

C. B. HANRIGHT.
CENTRIFUGAL SWITCH.
APPLICATION FILED JUNE 14, 1909.

992,870.

Patented May 23, 1911.

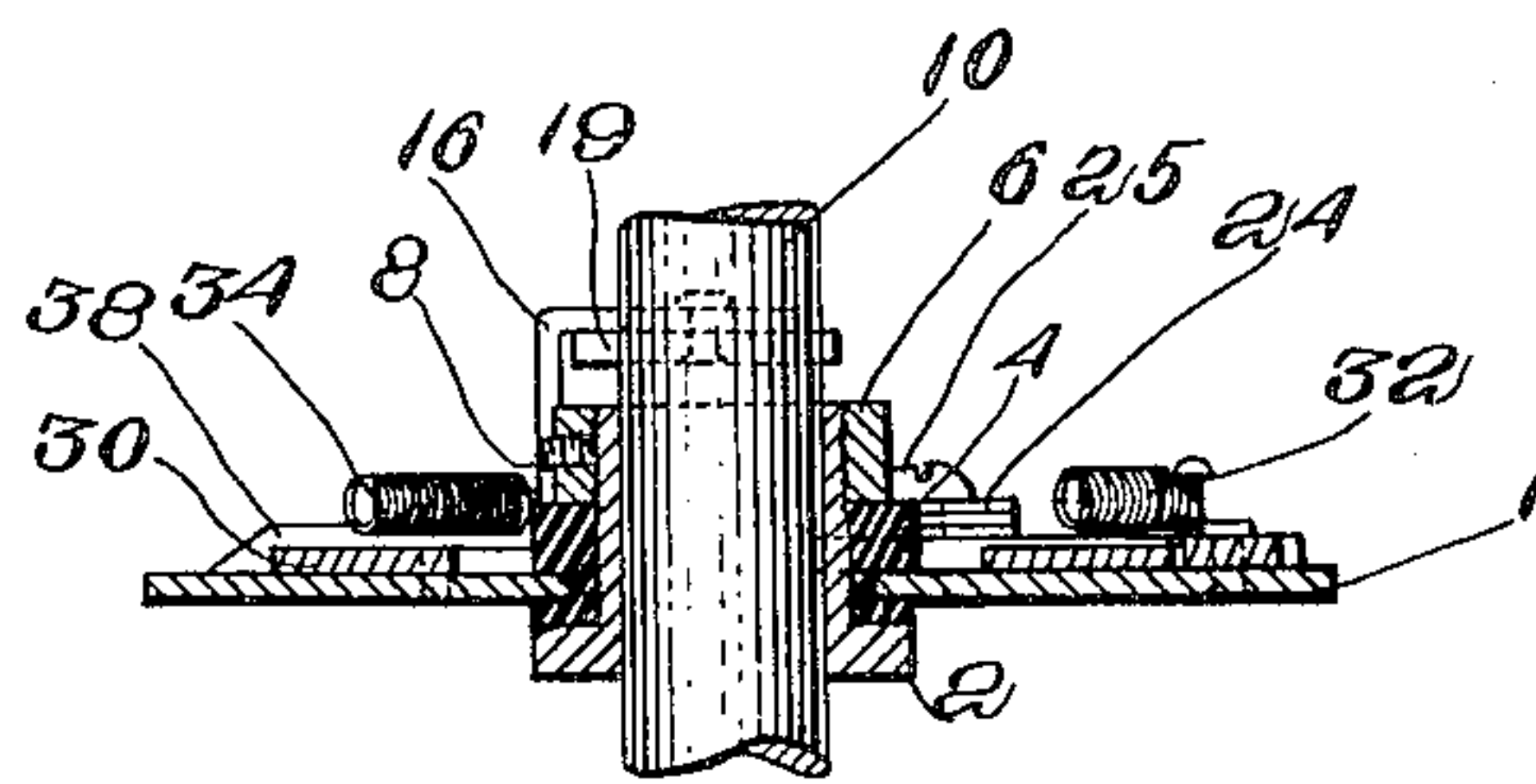
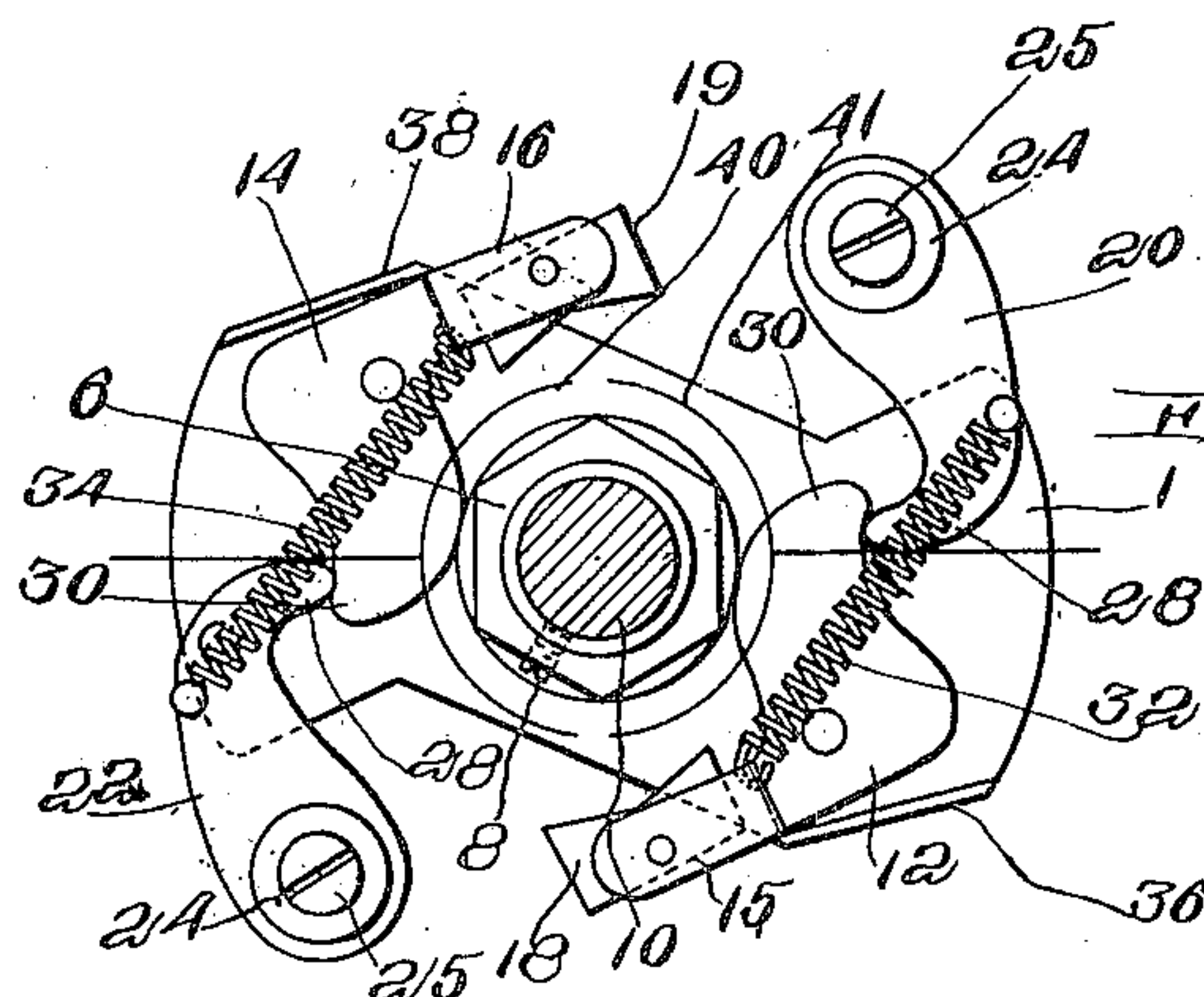
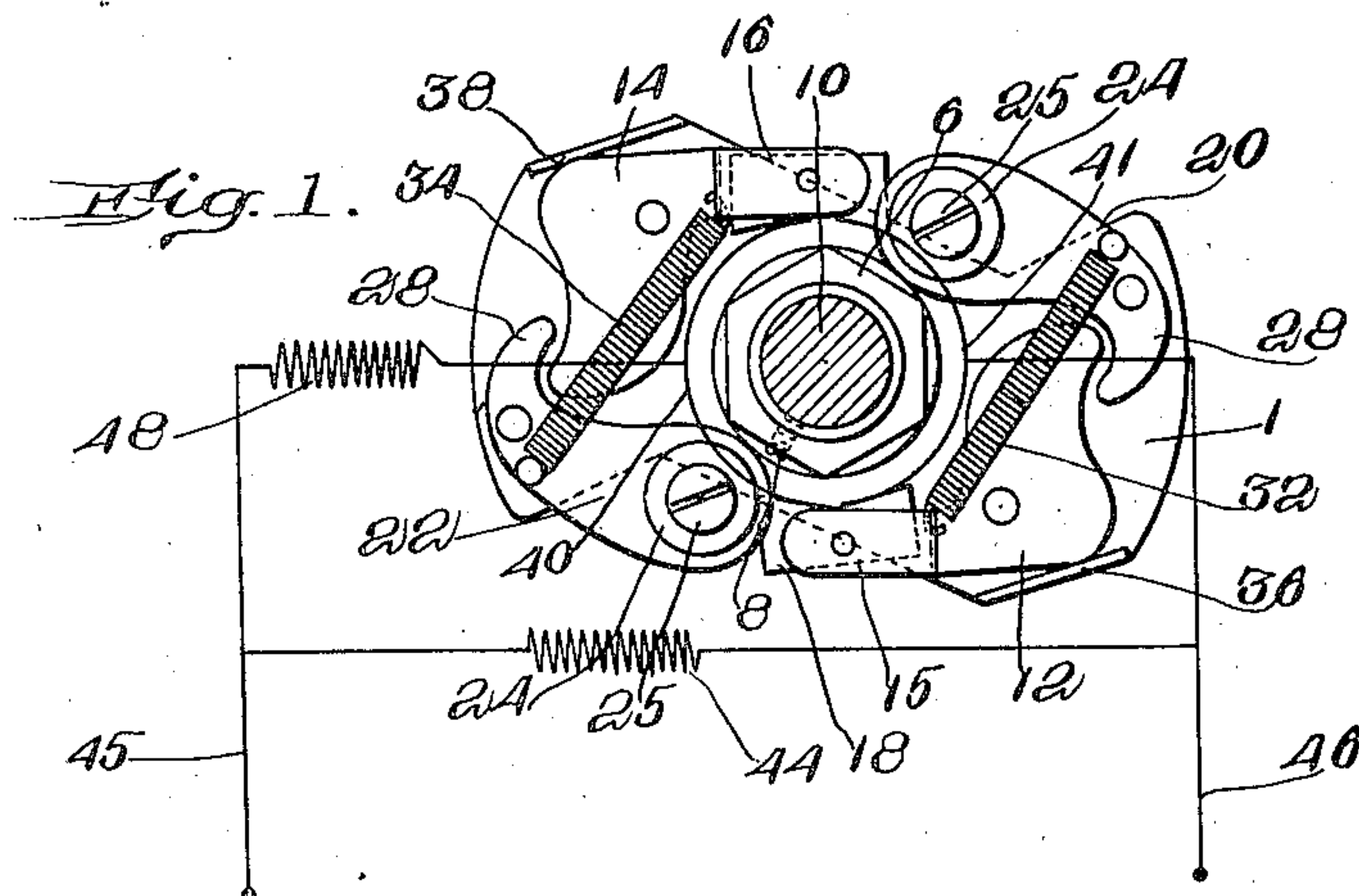


Fig. 5.

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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL SWITCH.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CLARENCE B. HAN-
RIGHT, a citizen of the United States, resid-
ing at Cambridge, in the county of Middle-
sex and State of Massachusetts, have invent-
ed certain new and useful Improvements in
Centrifugal Switches; and I do hereby de-
clare the following to be a full, clear, and
exact description of the invention, such as
will enable others skilled in the art to which
it appertains to make and use the same.

The invention relates to centrifugal
switches.

While this switch is especially intended
for use in connection with single-phase in-
duction motors of the type designed to be
started with auxiliary windings in parallel
with a working coil, or winding which aux-
iliary windings are cut out when a predeter-
mined speed is attained, it is not limited to
such use, as it may be used for other pur-
poses either to open or close a circuit when
the rotary element to which it is attached at-
tains or exceeds a predetermined speed.

Circuit interrupters, to be durable and re-
liable in operation, must act quickly so as to
prevent injurious sparking, for the slow
breaking of a circuit, and especially a cir-
cuit like that above mentioned, results in a
rapid deterioration of the switch contacts.

The primary object of the invention is
therefore to produce a centrifugal switch
with movable contacts, the incipient move-
ments of which, when a predetermined speed
is attained, precipitate a rapid completion
of the opening movements. It is also de-
sirable that the switch should not close again
until the rate of speed has been materially
reduced, so that minor changes of speed, due
to variations in load or other causes, will
not produce a closing movement of the
switch.

To this end the present invention contem-
plates the use of a contact member occupy-
ing closed or open position when at rest
and at low speeds, and a weighted pivoted
member arranged to actuate the former by
its movement under the influence of cen-
trifugal force when the predetermined speed
is attained. The weighted member is so lo-
cated with respect to the contact member,
and coöperates with it in such a manner that
its incipient movement under the action of
the centrifugal force, precipitates rapid

opening (or closing) movement of the con-
tact member.

In the accompanying drawing Figure 1 is
a plan view of the switch in closed position
showing diagrammatically the circuit con-
nections for a single-phase motor; Fig. 2 is
a plan view of the switch in open position;
and Fig. 3 is a central vertical section
through the switch.

As shown in the drawings, the switch com-
prises a plate or disk 1 which may be made
of brass or any other suitable conducting
material which is readily cut and bent into
shape by means of punches and dies. The
plate 1 is mounted upon a hub 2 but insu-
lated therefrom by means of insulating
washers 4 which are held between a shoul-
der formed on the hub 2 and a nut 6 screw-
threaded upon the hub and retained in po-
sition by a set-screw 8. The hub 2 is adapt-
ed to be mounted upon a shaft 10 which is
the main shaft of the motor. Pivoted to
the plate 1 are two opposed contact- or
brush-carrying levers 12 and 14 provided
with offset portions 15 and 16 respectively
upon which contact blocks or brushes 18
and 19 respectively are pivotally mounted.
Pivotally mounted upon the disk 1 are cen-
trifugal brush-carrier actuating arms 20
and 22 which are provided at their outer
ends with a series of washers 24 held in
place by screws 25, and adapted to be thrown
outwardly by centrifugal force when the
motor reaches a predetermined speed. By
varying the number of washers the critical
speed may be varied. The arms 20 and 22
are provided with inwardly extended horns
28 which are adapted to engage the opposing
portions 30 of the brush-carrying levers 12
and 14. Coiled springs 32 and 34 are con-
nected to the levers 12 and 14 and the cor-
responding arms 20 and 22. These springs
are attached to the levers and arms at points
between their pivots and their ends which
move outwardly. The movement of the le-
vers 12 and 14 is limited by stops 36 and 38
which project upwardly from the plate 1
into the path of travel of said levers.

A pair of contact segments 40 and 41 are
insulated from each other and mounted upon
a stationary portion of the motor frame.
These segments are adapted to be engaged
by the brushes 18 and 19 which are pivoted
to the brush levers so that they may prop-

erly contact with said segments during their revolution about the same. The brush-carrier actuating arms 20 and 22 while structurally independent of the brush-carrier levers, being separate devices, are operatively articulated therewith, so that while the carriers may (if desired) be balanced in their low-speed positions they are adapted to be actuated, not by their own centrifugal force, but by the movements of their respective actuating arms.

The motor circuit includes a working coil 44 which is connected directly across the line wires 45 and 46, and also contains a starting coil 48 which is connected at one end to the wire 45 and at its other end to the segment 40. The segment 41 is connected to the line wire 46. During the starting of the motor the switch is in the position shown in Fig. 1 in which the starting coil 48 operates in parallel with the working coil 44. During the rotation of the motor the brushes 18 and 19 are maintained in contact with the segments 40 and 41 by the springs 32 and 34. When the motor attains a predetermined speed, the weighted ends of the arms 20 and 22 fly outwardly, and the horns 28 deliver a blow to the opposing portions of the bell crank levers 12 and 14, so that the incipient movement of the weighted arms acts to forcibly precipitate rapid movement of the contact brushes from the segments 40 and 41 to quickly break the circuit through the starting coil, that is to say, the arms 20 and 22 being in unstable equilibrium as the motor speed approaches a certain critical maximum, the unbalanced centrifugal force, upon the attainment of such maximum, will move the arms 20 and 22 suddenly outwardly so as to cause said arms to deliver blows to the bell crank levers 12 and 14. As the weighted arms move outwardly, the leverage of the springs upon the arms and bell crank levers is reduced, as will be seen by reference to Fig. 2. Thus a considerable force will be required to draw the weighted arms and the contact brushes inwardly against the segments 40 and 41. This allows a considerable fluctuation in speed in the motor without causing the contact brushes to be brought into contact with the segments until a certain predetermined lesser or minimum speed of rotation is reached.

It is to be observed that the various parts of the switch may be formed of sheet metal, which is readily cut and punched into shape, thus affording a construction which is durable, yet readily and cheaply manufactured. Having thus described the invention, what is claimed is:—

1. A centrifugal switch having, in combination, a rotary support, a movable contact member mounted upon said support, independent centrifugal actuating means

mounted on the support for moving the contact member, and a spring connected to said centrifugal means and acting in opposition to the centrifugal force imparted to said centrifugal means by the rotation of the support, said spring being arranged to be overcome by the centrifugal force and allow said centrifugal means to move suddenly when a certain predetermined maximum speed of rotation is reached, and said spring also being arranged to overcome the centrifugal force and suddenly move said centrifugal means when a certain predetermined minimum speed of rotation is reached, substantially as described.

2. A centrifugal switch having, in combination, a rotary support, a contact member mounted upon the support, and independent centrifugal actuating means for moving the contact member comprising a weighted member and a spring so arranged that the weighted member is held stationary by the spring until a predetermined critical speed of rotation is attained and is then released to move suddenly and strike a hammer blow upon the contact member, substantially as described.

3. A centrifugal switch, having, in combination, a rotary support, a contact member mounted upon said support, an independent centrifugal arm for actuating the contact member and a spring acting first increasingly and later decreasingly to resist the actuating movement of the arm during the approximation of starting speed to the operating speed, substantially as described.

4. A centrifugal switch, having, in combination, a rotary support, a pair of contact members mounted upon said support, and weighted arms pivotally mounted upon said support, and articulated with said contact members to actuate them when the rotary member attains a predetermined speed, substantially as described.

5. A centrifugal switch, having, in combination, a rotary support, a pair of contact-carrying levers mounted upon said support, brushes on said levers, a pair of weighted arms pivotally mounted upon said support, and springs connecting the levers and the arms acting to exert pulls on the levers in the direction to oppose centrifugal force, substantially as described.

6. A centrifugal switch, having, in combination, a rotary support, a pair of contact-carrying levers mounted upon said support, brushes pivoted to said levers, a pair of weighted arms pivotally mounted upon said support, springs connecting the levers and the arms acting to exert pulls on the levers in the direction to maintain the contact members in closed position, and means for limiting the outward movement of said arms, substantially as described.

7. A centrifugal switch, having, in combination, a plurality of contacts, a rotary support, a pair of opposed brush carriers mounted thereon, brushes mounted on said carriers, and cooperating with said contacts, a pair of centrifugal brush carrier actuating arms, and springs and weights operatively related to the arms to determine the critical speed at which the brushes are to be separated from the contacts, substantially as described.

8. A centrifugal switch having, in combination, a rotary support, a contact member mounted upon said support, and independent centrifugal actuating means for moving the contact member arranged to be held in unstable equilibrium as a predetermined speed of rotation is approached and then upon the attainment of said predetermined speed of rotation to suddenly move under the action of centrifugal force and deliver a blow upon the contact member, substantially as described.

9. A centrifugal switch, having, in combination, a rotary support, a contact member mounted upon said support, independent centrifugal actuating means for moving said contact member in one direction when a predetermined speed is reached and means for moving the contact member in the other direction when a lesser predetermined speed is reached, substantially as described.

10. A centrifugal switch having, in combination, a rotary support, a movable contact member mounted upon said support, independent means operated by centrifugal force for moving the contact member, said means being arranged to be held stationary

until a certain predetermined speed of rotation is reached and then to be moved suddenly by an unbalanced centrifugal force to deliver a blow upon the contact member, substantially as described.

11. A centrifugal switch having, in combination, a rotary support, a movable contact member mounted upon said support, and a weighted arm pivotally mounted upon said support and articulated with said contact member to actuate it when the support attains a predetermined speed of rotation, substantially as described.

12. A centrifugal switch having, in combination, a rotary support, a contact carrying lever mounted upon said support, a weighted arm pivotally mounted upon said support, and a spring connecting the lever and arm acting to exert a pull in the direction to oppose the centrifugal force imparted to the weighted arm by the rotation of the support, substantially as described.

13. A centrifugal switch having, in combination, a rotary support, a contact carrying lever mounted upon said support, a weighted arm pivotally mounted on said support, a spring connecting the lever and arm and acting to exert a pull on the lever in the direction to maintain the contact member in closed position, and means for limiting the outward movement of said arm.

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

CLARENCE B. HANRIGHT.

Witnesses:

HERBERT A. BALCOME,
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