No. 646,688. Patented Apr. 3, 1900.

W. D. GHARKY.

DEVICE FOR SHIFTING ELECTRIC CURRENT FROM ONE CONDUCTOR TO ANOTHER.

(No Model.) (Application filed July 2, 1895.)

Fig. 1.

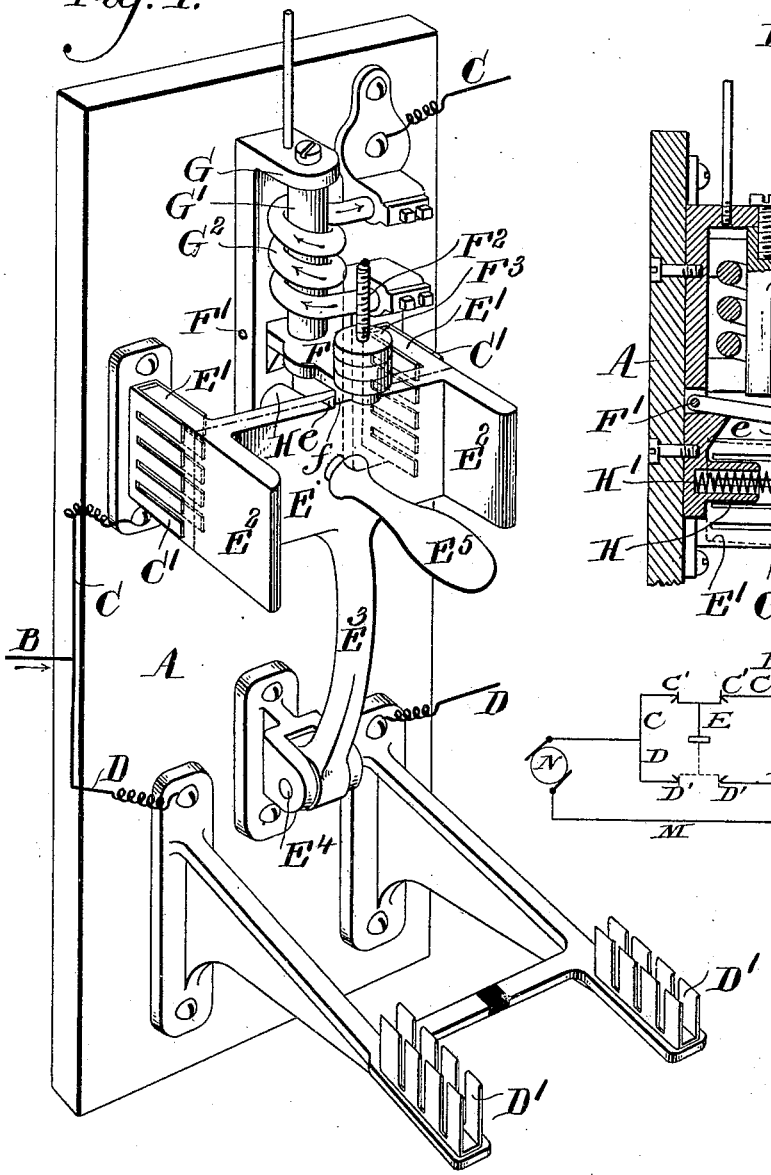



Fig. 2.

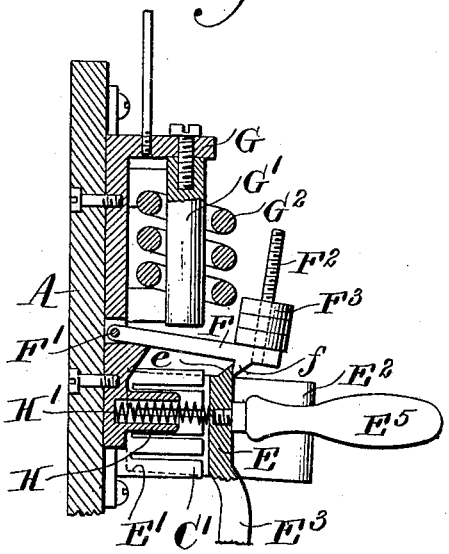
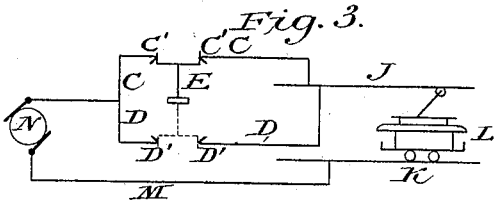



Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## DEVICE FOR SHIFTING ELECTRIC CURRENT FROM ONE CONDUCTOR TO ANOTHER.

SPECIFICATION forming part of Letters Patent No. 646,688, dated April 3, 1900.

Application filed July 2, 1895. Serial No. 554,713. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM D. GHARKY, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a certain new and useful Improved Device for Shifting Electric Current from One Conductor to Another, of which the following specification is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to devices used in railway and other systems where a constant supply of electrical energy is required to put out of service a circuit whose resistance from any cause is suddenly and dangerously lowered. The results of a short circuit or a ground resulting in a short circuit on a circuit carrying heavy currents are too well known to need enlarging upon, and as such short-circuiting or grounding is always to be apprehended, especially in systems whose central stations supply energy for the many and varied uses to which electricity is coming more and more to be applied, various devices have been proposed and many used successfully to cut off such circuits, and thereby prevent damage. Fuses of divers kinds, for instance, are commonly used. Electromagnetic cut-outs are now also common and successful. If a ground or a short circuit occurs on the feeder of a lighting or railway circuit, the resistance being lowered, the current correspondingly increases and the fuse blows or the cut-out acts. In such a case, however, the line is out of service, and unless means are provided to supply the consumption-circuits with energy through another channel the cars must stand still or the lamps must remain dark or other translating devices in the circuit remain inoperative until the trouble is located and current can again be safely transmitted.

The inconvenience and the loss sustained by reason of the shutting off of current from consumption-circuits for any appreciable length of time are such that it has been common in Edison lighting-stations, where frequently light-motors are also carried on the same wires, to increase the current enormously on a short circuit occurring, using all the machines in the station, if necessary, and so to literally burn off the short circuit. It can readily be imagined that while one sort of loss is avoided by this method the risk is incurred of causing others, not to mention the almost inevitable destruction of line conductors, cable, &c. It is therefore a step forward of some importance to be able to save such losses altogether by unfailing automatic means which not only prevent any damage being done to machines, switchboards, or lines, but also prevent even an instant's interruption in the transmission of energy to the consumption-circuits, and such means constitute my invention.

In order that the device employed may be successful and commercially practicable, it must be simple, infallible in operation, and involve no substantial change in existing circuits or mechanism. To attain these desiderata, I employ the ordinary feeder-circuits; but for each feeder or for each convenient group of feeders I add an auxiliary feeder-circuit. Of course it will be understood that when I say "feeder" I do not limit myself to any actual part of a system, but select the term employed merely for convenience of description. The consumption-circuits might well be protected in a similar way direct. The auxiliary feeder is normally disconnected and the source of energy is normally connected to the ordinary wires. A suitable switch is interposed in the normally-complete circuit or circuits, however, which tends of itself to open such circuits and close the generator to the auxiliary circuit, being restrained from such operation by a detent under the control of a magnet in the main or normal circuit. Thus it is apparent that if from any cause current should rise in the normal circuits beyond a safe predetermined limit the magnet would trip the detent and the faulty circuit would not only be cut off, thus preventing further trouble, but the current being instantaneously transferred to another (auxiliary) circuit paralleling the normal as far as its operativeness is concerned no interruption can be experienced in the consumption-circuit or in the translating devices connected therewith.

It frequently happens that a short circuit is but temporary, and in such case it is only necessary for the attendant to replace the

switch to normal to determine the fact, for if the trouble is a continuing one the device will promptly operate a second time, but if not it will not. The actuation of the switch calls the attention of the attendants to the trouble without any other annunciator.

My invention is fully illustrated in the accompanying drawings, wherein the same letters of reference point out the same parts throughout, and wherein—

Figure 1 is a perspective view of a switching device constructed in accordance with my invention. Fig. 2 is a central vertical section through a portion of the apparatus, and Fig. 3 is a diagram of circuits.

Referring to Fig. 1, A is a base, of insulating material, upon which the operative parts of the apparatus are mounted. C′ C′ and D′ D′ are switch-sockets fixed to the base, the latter being supported upon arms at a distance from the base and the former directly thereon. The arms supporting the parts D′ D′ are shown as stiffened by a cross-bar containing a section of insulating material. E is a heavy metal cross-bar carrying the blades E′ E′ and $E^2$ $E^2$ and provided with a handle $E^5$ for its manipulation. It is carried upon the end of a lever-arm $E^3$, pivoted at $E^4$, the arrangement of the sockets C′ C′ and D′ D′ being such that as the lever is swung on the pivot the blades E′ E′ will engage with the sockets C′ C′ in the upper position and the blades $E^2$ $E^2$ will engage with the sockets D′ D′ in the lower position. The lever and the cross-bar E are normally maintained in the upper position by means of a detent *f* on a swinging lever F, pivoted at F′ and carrying weights $F^3$, more or less of which may be screwed upon the pin $F^2$. The detent directly engages with a lip *e*, formed upon the upper edge of the bar E. The lever F is either of magnetic material or provided with an attached armature, and arranged within such a distance as to readily attract it when desired is a magnet-core G′, secured to a bracket G, fastened to the base A. This bracket G may be made adjustable, if desired, so that the attractive force normally exerted by the core on the armature and lever F may be fixed to a nicety; but this is not necessary when the weights $F^3$ are employed. The core G′ is surrounded by a few turns of a coarse conductor $G^2$, connected in the main feeder or other guarded circuit or in a parallel branch thereof and carrying the main supply-current. In the case of railway-feeders the conductor would be even heavier than shown, and as the amperage in its turns would be very considerable very few turns would suffice to produce the desired effect on the core. In order that the switch-lever $E^3$ may fall quickly from its upper to its lower position, a spring H′ is provided in a barrel H, which when the lever is latched, as shown, is compressed. Thus when the lever F is lifted the spring starts the blades promptly out of the sockets C′ and gives the initial impulse toward the sockets D′ D′.

Referring now to Fig. 3, the diagram represents a system in which a translating device is deriving current from a circuit fed from a dynamo, and in which my invention is utilized. Here N is the dynamo or generator, C is the main feeder, and D an auxiliary feeder. J is one side of the consumption-circuit, being represented as a trolley-wire, K, the track, being the other side thereof, and M the return to the generator. The coil $G^2$ of the safety device is supposed to be included in and form a part of the feeder C. Knowing the maximum amperage of the current that will be required to pass over the feeder C, the weights $F^3$ are adjusted so that for that maximum and for all less currents the core G′ will be insufficiently magnetized to draw up the lever F. If, however, a short circuit occurs on the feeders or on the consumption-circuit or a ground should be thrown on the circuits, the current strength would be augmented to such an extent that the magnet would be energized sufficiently to pull up armature-lever F, thereby freeing the lip *e* from the lip *f*, when the spring H′ would instantly throw out the cross-arm E and switch-blades E′ E′, thus breaking the circuit C, and the impetus thus given to the switch, added to its weight, would carry it down until the blades $E^2$ $E^2$ by bridging the sockets D′ D′, would complete the auxiliary circuit D.

In Fig. 1 the wire B leads from the generator N and is connected to both C′ and D′.

I am aware that numerous forms of electromagnetic cut-outs have been perfected, and that in the early days of the incandescent light it was common to make a second circuit when the main or normal supply or consumption circuit was broken; but I believe I am the first to accomplish this result of continuing the supply of current to consumption-circuits or translating devices substantially without any lapse, although the main feed-circuits may be and indeed are of necessity put temporarily out of service. It will be noted that I do not depend upon the breaking of one circuit to complete the other, nor upon completing a shunt, as no shunt exists when one circuit is broken, but I depend upon the simplest form of adjustment that responds to increase in current strength. Of course it will be understood that the auxiliary wire D will be properly fused or provided with magnetic cut-outs in the ordinary way, so that if in case of feeder systems the trouble is in the consumption-circuit the system will retain all the usual protection in addition to my device.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an electric-distribution system, a main supply-wire, an auxiliary supply-wire, switching mechanism adapted to maintain one of

said wires continuous and the other broken at any given time, a magnet controlling said switching mechanism, and means to prevent the effective energization of said magnet except upon the passage of an abnormal current, said magnet being included directly in the main supply-circuit or a shunt branch thereof, substantially as described.

2. In an electric-distribution system, a main supply-circuit normally closed, an auxiliary supply-circuit normally broken, a switching mechanism adapted to break the normally-closed circuit and close the normally-open circuit substantially simultaneously, a magnet included in said normally-closed circuit, and an armature for said magnet controlling the switching mechanism, said armature being so adjusted with relation to the magnet as to be attracted to release the switching mechanism only upon the passage of a current above the normal in the closed main circuit, substantially as described.

3. In an electric-distribution system, a main supply or feeder circuit normally closed, an auxiliary supply or feeder circuit normally open, a switching mechanism adapted to open the normally-closed circuit and close the normally-open circuit, a positively and constantly acting force tending to operate said switching mechanism, a detent normally restraining said force, and a magnet connected to the normally-closed main circuit and adjusted for effective energization upon the passage of a supranormal current, controlling said detent, substantially as described.

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