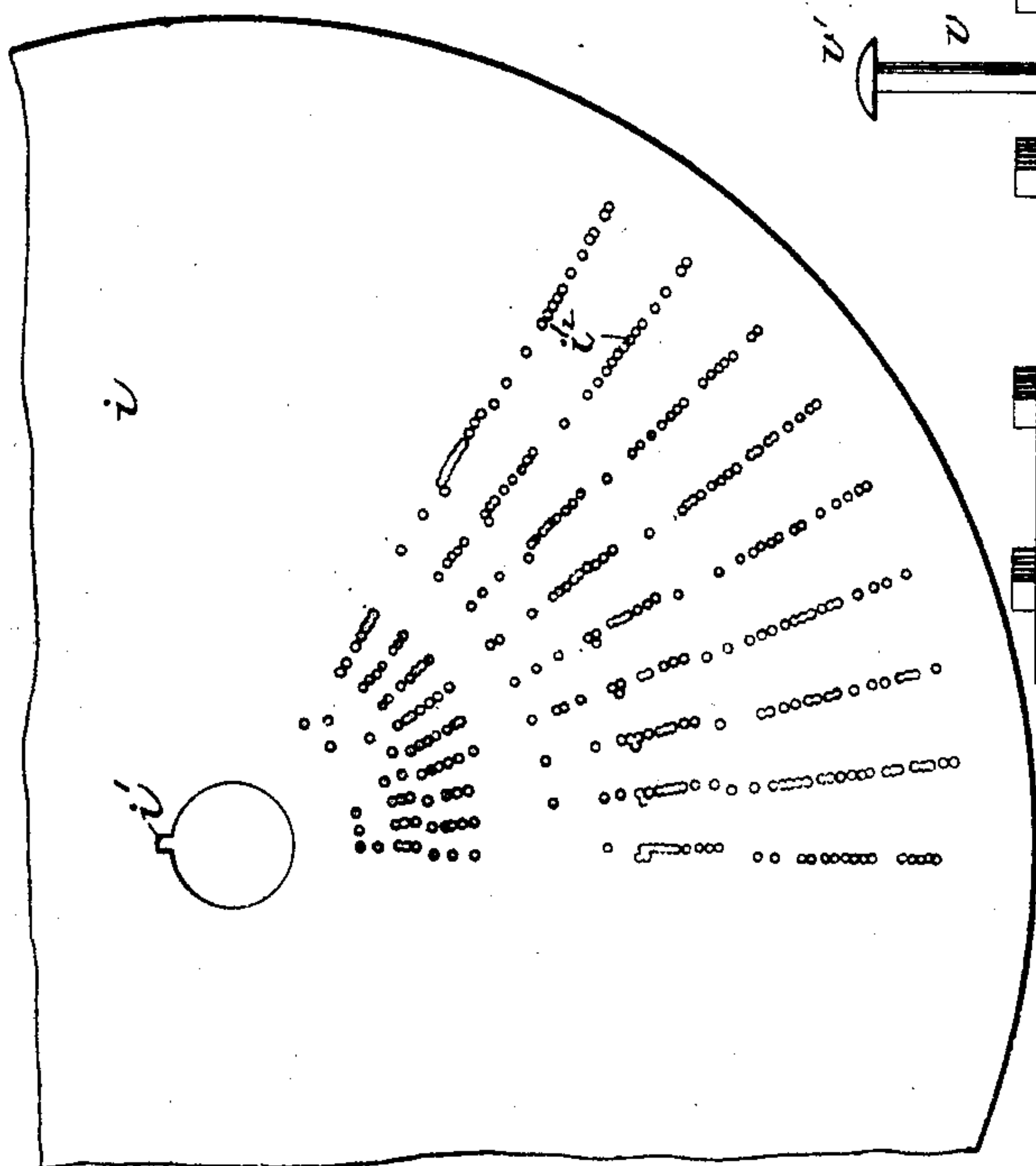
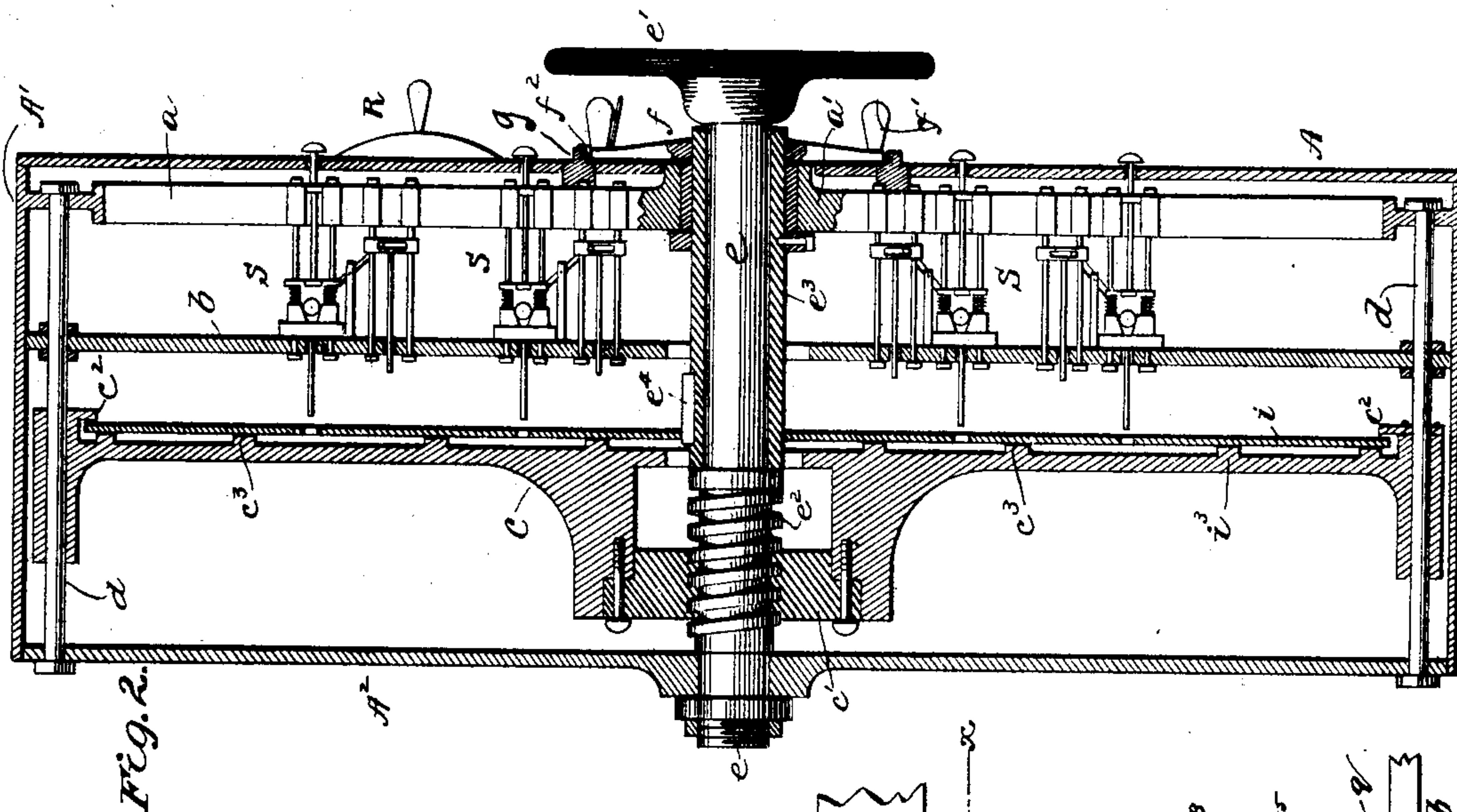
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WITNESSES:

Given under
 Willard B. Cross.

Fig. 3.

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(No Model.)

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Fig. 7.

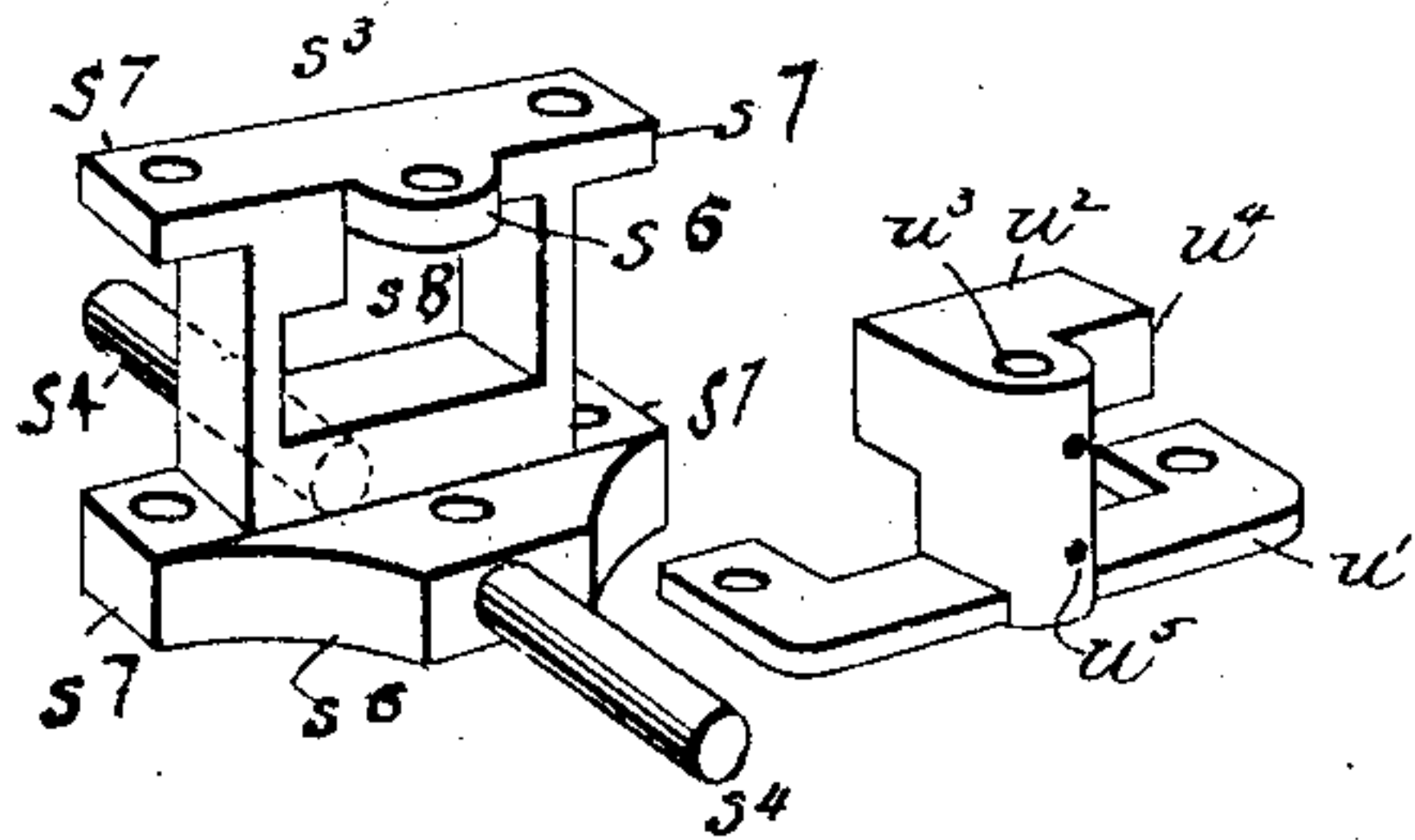


Fig. 5.

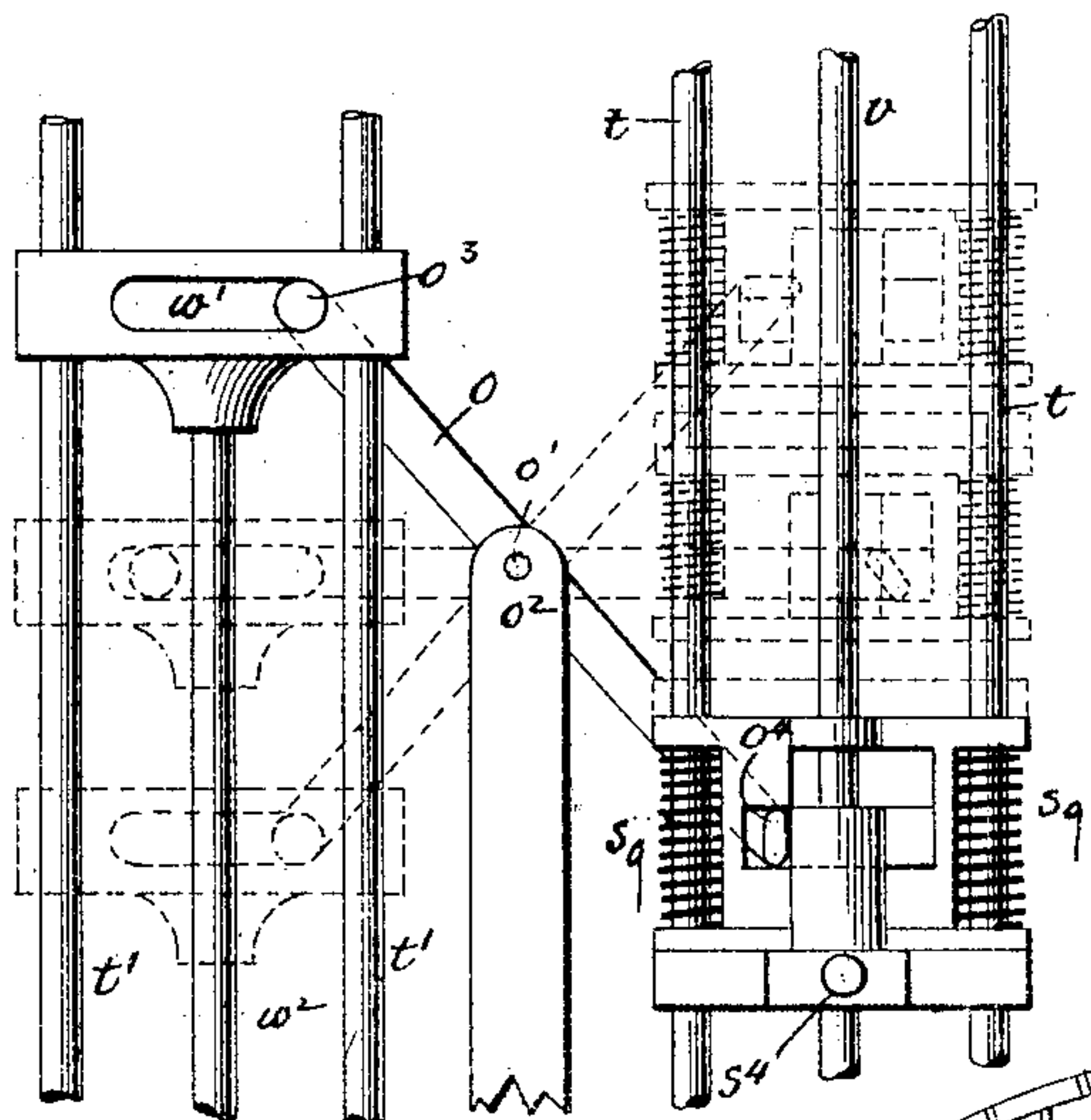
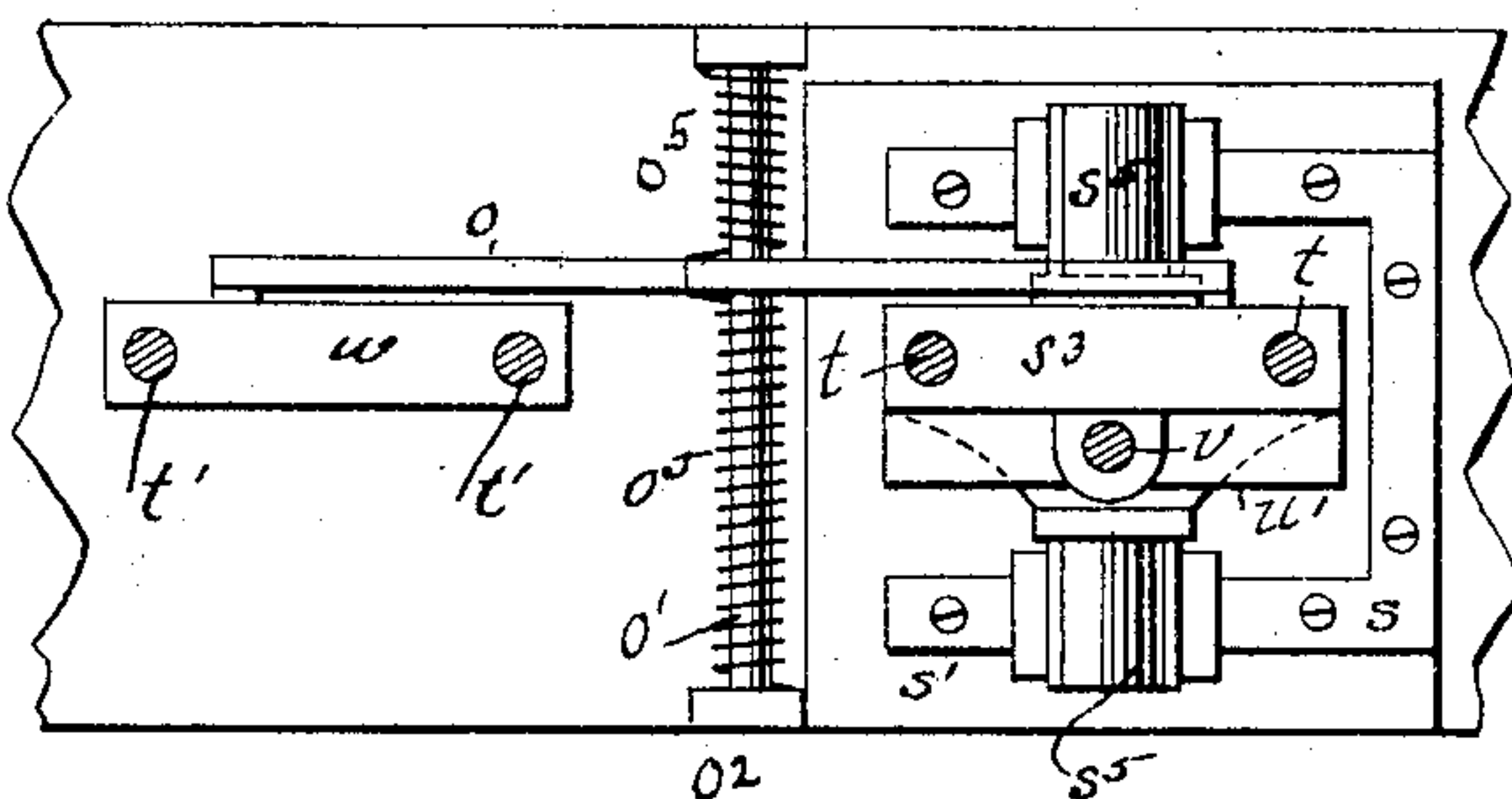


Fig. 6.

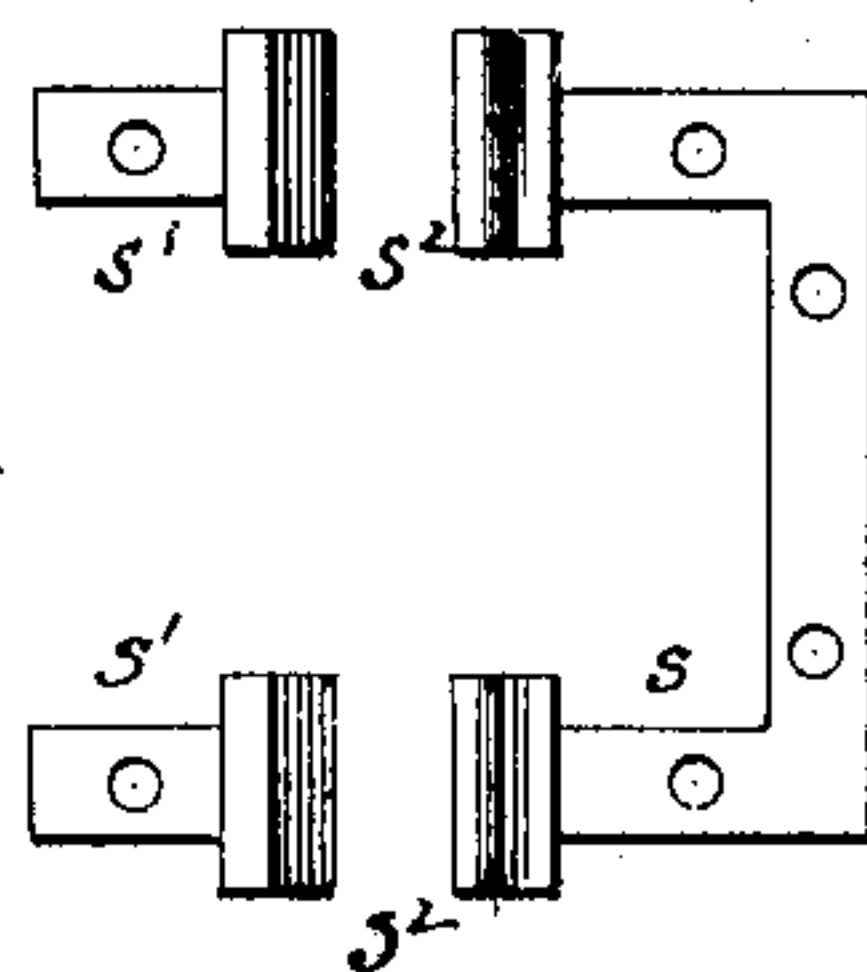


Fig. 8.

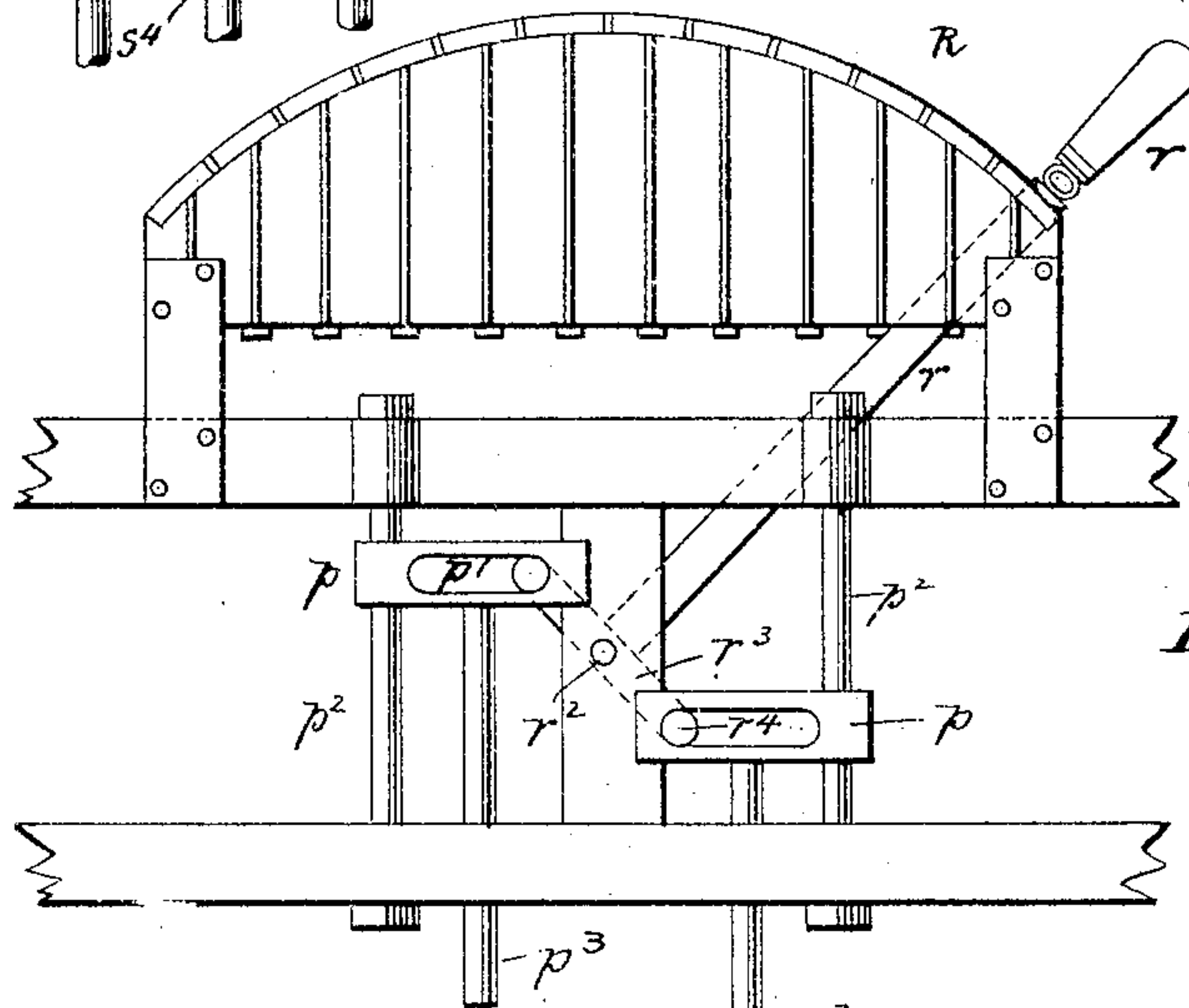


Fig. 9.

WITNESSES:

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UNITED STATES PATENT OFFICE.

ARTHUR R. ROE, OF DULUTH, MINNESOTA, ASSIGNOR OF ONE-HALF TO
GEORGE J. NORTHROP, OF MARQUETTE, MICHIGAN.

ELECTRIC SWITCHING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 502,104, dated July 25, 1893.

Application filed September 24, 1892. Serial No. 446,765. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR R. ROE, a subject of the Queen of Great Britain, residing at Duluth, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Electric Switching Apparatus, of which the following is a full, clear, and exact description.

This invention relates to electric switching apparatus and also, in connection therewith, to mechanism for operating rheostats.

The object of the invention is to provide means whereby any one of a number of combinations of electric switches or rheostats may be simultaneously operated. For instance, in theaters or other places where electric lights are arranged in groups, it is desirable to cut in and out more or fewer of the groups simultaneously, in order to light portions of the building or space, while other portions remain dark. It is also desirable at times to vary the intensity of the light in one or more of the groups simultaneously or simultaneously with the entire cutting in or out of other groups.

The apparatus constituting my invention is designed for this purpose and consists in the device and combinations hereinafter described and set forth in the claims.

Referring to the accompanying drawings: Figure 1 represents a face view of the apparatus, which may be termed a switch-board. Fig. 2 is a transverse central section of the same. Fig. 3 is a detail of a portion of the combination plate. Fig. 4 is a side elevation of one of the switches. Fig. 5 is a plan of the same below the line *xx* of Fig. 4. Figs. 6 and 7 are details of the switches. Fig. 8 is a view showing the different positions which the switches may assume. Fig. 9 is a detail of one of the rheostats.

Referring to the drawings by letter, A represents the front plate or face of the switch-board. It is secured in any suitable way to the side frames A' and the latter are secured to the rear plate or portion of the frame A². This rear portion is secured in any manner against a wall or other support.

Immediately back of the front plate and parallel thereto is a frame *a* which may be in the form of a series of spokes radiating

from a hub *a'* and with its rim secured to the sides of the main frame, or it may be in the form of a continuous plate. Back of this frame *a* is still another one *b*, about eight or ten inches from it, which may be of a similar or different construction and secured rigidly to the sides of the main frame. These two plates or arms are held rigidly in parallel positions with respect to each other and they form the supports for the switches and rheostat mechanism hereinafter described. Back of the plate *b* is a movable skeleton frame *c* mounted upon guide rods *d*, firmly fixed to the main frame and located at intervals around the edges of frame *c*. These three frames or plates, so far described, are all mounted concentrically and each is provided with a central opening for a shaft *e*. This shaft has its bearings in the back plate of the main frame and its outer end projects through the front plate of the apparatus and carries a hand-wheel *e'*. A portion of its body near the inner end is provided with a screw-thread *e²*, which engages with a fixed nut *c'* carried by the frame *c*. The outer half of the shaft is surrounded by a loose sleeve *e³* carrying a feather *e⁴* and projecting through the front plate. Its outer end has fitted to it an index arm *f* having a handle *f'* at each end by which it may be turned to rotate the sleeve, and a bolt and operating lever therefor at one end whereby it may be locked at any desired position around the circle in which it turns. A ring *g* is formed upon or attached to the outer plate concentric with the shaft, which ring is numbered or lettered to represent combinations, as will hereinafter appear. The index arm has a pointer *f²* running in front of the circle of numbers or letters to aid in determining the position of the combination apparatus. The bolt locking the index arm extends into notches in the flange or ring *g*, as shown in Fig. 2. The sleeve *e³*, carried by the index arm, moves independent of the shaft. On the front of the moving frame *c* is placed a circular plate *i*, which I shall term a combination plate. It surrounds the shaft and is held in position by lips *c²* on the frame. It is free to rotate about its center and may move along its axis with the frame *c*. At the center it is provided with a

notch i' in which the feather e^4 is located. The frame c has projections c^3 which rest against the back of the combination plate to hold it stiff when pressure is brought against its front side.

As above stated, the switches, which are lettered S, are mounted between the frames a and b . The switches are all alike and a description of one of them will suffice. To the plate b is secured a block of slate or other insulating material q , and upon this are mounted the metallic pieces s, s' , shown in Fig. 6. The two wires of the circuit are to be connected with the parts s' , respectively, and the circuit is completed when both of the parts s' are connected to the part s . The parts are provided with jaws s^2 into and out of which the moving portion of the switch passes to make and break the circuit. This moving portion or circuit controller consists of a block of metal or other suitable material of the shape shown at s^3 in Fig. 7. It is provided at its lower end with studs s^4 which carry cylindrical metallic parts s^5 , respectively, suitably insulated from the studs. These cylinders respectively make and break contact with the jaws $s^2 s^2$. The body or cross-head s^3 carrying these cylinders has two offset portions s^6, s^6 , on one side and four ears s^7 , &c., all of which are perforated vertically, as shown. The central portion of this body is also provided with an opening s^8 shaped like the letter L reversed. This part s^3 is mounted to slide upon a pair of parallel rods $t t$, mounted between the plates $a b$ of the apparatus. The rods pass through the ears s^7 .

u represents another moving portion of the switch consisting of a yoke u' , the ends of which are perforated as shown and embrace the rods $t t$. To the center of the yoke is attached a lug u^2 having a vertical perforation u^3 and a lateral projection or stop u^4 . When the part u is adjusted upon the rods t , the yoke occupies a position between the ears on the part s^3 and the stop u^4 projects into the opening s^8 . The width of the stop is the same as the width of the vertical portion of the opening s^8 and its height or thickness is just one-half of the vertical length of said opening, so that the stop may be moved up and down in the opening. Operating rods v mounted loosely in bearings in the plates a and b extend loosely through the perforations in the offsets s^6 and through the perforation u^3 . Set screws u^5 secure the part u rigidly to the rod. The rods t between the upper ears s^7 and the yoke u' are surrounded by coil springs $s^9 s^9$ which tend to press the yoke forward or in. The operating rod v extends through the face plate A and carries a knob v' by which it may be operated by hand when desired. The rod also extends through the plate b and to within a certain distance of the combination plate i . $t' t'$ represent another pair of guide rods similar to the pair $t t$ and adjacent to the latter. Upon these is mounted a cross-head w having a slot w' and

carrying a rod w^2 projecting through the plate b to within a certain distance of the combination plate i .

o is a walking-beam mounted upon a shaft o' in bearings o^2 between the two pairs of rods $t t$ and carrying at one end a pin o^3 which works into the slot w' and at the other end a lug o^4 which when the switch is closed projects into the horizontal portion of the L shaped opening s^8 in the part s^3 . The shaft o' is surrounded by two coil springs o^5 which tend to twist the shaft and swing the walking-beam into an angular position, the opposite of what is shown in Fig. 4. The operation of these switches is as follows: When the operating rod v is pulled or pushed downward slightly, the lug u^4 is carried to the upper or outer portion of the opening s^8 , leaving a free space beneath it. The coil springs o^5 which are then under tension are thereby permitted to swing the arm and lift or move the part s^3 and the operating lever to the opposite extremities of the rods t , the lug o^4 meanwhile traveling across the horizontal portion of opening s^8 . The different positions of the parts in making this movement are illustrated in Fig. 8, wherein it will be seen that the lug o^4 travels entirely across the horizontal portion of the opening s^8 and back again to its first position. Meanwhile the operating rod v is pushed outward the full extent of its movement in that direction while the rod w^2 is pushed inward the full extent of its motion. By this movement the cylinders s^5 are moved from contact with the jaws s^2 , and the circuit controlled by the switch thereby broken. To complete the circuit the rod w is to be pushed forward to its original position, thus causing the lug o^4 to again travel across the horizontal portion of the opening s^8 and back into its original position in the lower left-hand corner of the opening. As soon as the lug enters this lower corner, the springs s^9 push the yoke downward or inward and thus carry the stop u^4 into the horizontal portion of the opening and thereby lock the switch in its closed position.

The rheostats are represented by R. The contact plates of each of them are exposed on the front of the switch board, and the circuit controlling lever r carries a handle r' within reach of the operator. This lever extends inward to a point r^2 between the plates a and b where it is pivoted, and carries a cross-arm r^3 having at each end a pin r^4 engaging with slot p' in cross-heads p . These cross-heads are similar to the cross-heads w and are mounted upon rods p^2 or in any other suitable manner to properly guide them. These cross-heads carry rods $p^3 p^3$, which extend within a certain distance of the combination plate i . When one of these rods reciprocates in one direction the other moves in the opposite direction, and the lever r which operates in connection with the rheostat contacts makes a corresponding movement, which will be understood.

Instead of making the cross-head r^3 and the lever r in one piece, as shown in Fig. 9, they may be made separate and pivoted on the same centers.

5 The combination plate i is provided on radial lines with different numbers of holes i^2 arranged in various positions from the center to the edge, but always in line with the operating rods v . When it is desired to close a
10 certain number or combination of switches, the combination plate must be rotated until the holes in the plate are brought simultaneously into line with the operating rods of all those switches which are to be closed, and
15 solid portions of the plate must be at the same time in line with the operating levers of all the other switches.

With this understanding the operation of the apparatus is as follows: Suppose it is desired to close the circuit of all the switches
20 in combination No. 9, which for illustration we will say are the "footlights," the "green bunches" and the "first balcony lights" (assuming the apparatus is used in a
25 theater). To accomplish this the index arm f is unlocked and turned until the pointer reaches No. 9 on the circle g . In doing this the sleeve e^3 and the combination plate i are moved together, thus bringing the holes
30 and solid portions of the combination plate into the proper position to close the circuit of the three groups of lights mentioned and open the circuit of all the other groups. The index is then locked in place and the hand-
35 wheel e' turned. This will cause the frame c to move bodily forward and carry the combination plate toward the ends of the operating rods v . All those rods which happen to be in
40 and which are struck by the combination plate, are forced outward until the stops w^4 of the switches have been carried outward clear of the lug o^4 when the springs o^5 immediately act in the manner hereinbefore described and open the switches, throwing the same by a
45 quick movement. The rods w^2 of all those switches which happen to be closed at the time will move inward toward the combination plate and will pass through the holes therein. It will be observed therefore that in
50 every combination there must be a hole in front of one or the other of the rods of every switch and the rod which the hole happens to be in front of determines whether the switch is to be open or closed when the combination
55 plate moves forward. As soon as a combination of switches has been operated in the manner described, the hand-wheel e' is turned in the opposite direction, thus carrying the combination plate back and out of range of the
60 ends of all the operating rods. The plate may then be rotated to a different combination.

Although in the operation I have mentioned only the switches, I desire it understood that the rheostats are operated exactly in the same
65 way and simultaneously in the same manner as the switches, as will be understood.

When desired any of the switches or rheo-

stats may be operated by hand from the front by pulling or pushing on the knobs on the ends of the operating rods and levers. The
70 space between the combination plate and frame c may be sufficiently great to prevent the switch and rheostat rods from striking the frame when they pass through the plate, although when the frame is a skeleton the
75 openings therein may occur directly back of the radial lines on which the holes in the combination plate are drilled.

To work the combinations it may be necessary to use a chart or schedule giving groups
80 of lights in each combination.

I am aware that it has been proposed to operate a series of groups of lamps in rotation, but so far as known to me a device has never
85 been proposed whereby any group may be selected and operated at will without regard to order.

Having thus described my invention, I claim—

1. In an electric switching apparatus, two
90 elements in combination, one a gang or plurality of switches or circuit controllers and the other a device acting at intervals upon the switches or circuit controllers to simultaneously open some of them and close others, the
95 switches or circuit controllers remaining in the condition to which they were last thrown, during the intervals between the actions of said device, substantially as described.

2. The combination with a plurality of electric switches, two movable rods or levers controlling each switch, and a plate or frame having openings in the line of movement of said rods or levers, said plate or frame having two
100 movements, one to determine how its openings shall be placed with respect to the rods or levers and the other toward or against said rods or levers, substantially as described.

3. The combination with a plurality of switches, each of which has two operating rods
110 or levers, of a plate or frame having means for moving one or the other of the rods or levers of each switch, and means for setting said plate or frame to determine which of said rods or levers shall be operated.

4. The combination of a plurality of electric switches, two reciprocating rods operating each, a plate or frame provided with openings and having two movements, one to determine how its openings shall be placed with
120 respect to the rods and the other toward or against said rods for the purpose set forth.

5. The combination of a plurality of electric switches arranged around a common center, reciprocating rods operating said switches, a
125 concentrically placed plate or frame located back of and in a plane parallel to the ends of said rods and means for moving said plate or frame against the ends of the rods to operate the switches.

6. The combination of a plurality of electric switches arranged around a common center, reciprocating rods operating said switches, a
130 concentrically placed plate or frame located

back of and in a plane parallel to the ends of said rods, said plate provided with openings through which the rods can pass and solid portions through which the rods cannot pass, means for rotating said plate to properly adjust the openings and solid portions and means for moving it toward or against the ends of the rods substantially as described.

7. The combination of the main frame, the electric switches mounted therein and provided with reciprocating operating rods, a traveling carriage mounted in the main frame a plate carried by the traveling carriage and adapted to be brought against the ends of the operating rods and means for moving said traveling carriage forward and backward.

8. The combination with a shaft mounted in a frame of a plurality of switches arranged in the frame around the shaft, a traveling carriage carrying a stationary nut engaged by a thread on the shaft, a concentric rotatable plate also carried by the carriage, a loose sleeve on the shaft engaging the plate and an index arm on the sleeve by which the same may be turned to rotate the plate, substantially as and for the purpose set forth.

9. The combination of the main frame, the switches mounted therein, the switches provided with operating rods extending outside the frame and there provided with handles and the movable combination plate located

inside of the frame and adapted to throw the switches.

10. The combination of two push rods connected together by a walking-beam, one of the rods carrying the movable part of an electric switch or cut-out, of a plate or frame having two holes in it, means for turning the plate to bring one or the other of the holes into line with one or the other of the rods and means for moving the plate toward or against said rods for the purpose set forth.

11. The combination of two cross-heads, one carrying the movable part of an electric switch, and both provided with slots, a walking-beam having pins at its extremities working in said slots respectively, a pair of rods connected with said cross-heads respectively, one of said rods carrying a stop arranged to partially close one of the slots in the cross-heads, a spring arranged to swing the walking-beam on its center and means for moving the rod carrying the stop, whereby the switch is released and permitted to operate by the action of the spring.

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

ARTHUR R. ROE.

Witnesses:

WILLARD B. CROSS,
F. W. MERRITT.