

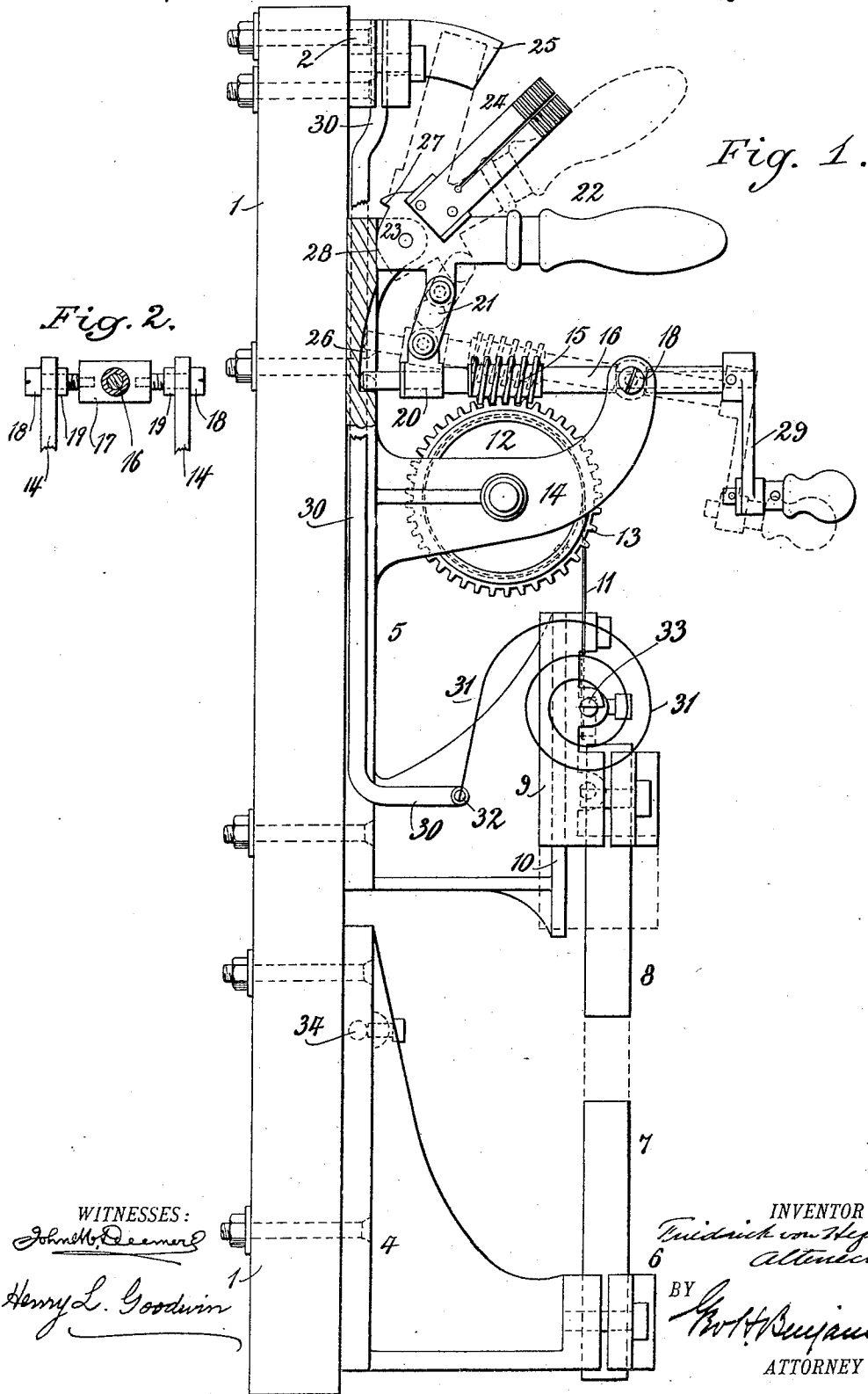
(No Model.)

2 Sheets—Sheet 1.

F. VON HEFNER-ALTENECK.
CARBON SWITCH.

No. 520,263.

Patented May 22, 1894.



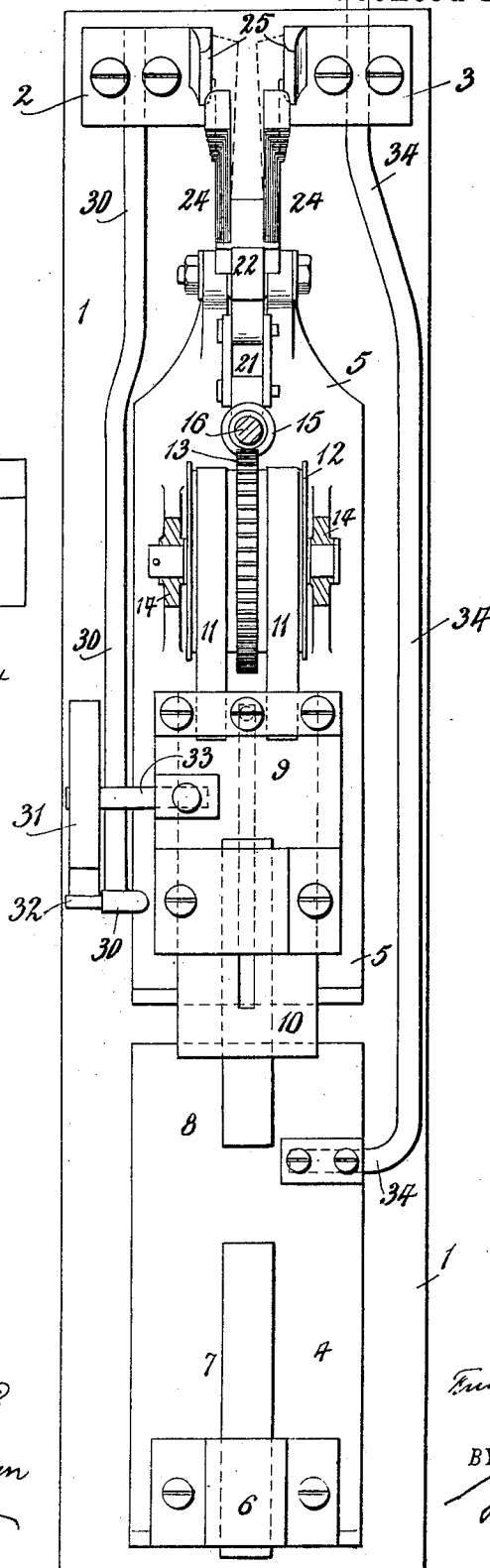
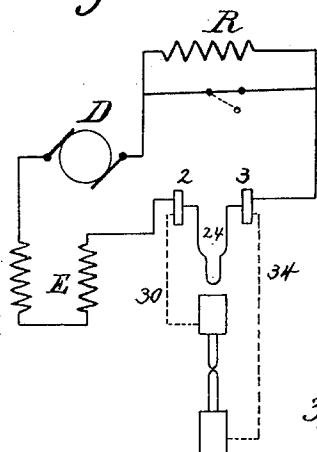
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Fig. 3.

Fig. 4.



WITNESSES:
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UNITED STATES PATENT OFFICE.

FRIEDRICH VON HEFNER-ALTENECK, OF BERLIN, GERMANY, ASSIGNOR TO
SIEMENS & HALSKE, OF SAME PLACE.

CARBON SWITCH.

SPECIFICATION forming part of Letters Patent No. 520,263, dated May 22, 1894.

Application filed November 15, 1893. Serial No. 490,990. (No model.)

To all whom it may concern:

Be it known that I, FRIEDRICH VON HEFNER-ALTENECK, a subject of the King of Bavaria, residing at Berlin, in the Kingdom of Prussia, German Empire, have invented new and useful Improvements in Carbon Switches, of which the following is a specification.

This invention relates to carbon switch devices adapted for use at central stations or with isolated electric plants, for cutting resistance into and out of the main line circuit, and has for its object to prevent too sudden and injurious variations of load upon electric generators supplying the current.

The invention consists in a carbon switch device so constructed that when resistance is cut into circuit by it, the mechanism will automatically adjust itself in readiness for convenient and positive operation for regulating the resistance by separating the switch carbons or fusible contacts more or less to control the length of the electric arc formed between them.

The invention will first be described and then will be particularly defined in claims hereinafter set forth.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar reference numerals and letters indicate corresponding parts in all the views.

Figure 1, is a side elevation, partly broken away and in section, of the improved carbon switch. Fig. 2, is a detail front sectional view of the worm shaft pivotal bearings, and Fig. 3, is a front sectional view of the carbon switch device. Fig. 4, is a diagram showing connections in a system.

To any suitable bedplate 1, made of wood or other insulating material, are fastened two metal line wire binding posts or contacts 2, 3; a lower metal frame 4, and an intermediate metal frame 5. The frame 4, has a suitable clamp 6, in which is fixedly but adjustably held the lower switch carbon or fusible contact 7, opposed to an upper carbon or fusible contact 8, which is clamped to a traveler 9, fitted to slide upon ways or guides 10, provided on the intermediate frame 5. To this traveler 9, are attached one end of metal

bands 11, the other ends of which are fixed to a drum 12, which has a peripheral gear 13, and is journaled in brackets 14, on the fixed frame 5. A worm 15, fixed to a shaft 16, is adapted to engage the drum gear 13, and to be disengaged therefrom by bodily swinging of said shaft on its pivotal connection with the extremities of the brackets 14.

The pivotal connection of the shaft 16, is best shown in Fig. 2 of the drawings, wherein the shaft is journaled in a box or bearing 17, which may rock on trunnions formed at inner ends of opposing screws 18, which are fitted in the brackets 14, and have jam nuts 19, locking them to the brackets when properly adjusted. With this construction the shaft 16, may be rotated in the box 17, and in its inner bearing 20, which is coupled by a link 21, to a hand lever 22, which is fulcrumed at 23, to lugs on the frame 5, and carries the brush contacts 24, 24, which are adapted to contact faces or lugs 25, 25, on the binding posts 2, 3, of the device. The inner end of the shaft 16, is preferably entered into a slot 26, of the base of the frame 5, to give greater lateral steadiness to the shaft than the link connection 21, with the switch lever alone would afford. The lever has two stop shoulders 27, 28, which by contact with the frame limit the upward and downward movements respectively of the lever and consequently of the worm shaft 15, 16. The shaft has a hand crank 29, for turning it. One terminal 30, of the line wire connected to the contact post 2, is also connected to the traveler 9, and it may be in any manner allowing movement of the traveler on the guides 10, as for instance by a looped or coiled arrangement of the wire, but it is preferable to interpose a coiled band or strip 31, of copper or other conductive metal connected at opposite ends to the wire and traveler and preferably by means of split pins 32, 33, as shown in the drawings. This interposed coiled conductor 31, not only accommodates itself to the movements of the traveler, but it makes a durable non-kinking electrical connection of the wire 30, and the traveler without lateral overhang of the wire or other parts beyond the bedplate 1, or danger of their entanglement with adjacent mech-

anism of an electrical plant. The other line wire terminal 34, is held at the binding post 3, and is connected to the frame 4, of the device.

5 The operation of my device is as follows: It being desirable to "kill" the dynamo quickly without, however stopping the steam-engine or other driving power, the full resistance of the rheostat R is first cut into the circuit, in order that the electromotive force may
10 be reduced as much as possible. The lever 22 being at this time in such a position as to close the circuit between the points 2 and 3, the worm-wheel 15 jointed thereto by means
15 of a toggle joint 21 is removed from engagement with the cog-wheel 13, and the carbons 7 and 8 are in engagement. The cutting in or out of said resistance R is accomplished by breaking or making the main circuit between
20 the dynamo D and contact point 3 around R by means of an ordinary switch. Any other well known mechanism may be employed however to accomplish the same result. Referring to Fig. 4, the circuit at this time is as
25 follows: from dynamo D through shunt winding E, contact 2, switch tongue 24, to point 3, rheostat R to dynamo. The carbons 7 and 8 being in apposition, there is a certain, though
30 small, amount of current shunted there-through through the medium of the conductors 30 and 34. The rheostat having been brought into circuit, as above mentioned, the lever 22 is operated to raise its switch tongue
35 24, and thus to shunt the entire current through the carbons 7 and 8, the worm-wheel 15 being brought into mesh with the cog-wheel 13 simultaneously therewith. Crank 29 is then revolved to turn its shaft 16, and
40 worm 15 to operate wheel 13 in such a direction as to wind the band 11 thereabout, and thus to separate the carbons 7 and 8. By such separation an arc is formed between the carbons, the length of which may be varied,
45 as will be seen, and thus the current may be gradually and completely cut from the shunt winding. By this means the current may be cut down to the point of neutralization without endangering the insulation of the machine
50 by self-induction discharge as the gradually increasing resistance introduced by lengthening the arc between the carbons makes any charge, which might tend to form, harmless. By reference to the drawings it will be seen
55 also that the circuit cannot be closed through the switch without at the same time closing the shunt circuit through the fusible carbon contacts, and that the circuit cannot be opened thereafter without first breaking the circuit at the metallic contacts by means of the switch
60 and afterward striking the arc between the carbons.

Conversely, in order to "revive" the dynamo it is only necessary that the lever 22 be operated in a direction opposite to that last
65 described, to complete the circuit between points 2 and 3, at which time the worm 15 will be drawn from engagement with the cog-

wheel 13, and the carbon 8 will be allowed to descend, due to gravity, and will assume a position ready to be operated in the manner
70 just described.

Having thus described my invention, I claim—

1. A switch comprising metallic contacts for closing an electric circuit; fusible contacts also for closing said circuit, a controlling device for said metallic contacts; a controlling means for gradually forming and springing an arc between said fusible contacts; and means controlled by the metallic
75 contact controlling device for disengaging the controlling means from the fusible contacts and bringing said contacts into apposition upon the making of the circuit through the metallic contacts.
80

2. A switch comprising metallic contacts for closing an electric circuit; fusible contacts also for closing said circuit, a controlling device for said metallic contacts; a controlling means for gradually forming and springing an arc between said fusible contacts; and means controlled by the metallic
90 contact controlling device for disengaging the controlling means from the fusible contacts and bringing said contacts into apposition upon the making of the circuit through the metallic contacts, and for restoring the connection between the controlling means and the fusible contacts upon the breaking of the circuit at the metallic contacts.
95

3. A carbon switch, comprising opposing approachable carbons, a lever having contacts adapted to line wire contacts, one terminal of the line wire being in electric connection with each carbon, and worm wheel and drum and band gearing for relatively adjusting the carbons interposed between the movable carbon and the switch lever, substantially as described.
100

4. A carbon switch, comprising opposing carbons, one fixed and the other held to a traveler, a lever having contacts adapted to line wire contacts, one terminal of the line wire being connected to the fixed carbon and its other terminal being connected through
105 the traveler with the movable carbon, and worm wheel and drum and band gearing for relatively adjusting the carbons interposed between the traveler and the switch lever, substantially as described.
110

5. A carbon switch, comprising opposing carbons, one fixed and the other held to a traveler, a lever carrying contacts adapted to line wire contacts, one terminal of the line wire being connected to the fixed carbon, and
115 its other terminal being connected to the movable carbon through the traveler and by an interposed conductive coil accommodating movement of the traveler; and gearing for relatively adjusting the carbons interposed
120 between the traveler and switch lever, substantially as described.
125

6. The combination, in a carbon switch, of a fixed carbon 7, an adjustable carbon 8, in a

traveler 9, a drum 12, having a worm wheel 13, bands 11, connecting the traveler and drum, a pivotally journaled worm shaft 15, 16, adapted to engage the wheel 13, and to be disengaged therefrom, a switch lever having contacts 24, and coupled to the worm shaft, stationary contacts 25, to which those 24, are adapted, and a line wire in electric connection with the contacts 25, and having terminals connected one with each carbon, substantially as described.

7. The combination, in a carbon switch, of a fixed carbon 7, an adjustable carbon 8, in a traveler 9, a drum 12, having a worm wheel 13; bands 11, connecting the traveler and drum, a pivotally journaled worm shaft 15, 16, adapted to engage the wheel 13, and to be disengaged therefrom, a switch lever having contacts 24, and coupled to the worm shaft, stationary contacts 25, to which those 24, are adapted, and a line wire in electric connection with the contacts 25, and having terminals one connected with the fixed carbon 7, and the other connected by a conductive coil

31, with the traveler 9, and carbon 8, substantially as described.

8. The combination, in a carbon switch and with the drum worm wheel 12, 13, and worm shaft 15, 16, pivotally journaled at 17, 18, of an inner journal bearing 20, for said shaft, a switch lever 22, carrying contacts adapted to contacts connected with the line wire, and a link 21, between the parts 20, 22, substantially as described.

9. The combination, in a carbon switch and with the drum worm wheel 12, 13, and worm shaft 15, 16, pivotally journaled at 17, 18, of an inner journal bearing 20, and a lateral slot guide bearing 26, for said shaft, a switch lever 22, carrying contacts adapted to line wire contacts, and a link 21, between the parts 20, 22, substantially as described.

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

FRIEDRICH VON HEFNER-ALTENECK.

Witnesses:

JOHN B. JACKSON,
MAX WAGNER.