

(No Model.)

2 Sheets—Sheet 1.

E. THOMSON.
ELECTRIC SWITCH.

No. 500,629.

Patented July 4, 1893.

FIG. 1.

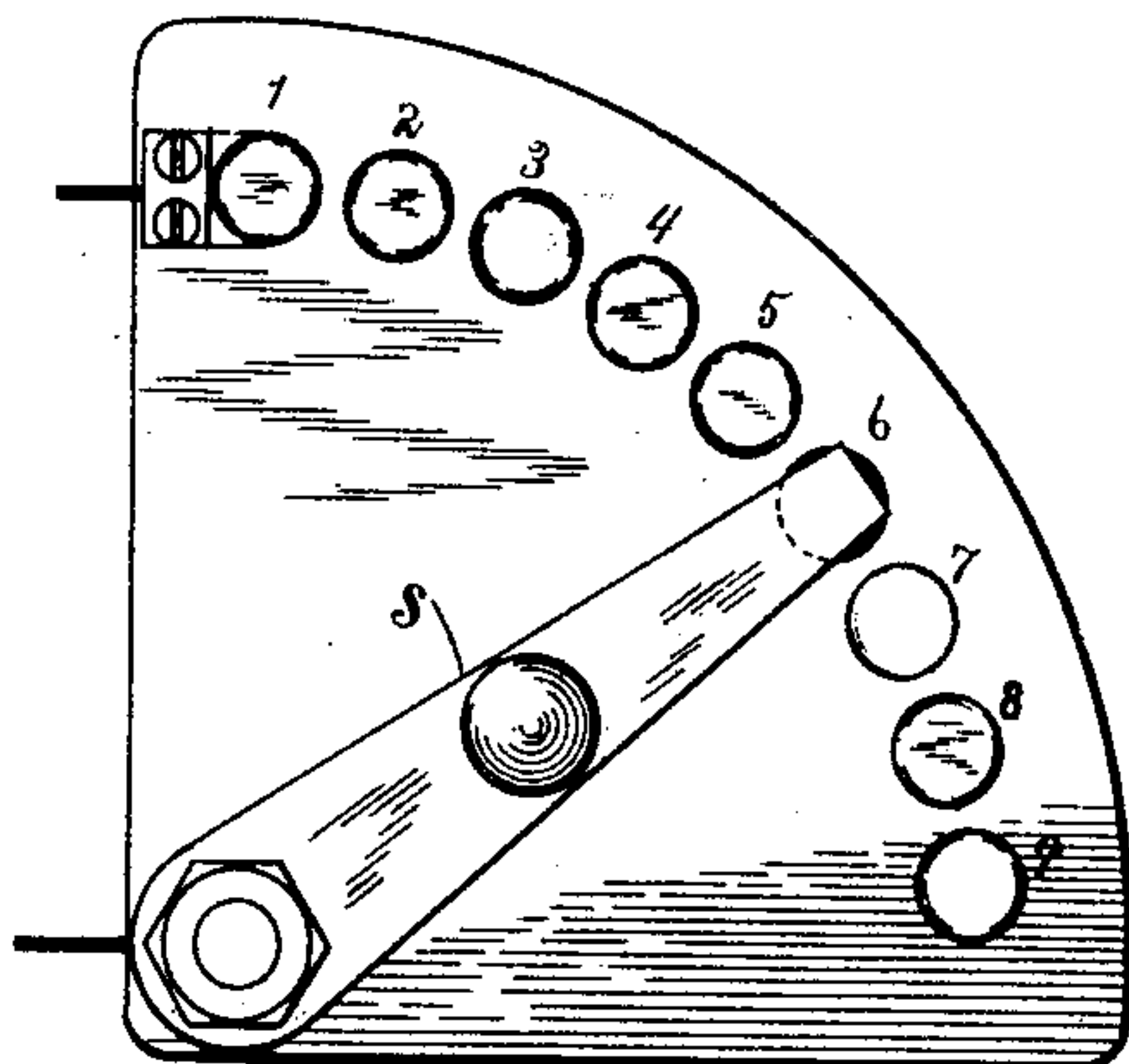


FIG. 2.

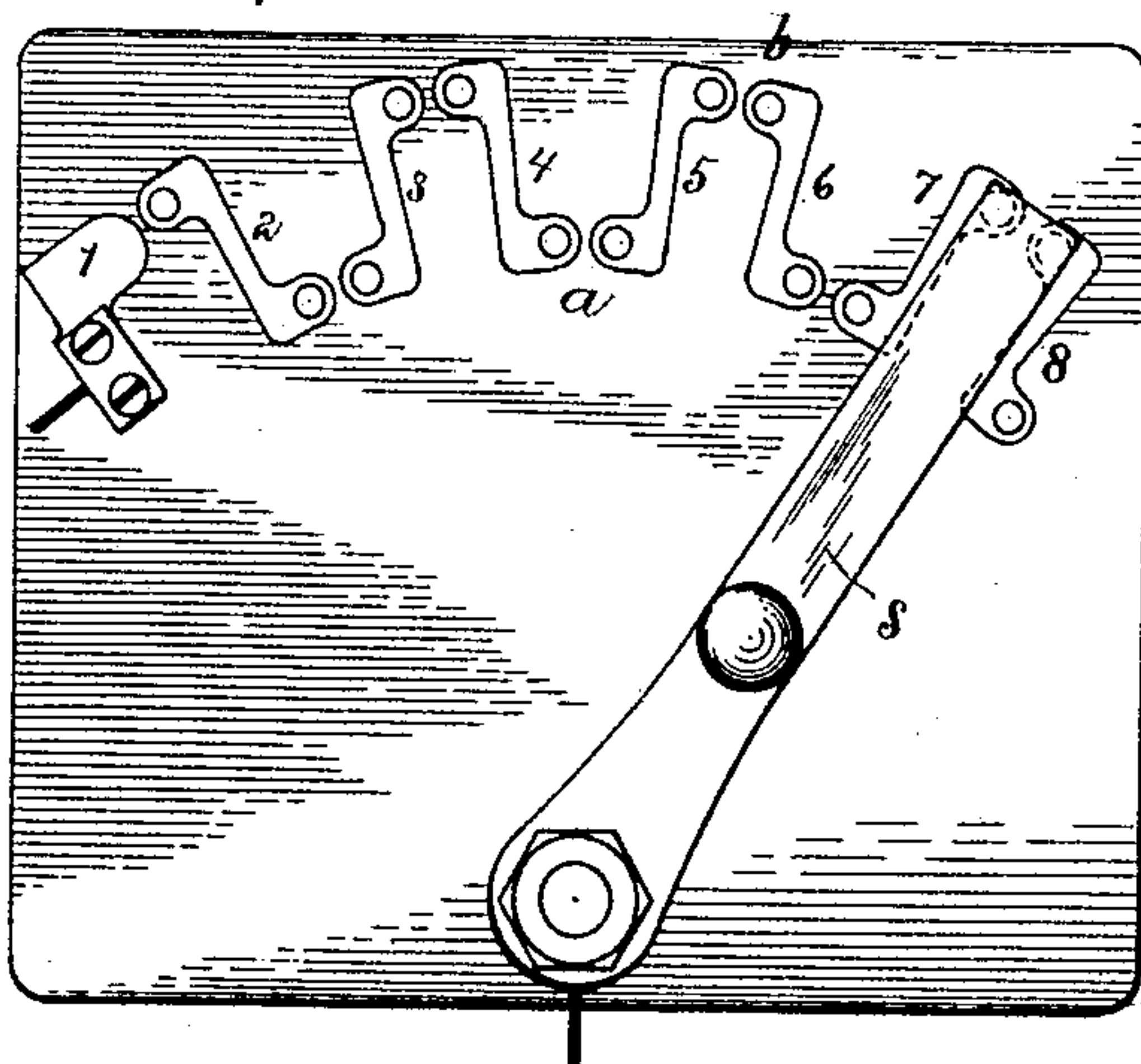


FIG. 3.

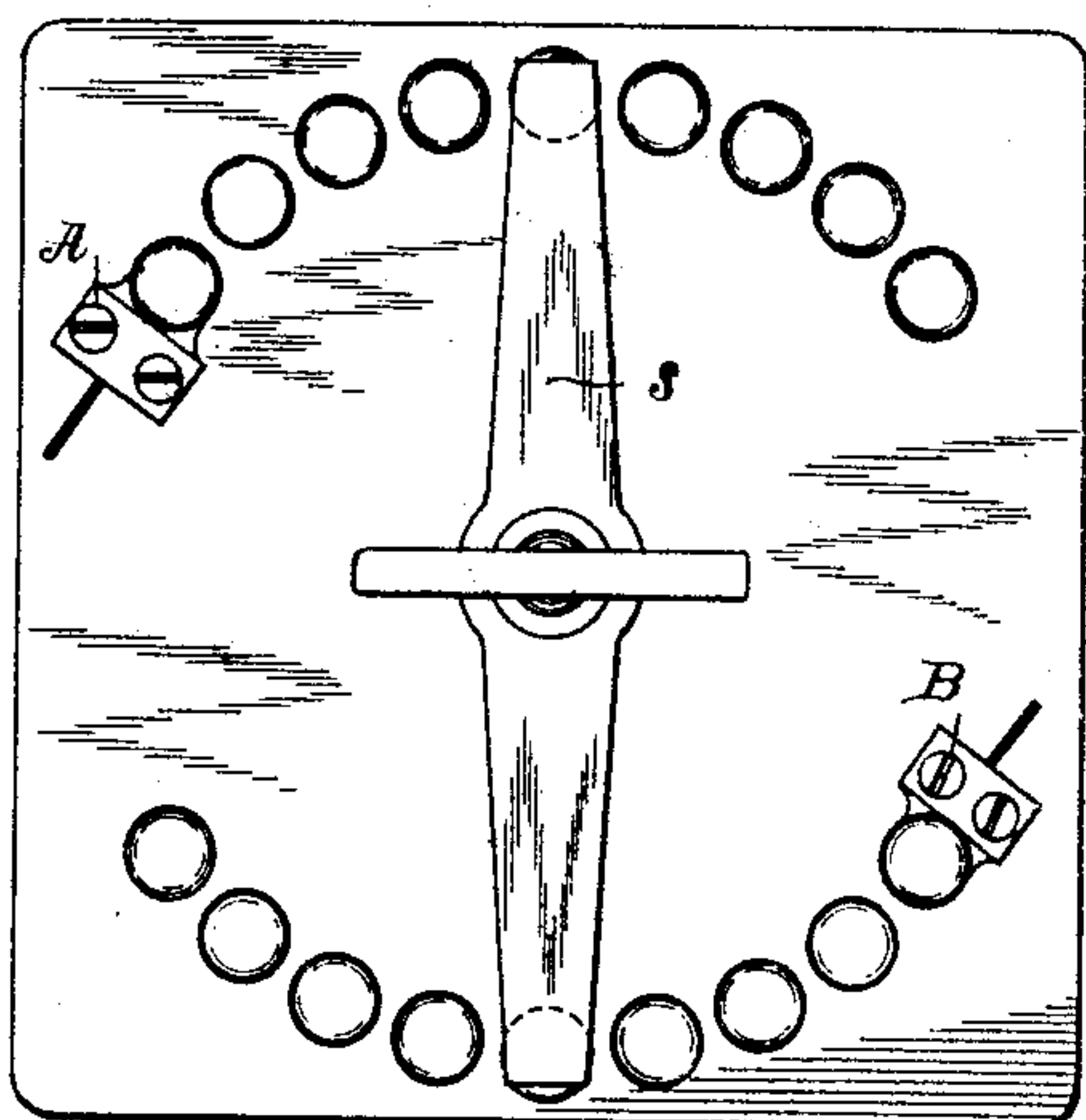


FIG. 4.

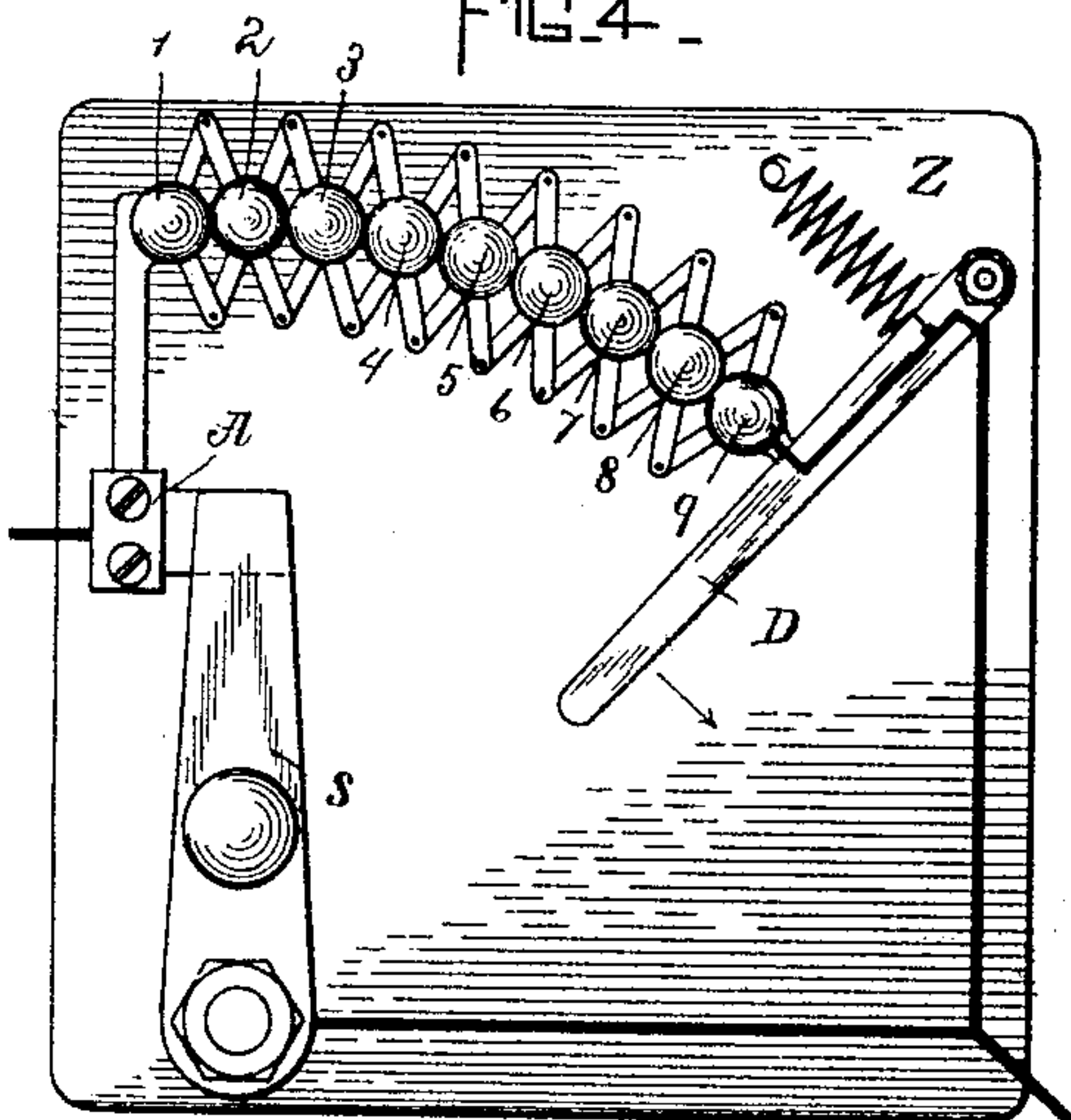
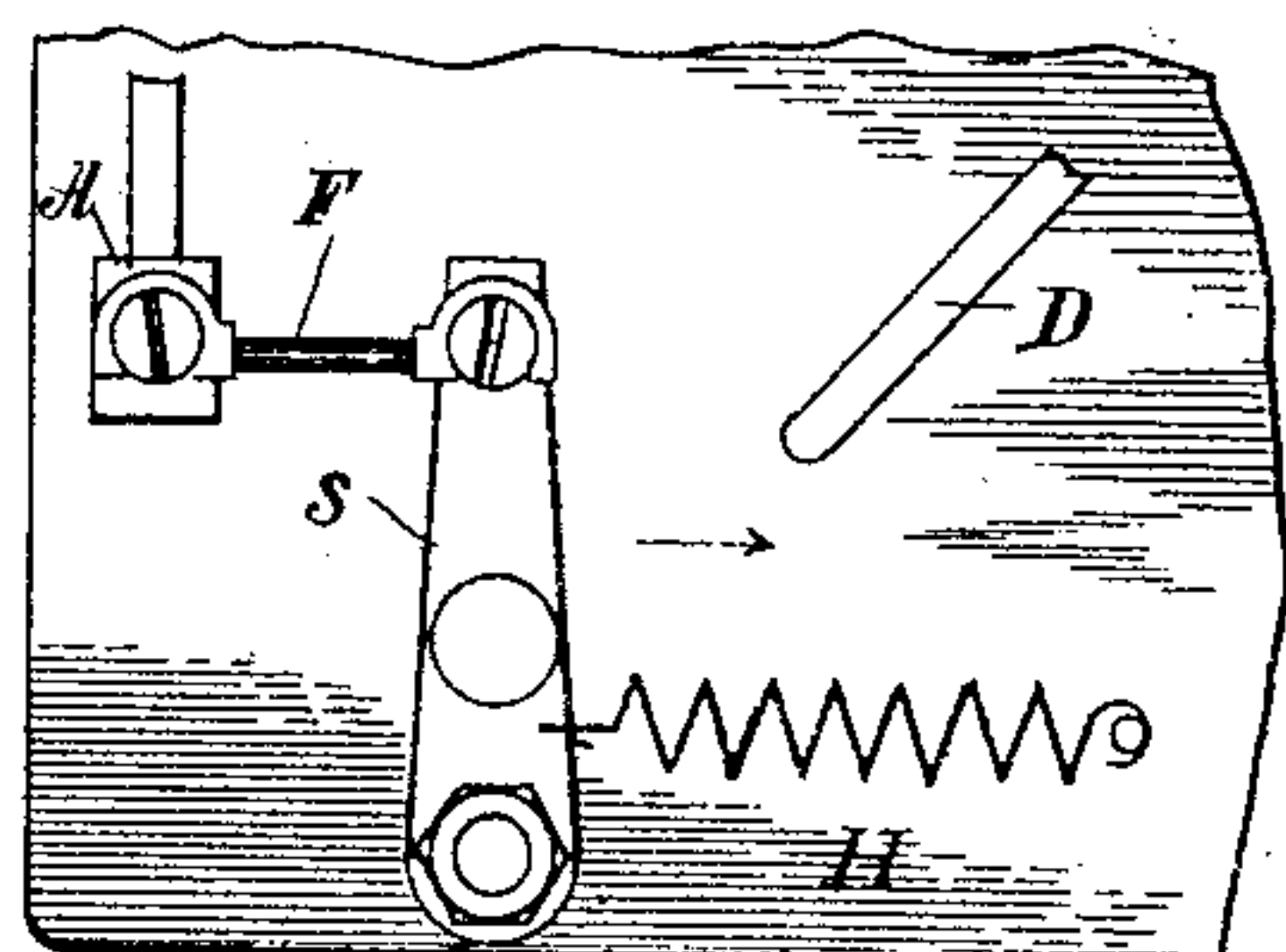


FIG. 5.



WITNESSES.

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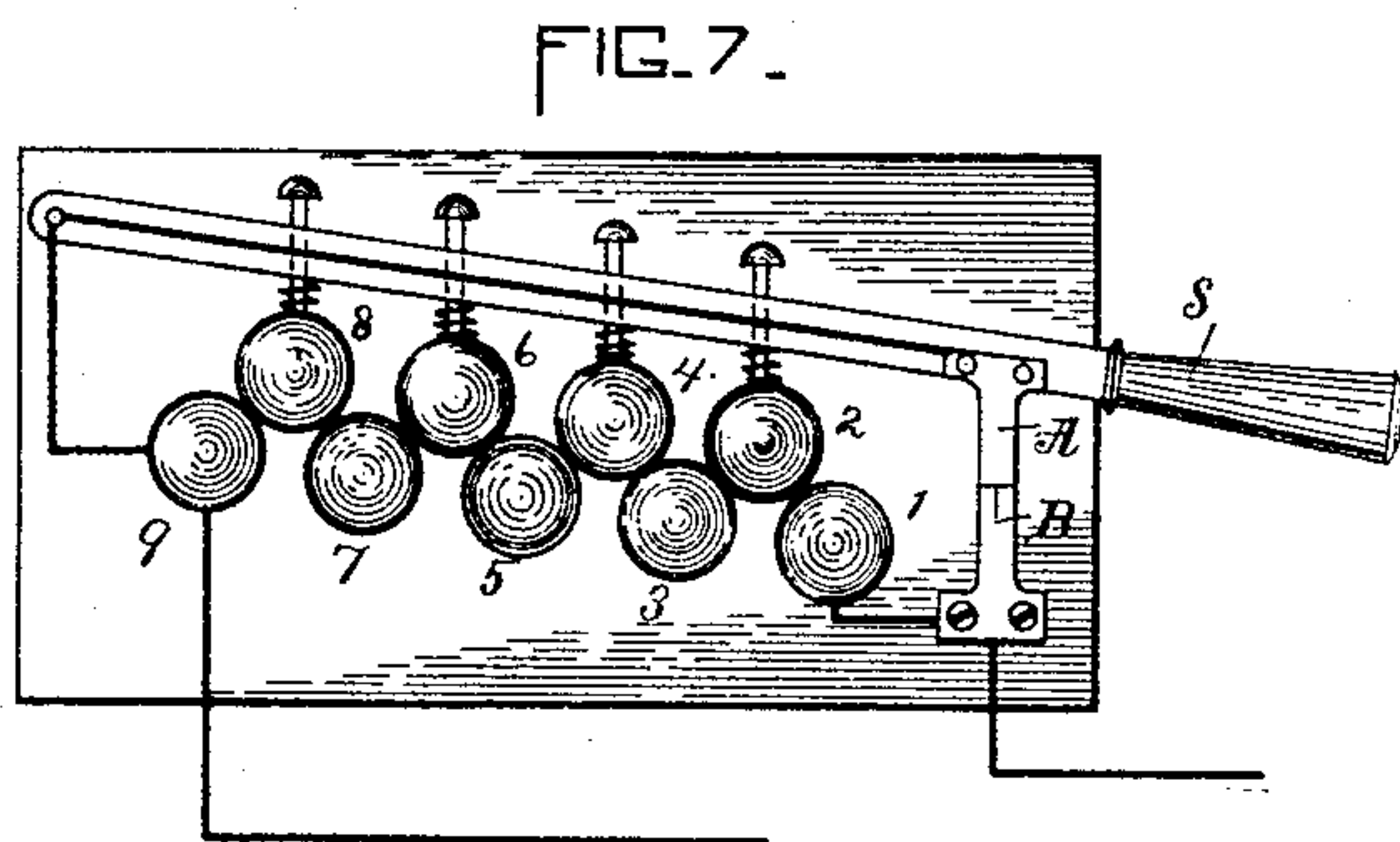
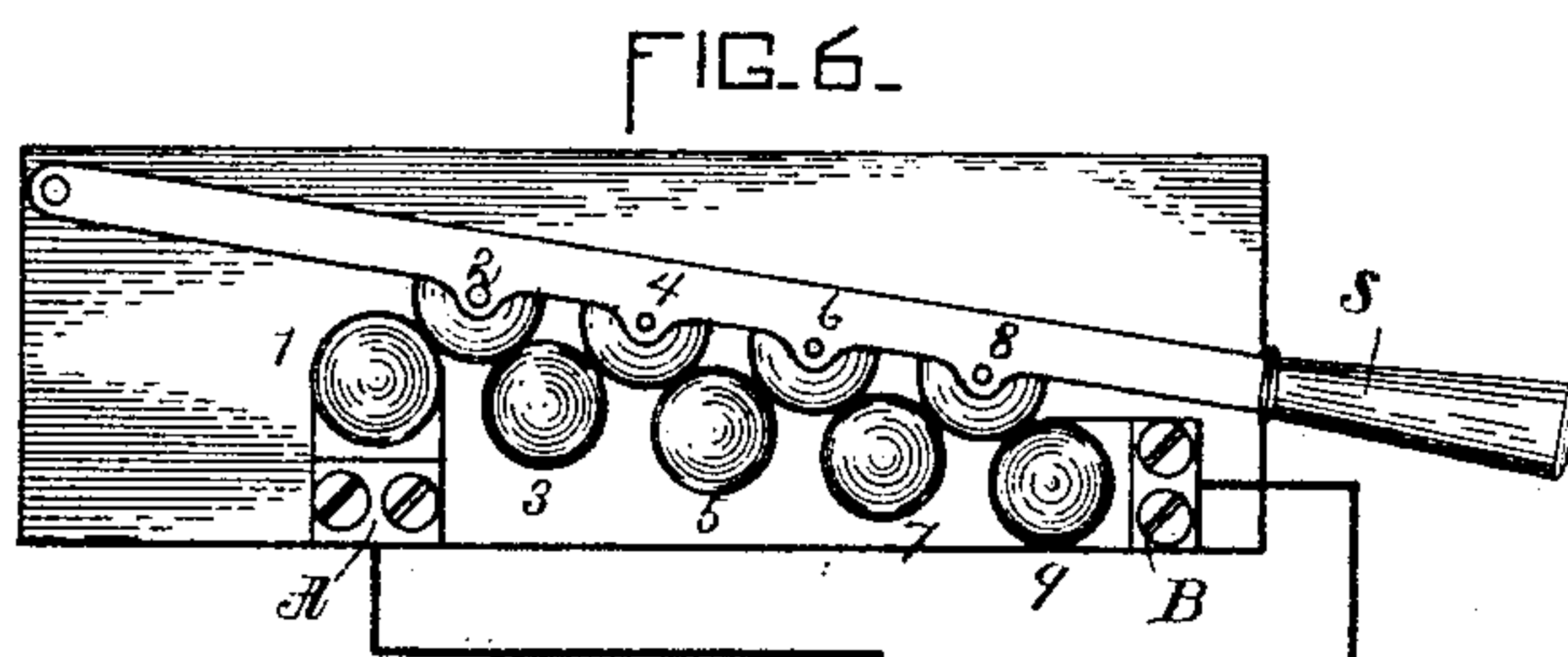
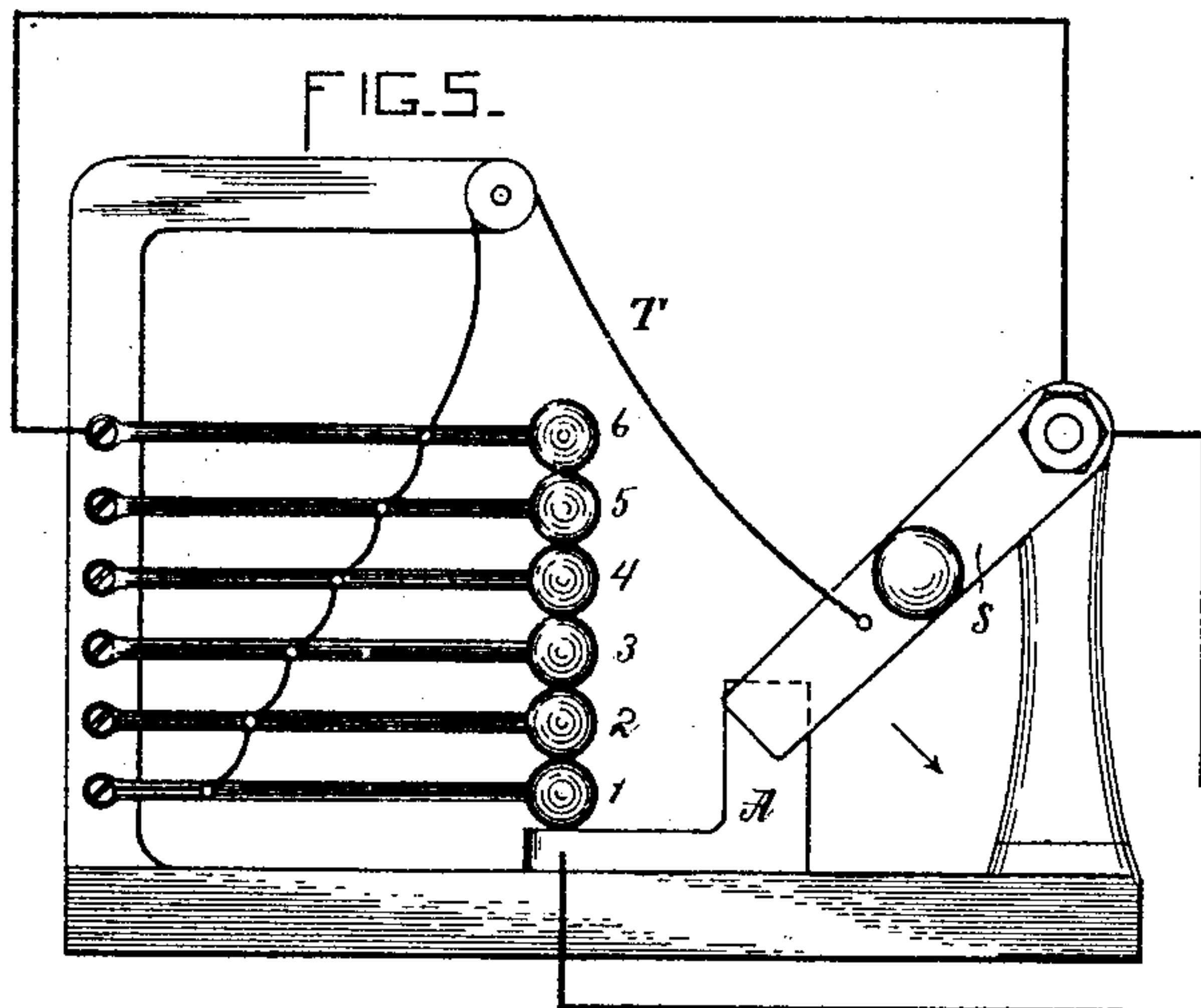
(No Model.)

2 Sheets—Sheet 2.

E. THOMSON.
ELECTRIC SWITCH.

No. 500,629.

Patented July 4, 1893.



WITNESSES.

A. H. McDonald
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INVENTOR.

Elihu Thomson
by Brinley Knight
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UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE THOMSON-HOUSTON ELECTRIC COMPANY, OF CONNECTICUT.

ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 500,629, dated July 4, 1893.

Application filed April 20, 1890. Serial No. 352,507. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have
5 invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

My invention consists in an apparatus by means of which an electric circuit carrying a
10 strong current of considerable potential may be interrupted with but little or no arcing. It is based upon the fact that a disruptive discharge between two terminals of an electric circuit will pass over a series of breaks
15 whose aggregate length is greater than any single break over which the same discharge would pass, but that an electric arc on the contrary can be maintained over a single break of a length greater than the aggregate
20 length of a series of breaks over which it could be maintained. This phenomenon arises from the fact that in a disruptive discharge there is an inductive effect between the successive contact pieces or plates forming a
25 series of breaks so that a small spark starting at the first gap and leaping to the first conducting plate breaks down the dielectric after which the action is repeated at every successive step, and the dielectric once broken
30 down is broken down for good during the continuance of the discharge. With an arc on the other hand I have found that the greatest part of the resistance or counter-electro motive force is concentrated at the
35 positive electrode and that a comparatively small part exists in the flame of the arc. Thus, in an ordinary arc there are at least forty volts required to overcome the resistance at the surface of the positive electrode so that if
40 there were ten arcs between the terminals of the circuit, a potential of four hundred volts would be required simply to overcome the surface resistance of the successive positive electrodes, and with that voltage there would
45 be no potential left to maintain ten arcs in series however short the distance, but a single arc with a potential of four hundred volts could be maintained over a space much greater than the aggregate of the ten spaces which

would be employed in a circuit breaker constructed according to my invention for that
50 degree of potential.

My invention may be used in any instance where it is desired to interrupt a circuit. It
55 may be used with a manual switch or with an automatic switch of any kind, as for instance one in which a fuse is adapted to give way and break the circuit upon an abnormal passage of current.

Referring to the accompanying drawings, 60
Figure 1 illustrates a simple switch embodying my invention. Figs. 2, 3, 4, 5 and 6 show modified forms of the invention. Fig. 8 shows
65 an automatic switch adapted to be released by a fuse.

Referring to Fig. 1, S represents a switch
arm of ordinary construction connected to one terminal of the circuit. 1 is a contact
70 piece connected to the opposite terminal of the circuit. 2, 3, 4, 5, 6, 7, 8 and 9 are contact
75 pieces similar to it and placed in series along the path of arm S when it is moved to open the circuit. The said arm when it is
operated will pass in succession over these
80 contact pieces, so that when it is fully open the two terminals of the circuit will be separated by a series of metallic pieces insulated from one another and forming a series of
85 breaks over which an arc or arcs cannot be maintained.

In Fig. 2 a similar device is shown but the
contact pieces are of a different shape so that
the break between any two adjacent pieces
85 will not be in line with the break between either piece and the adjacent one of the series. In this arrangement there will be a
still greater obstruction to the arc because
it is not disposed to follow a zig-zag course.

In Fig. 3 a double series of contact pieces
90 and a double arm switch S are shown.

In Fig. 4 the contact pieces consist of a series of balls, attached to a series of levers,
through which the circuit is normally maintained. When the switch arm S is moved to
95 open the circuit it first breaks a short circuit around these balls and then comes in contact with a lever D and operates the said lever against the pressure of spring Z to draw apart

the whole series of balls. This will cause a number of breaks sufficient to exhaust the force of the arcs or potential acting to form them.

5 In Fig. 5 a similar series of balls are operated by means of a cord T attached to switch S.

In Fig. 6 there is a similar series of balls but the alternate ones of the series are attached to lever S so that when the lever is
10 moved the same series of breaks will occur between the two terminals of the circuit.

Fig. 7 shows the same arrangement except that the alternate balls are connected to switch S by a yielding connection which enables
15 them to adjust themselves to close the gaps between the stationary balls.

In Fig. 8 there is shown a modification of Fig. 4. In this form the switch S is normally held by the fuse F and against the force of
20 spring H. When the fuse melts, the arm S is released and the circuit is broken as in Fig. 4.

What I claim as new, and desire to secure by Letters Patent, is—

25 1. An electric switch or circuit breaker, having a movable part by which the circuit is opened or closed, and a number of insulated conducting pieces forming a series of breaks on the opening of the circuit which
30 tends to prevent the continuance of an arc thereat, as described.

2. An electric switch or circuit breaker having two stationary terminals, an insulated movable part and a number of insulated con-
35 ducting pieces in series adapted to form a series of breaks on the opening of the switch

which will tend to prevent the continuation of an arc.

3. The combination in an electric switch or circuit breaker, of two circuit terminals, an
40 intermediate movable part, and a number of insulated conducting pieces in series placed in the path of said movable part and adapted to form, when the switch is opened, a series of breaks tending to prevent the continua- 45
tion of an arc.

4. An electric circuit breaker having a series of insulated conducting pieces with their successive discharge points arranged out of
50 line with one another so as to form a zig-zag series of breaks tending to prevent the continuance of an arc thereat, as set forth.

5. The combination in an electric switch or circuit breaker of two circuit terminals, an
55 intermediate movable part and a series of insulated pieces having their adjacent points offset and adapted to form, when the switch is open, a zig-zag series of breaks tending to prevent the continuation of arcs.

6. The combination with an electric switch
60 or circuit breaker controlled by a fuse, of a series of contact pieces between the opposite terminals of the circuit adapted to form, when the switch is open, a series of breaks tending to prevent the continuation of arcs. 65

In witness whereof I have hereto set my hand this 14th day of May, 1890.

ELIHU THOMSON.

Witnesses:

SAMUEL DEACON,
WM. D. POOL.