

No. 647,254.

Patented Apr. 10, 1900.

E. CROS.
CENTRIFUGAL ELECTRIC SWITCH.

(Application filed Dec. 6, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

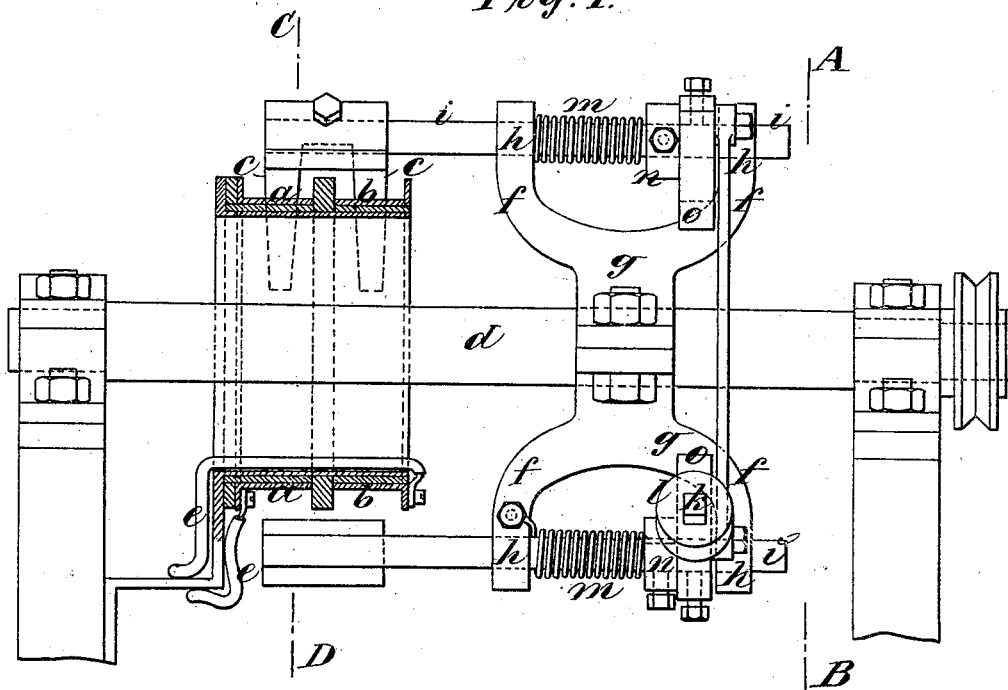
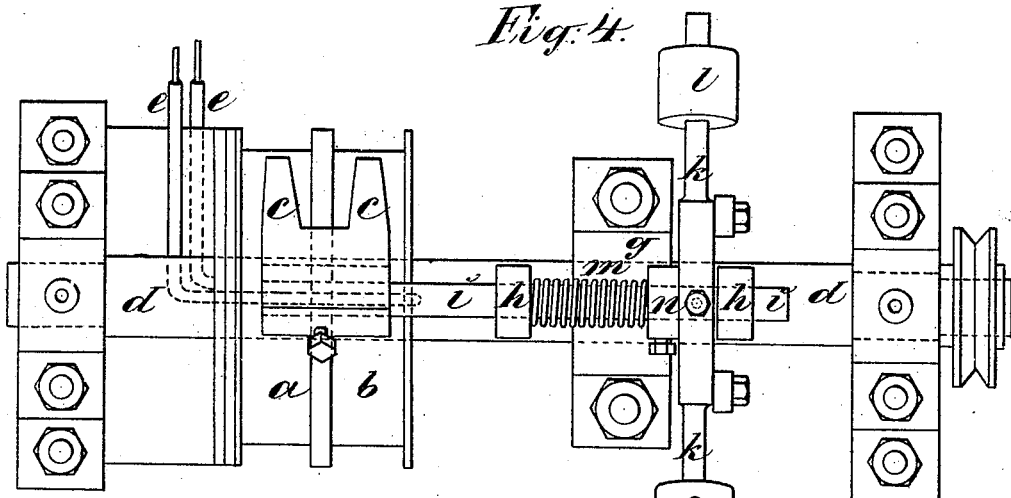


Fig. 4.



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CENTRIFUGAL ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 647,254, dated April 10, 1900.

Application filed December 6, 1899. Serial No. 739,354. (No model.)

To all whom it may concern:

Be it known that I, EDOUARD CROS, a citizen of the Republic of France, residing at Paris, France, have invented a new and useful centrifugal electric switch applicable in all cases where a variation of velocity permits of the regulation of motive force by electricity, of which the following is a specification.

10 This invention relates a centrifugal electric switch for enabling an electric circuit to be made or broken according to the speed of the shaft carrying the same, the said shaft being in connection with an apparatus or machine
15 the variations in the speed of which are to control the making and breaking of the circuit.

• This switch can be arranged either to close the circuit by a diminution of speed and to
20 break it in the contrary case, or it can be arranged to make the circuit as soon as its shaft attains and passes a predetermined speed. In the latter case the circuit breaks of itself when the speed is sufficiently reduced.

25 The apparatus consists, essentially, of a kind of governor operating by centrifugal force, and the weights of which are each mounted upon a pivoted arm fixed to a rotary shaft and also carrying a metal fork which
30 can apply each of its arms to a fixed ring, the two rings being in connection, respectively, with the two conductors to be joined.

35 The position of the forks with respect to the counterweights of the apparatus is determined by the condition that the rubbing contacts should be applied to the rings at the moment when the speed diminishes or when the said speed increases. It is independent of the direction of rotation.

40 This type of switch may be applied, for example, to the external lighting of a train when stopping or when running at a reduced speed, in which case it closes the circuit the moment the speed diminishes. It can also
45 serve for feeding the accumulators of a battery coupled to or in connection with the motor or the dynamo. The circuit does not close until the speed has become sufficiently high. It is then a true make and break.

50 The accompanying drawings represent a

switch device of the kind above described in several views. The said switch is arranged to close the circuit when its shaft slows down or stops.

In the said drawings, Figure 1 is a longitudinal sectional elevation of the apparatus; Fig. 2, a section on the line A B, Fig. 1. Fig. 3 is a section on the line C D, and Fig. 4 is a plan.

My apparatus consists of two parts—that 60 is to say, the electric part and the centrifugal mechanical part.

The electric portion of the apparatus is fixed to a frame, suitably arranged, supporting the shaft to which is to be fixed or connected the mechanical part of the device
65 adapted to be operated by centrifugal force. It is composed of two metal rings *a b*, the said rings being equal and parallel, of the same diameter, electrically insulated from
70 one another, and which when they are mechanically connected by an arrangement of two contact fingers or brushes *c c* close the accumulator-circuit. These rings *a b* are arranged concentrically around the shaft *d*,
75 and their periphery is at a distance from the periphery of this shaft sufficient to avoid any contact between the rings and the shaft which might be brought about by oscillation or by the play of the suspension-springs in
80 the case of the application of the apparatus to a carriage. Each of the rings *a b* is electrically connected with one of the insulated wires *e e*, connected to the circuit which provides the current between the accumulators
85 and a lamp—for example, through the medium of the rings *a b* and of the fingers or brushes *c c*.

The centrifugal mechanical part of the apparatus consists of a centrifugal device of
90 special construction, the object of which is to avoid any friction between the various parts during rotation, such friction always being present in ordinary apparatus operating by centrifugal force. This mechanical portion
95 comprises, essentially, the two pivoted arms *f f*, symmetrically mounted with respect to the rotating shaft *d* upon a frame *g*, fixed to the said shaft. The frame *g* carries two bearings
100 *h*, cast in one with it, the said bearings

being arranged to support spindles *i i*, to which are fixed the levers *k k*, carrying the weights *l l*.

Two antagonistic springs *m m*, which are 5 connected, on the one hand, to one of the arms *f* and, on the other hand, to the ring *n*, fixed to the spindle *i*, are arranged in such a manner that they oppose the centrifugal force which tends during rotation to separate the 10 levers *k k*. Upon the spindles *i* of the levers *k k* are fixed the double metal fingers *c c*, forming a kind of fork. They are fixed in such a manner that when at rest they touch under the action of the springs *m m* the two 15 electric rings *a b*, and thereby establish communication between the said rings, and consequently close the circuit.

The construction of the apparatus being thus set forth, the operation thereof will be 20 easily understood. When the movement of rotation is imparted to the shaft *d* upon which the device is mounted, the masses of the weights *l l*, by reason of the centrifugal force, tend to separate from the rotating shaft; but 25 the said weights being solid with the levers *k k* turn the said levers and their spindles *i* in the bearings *h h*, and as the fingers *c* are fixed to these spindles *i* they participate in the movement of rotation and separate from 30 the two rings which they connect electrically. The springs *m* can be regulated by turning them in the required direction or by varying the distance of the weights *l l* from the axis of the spindle *i* or the value of the weights 35 such that the centrifugal force only overpowers the antagonistic force of the springs at a predetermined speed of rotation. Suitably-arranged stops *o* limit the extent to which the weights can be swung out under 40 the action of centrifugal force by bearing upon the arms of the frame *g*. It will be seen that while the apparatus is in movement all the parts are absolutely at rest relatively with one another, which gives rise to the following results: absence of friction between the parts, 45 no wear, no necessity for lubrication nor for repair, and no necessity for overlooking the parts for which the mere manufacture will be practically sufficient. Furthermore, the whole 50 of the apparatus can be inclosed in a jacket through which only the ends of the shaft *d* extend, so that the mechanism can be protected from dust and weather.

The arms of the levers, the weights, their 55 position, and the strength of the antagonistic springs are all calculated on the basis that the said antagonistic springs shall overcome the centrifugal force as soon as the latter is rendered weak by reason of the considerable 60 diminution in the velocity of rotation of the apparatus, the result being that the contact of the double fingers with the rings is always effected a short time before the rotating shaft completely stops. From this there result two 65 important advantages—first, the cleaning or scouring of the rings before the stoppage of

the rotating shaft by the friction of the double fingers or brushes, and, second, the apparatus becomes practically a tachometer, provided 70 that when arranging the weights upon the length of the arms of the lever the device can be regulated so that the antagonistic springs do not overcome the centrifugal force until the speed is below a limit which can be fixed 75 very approximately.

By inverting the position of the keys or fingers, as has been hereinbefore explained, the apparatus can be specially adapted for 80 charging a battery of accumulators in such a way that it interrupts the charging-current when the tension drops below a predetermined value—that is to say, when the speed 85 of the dynamo has fallen below the corresponding speed. The two fingers therefore only come into contact with the two rings 85 when a predetermined speed has been attained and the centrifugal force is of the requisite strength.

The apparatus hereinbefore described is capable of many applications—as, for exam- 90 ple, first, the automatic and intermittent external lighting of railway-carriages during the stoppage of the trains at stations and on the line at night-time; second, the governing of the speed of automobile vehicles by the break- 95 ing of the ignition-current when the speed of the motor increases, and, third, the charging of accumulators by a dynamo by inverting the keys, thereby replacing the very delicate apparatus now in use for this purpose. 100

The weighted levers *k* may be coupled together to insure joint and simultaneous action, as clearly shown in Fig. 2.

Having now particularly described and ascertained the nature of my said invention and 105 in what manner the same is to be performed, I declare that what I claim is—

1. In a centrifugal electric switch, the combination with two stationary, metallic contact-rings, in the circuit but insulated from 110 each other, a rotatable shaft extending through said rings, and a frame fixed on said shaft and having a radial bearing arm or part, of a rocking spindle mounted in said arm of the frame, a weighted lever fixed to said 115 spindle, a spring which antagonizes the centrifugal force acting on said weighted lever, and contact fingers or brushes carried by said rocking spindle and adapted to be put into and out of contact with the said stationary 120 rings by the rocking of said spindle through the influence of centrifugal force and the said antagonizing spring.

2. In a centrifugal electric switch, the combination with two stationary, metallic contact-rings, in the circuit but insulated from 125 each other, a rotatable shaft extending through said rings, and a frame fixed on said shaft and provided with two oppositely-situated, radial bearing arms or parts, of rocking 130 spindles mounted respectively in said bearing-arms and extending substantially parallel

with the main shaft, a weighted lever fixed
on each of said rocking spindles, the antago-
nizing springs which oppose the effect of cen-
trifugal force on the weighted levers, and the
5 contact fingers or brushes carried by the re-
spective rocking spindles and adapted to
make and break the circuit when shifted by
the rocking of their spindles.

In witness whereof I have hereunto signed
my name, this 21st day of November, 1899, in ro
the presence of two subscribing witnesses.

EDOUARD CROS.

Witnesses:

EDWARD P. MACLEAN,
ALEXANDER MATHIEU.