

1,282,853.

Fig. 1.

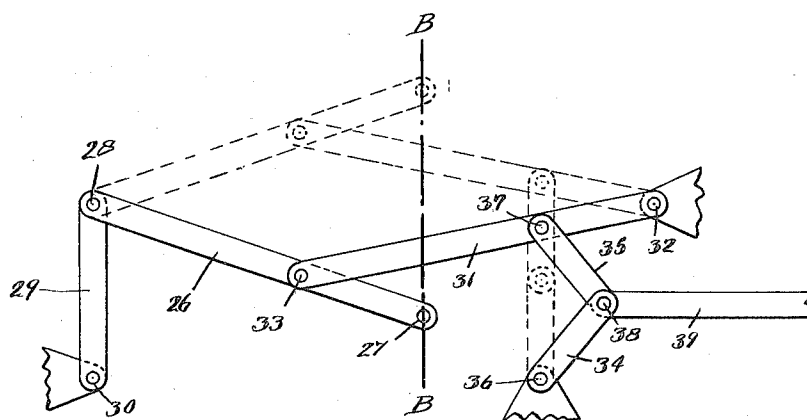


Fig. 2.

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UNITED STATES PATENT OFFICE.

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STRAIGHT-LINE MOTION.

1,282,853.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ARTHUR C. KELLE, a citizen of the United States, residing at Hyde Park, in the county of Norfolk and State of Massachusetts, have invented an Improvement in Straight-Line Motions, of which the following is a specification.

My invention relates to straight line motion mechanisms, and has more specific reference to such mechanisms as applied to electric switches.

In many types of electric switches, and particularly those employed for the interruption of circuits of high voltage, it is desirable that the movable switch members operate in a substantially straight line. Inasmuch as the switch operating mechanism employed for this purpose is usually mounted on the top of the switch casing or housing, and between the switch terminals, it is very compact, in order not to impose a large mass of metal between said terminals; that admits of the symmetrical arrangement of its various parts about the movable switch operating member, in order that said mechanism may be disposed on the top of the case without projecting over the side thereof, and that is so arranged that when the mechanism is operated to move the switch member into switch closed position, there will be no great mass of metal moved into the space between the switch terminals.

Because of the long operative range of motion required of these mechanisms, and furthermore because of the compact arrangement of the various parts of the mechanisms made necessary to fulfil the above enumerated requirements, such mechanisms usually require a comparatively large force to be exerted upon a switch operating member to cause the operation of said mechanism.

Such mechanisms are usually so constructed that the switch operating member or rod is directly connected to one of the links of the mechanism or to an extension thereof, in the form of a lever. Such a connection of the operating rod, however, does not reduce the power required to operate the mechanism.

It is well known that the toggle is the best combination of links that can be obtained for the purpose of producing a compara-

tively great force with a comparatively small pressure exerted upon one of the links thereof, and it is highly desirable to associate a toggle directly to one of the guide links of the mechanism, by means of which said mechanism may be operated with a minimum of exertion. The toggle has not been used, heretofore, for the actuation of straight line mechanisms as applied to switches because the peculiar design, construction, and limitation of said mechanisms has been such that it has been impractical to associate a toggle directly with a guide link of the mechanism and if the toggle is applied to any other link of the mechanism, its value, as a toggle, is lost.

Consequently, the object of my invention is to provide an operating mechanism for electric switches by which the movable switch members thereof may be moved in a substantially straight line; that will be compact; that will admit of a symmetrical disposition of its links about the switch operating member; that will have a minimum number of links, and that will be so designed that the parts thereof will be subjected to but small stress.

A further object of my invention is to associate a toggle with a guide link of said mechanisms, whereby the operation of the toggle causes the proper operation of the mechanism.

Figure 1 is a diagrammatic representation of a form of straight line motion mechanism and associated toggle.

Fig. 2 is a modified form of straight line motion mechanism and associated toggle.

Referring to Fig. 1, the straight line motion mechanism, as here shown, consists of a link 10 to the end 11 of which is or may be pivoted the movable switch operating lever, not shown. The end 11 of link 10 when operated through and guided by its associated links, is adapted to trace a substantially straight line A—A. Link 10 has a short link 13 pivoted to it at 12, and said link 13 is pivoted at 14 to a fixed support or part of the switch casing. Link 10 also has pivoted to it, at some point intermediate its length, a link 15, and said link is in turn pivoted to a link 16, which is movably connected to the pivot 14 secured in the switch casing. Links 10, 13, 15, and 16 are so connected as

to form a parallelogram, the opposite sides of which are always parallel in any positions of the mechanism compressing said links and said mechanism is adapted to pivot about the fixed point 14.

A guide link 17 is pivoted at one end 18 thereof to a fixed part of the switch casing and has its other end pivoted to some point, as 19, on link 15, and said guide link 17, in conjunction with said other links 10, 13, 15 and 16, forms mechanism by means of which the end 11 of lever 10 is guided to move in a substantially straight line upon the operation of said mechanisms.

As here shown, the mechanism is so disposed that the straight line traced by the end of link 10 lies practically in the center of the mechanism, or the mechanism is symmetrically disposed about said line. Any modification of this relative disposition of line and mechanism necessitates a corresponding change in the length of guide link and the point of connection therewith to the remaining links of the mechanism.

The toggle comprising links 20 and 21, has one of its links 20 pivoted at 22 to a fixed part of the switch casing and its other link 21 directly pivoted to some point 23 on the guide link 17. The switch operating rod 24 is pivoted to the pivotal connection 25 of the two links 20 and 21 of the toggle.

This disposition of toggle, directly connected to the guide link of the mechanism, results in the application of power to said mechanism to the greatest advantage in that the power is transmitted directly from the guide link to the link 10 to which the movable switch member is attached, and the disposition of links is such that a long range of motion may be obtained without the necessity for great lever ratios, and therefore, the stresses in the various parts of the mechanism are low.

The modification shown in Fig. 2 results in an even more simple arrangement of parts and disposition of the toggle members than in the mechanism above described.

The link 26, to one end 27 of which the switch operating member is or may be movably connected, is pivoted at its other end 28 to a link 29, which, in turn, is pivoted at 30 to a fixed part of the switch casing. The guide link 31 is pivoted, at one end 32, to a fixed part of the switch casing, and at its other end, to a suitable point 33 on link 26. The lengths of the various links and their pivotal connections are so chosen that the operation of the mechanism causes the end 27 of lever 26 to trace the substantially straight line B—B.

The toggle comprising links 34 and 35 is pivoted respectively at 36 to a fixed part of the casing, and at 37 to the guide link 31, and is connected, at the pivot 38 to the switch operating rod 39.

The arrangement of links as above described, also results in an advantageous disposition of toggle and guide link, whereby but a small exertion is required to operate the mechanism and the various links are subjected to no abnormal stresses.

I claim:—

1. Operating mechanism for electric switches including in combination with a movable switch member, a guide link, other links associated with said guide link and the movable switch member, and a thrust toggle on said guide link, the operation of said toggle serving to operate said guide link to cause a movement of the movable switch member.

2. Operating mechanism for electric switches including in combination with a movable switch member, a guide link, a thrust toggle associated therewith, and other links associated with said guide link and the movable switch member, said guide and other links cooperating to restrain a point on the movable switch member to move in a substantially straight line when operated by said toggle.

3. Operating mechanism for electric switches including in combination with a movable switch member, a guide link, a link pivoted to the movable switch member and operably connected with said guide link, restraining means for said second link, and a thrust toggle pivoted to said guide link and operable to cause the operation of the aforesaid links to move the movable switch member.

4. Operating mechanism for electric switches including, in combination with a movable switch member, a link pivoted to the movable switch member, a movable fulcrum for said link, a guide link operably connected with said link and a thrust toggle associated with said guide link and operable to cause a movement of the movable switch member.

5. Operating mechanism for electric switches including, in combination with a movable switch member, a link pivoted to the movable switch member, a movable fulcrum for said link, a guide link operably connected with said link and a thrust toggle associated with said guide link, operable to cause a movement of the movable switch member, and which in its fully operated position serves to maintain the movable switch member in switch-closed position.

6. Operating mechanism for electric switches including, in combination with a movable switch member, a guide link, a fulcrum therefor, other links associated with said guide link and the movable switch member, said links being so arranged that they may be symmetrically disposed with respect to the movable switch member and that when operated, will serve to constrain a point on

the movable switch member to move in a straight line, and a thrust toggle for operating said links.

7. Operating mechanism for electric
5 switches including, in combination with a movable switch member, a link pivoted to the movable switch member, a movable fulcrum for said link, a guide link operably connected with said link and disposed on the
10 opposite side of the movable switch member from said link, the disposition of the afore-said links being such that the actuation of

said links will operate to restrain a point on the movable switch member to move in a substantially straight line, and means to 15 operate said links.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR C. KELLE.

Witnesses:

GORDON CAMERON,

DANIEL M. SCHENFERT.