(No Model.)

3 Sheets—Sheet 1.

T. H. PARKER.

MEANS FOR USE IN OPERATING ELECTRICAL SWITCHES.

No. 598,679 Patented Feb. 8, 1898.

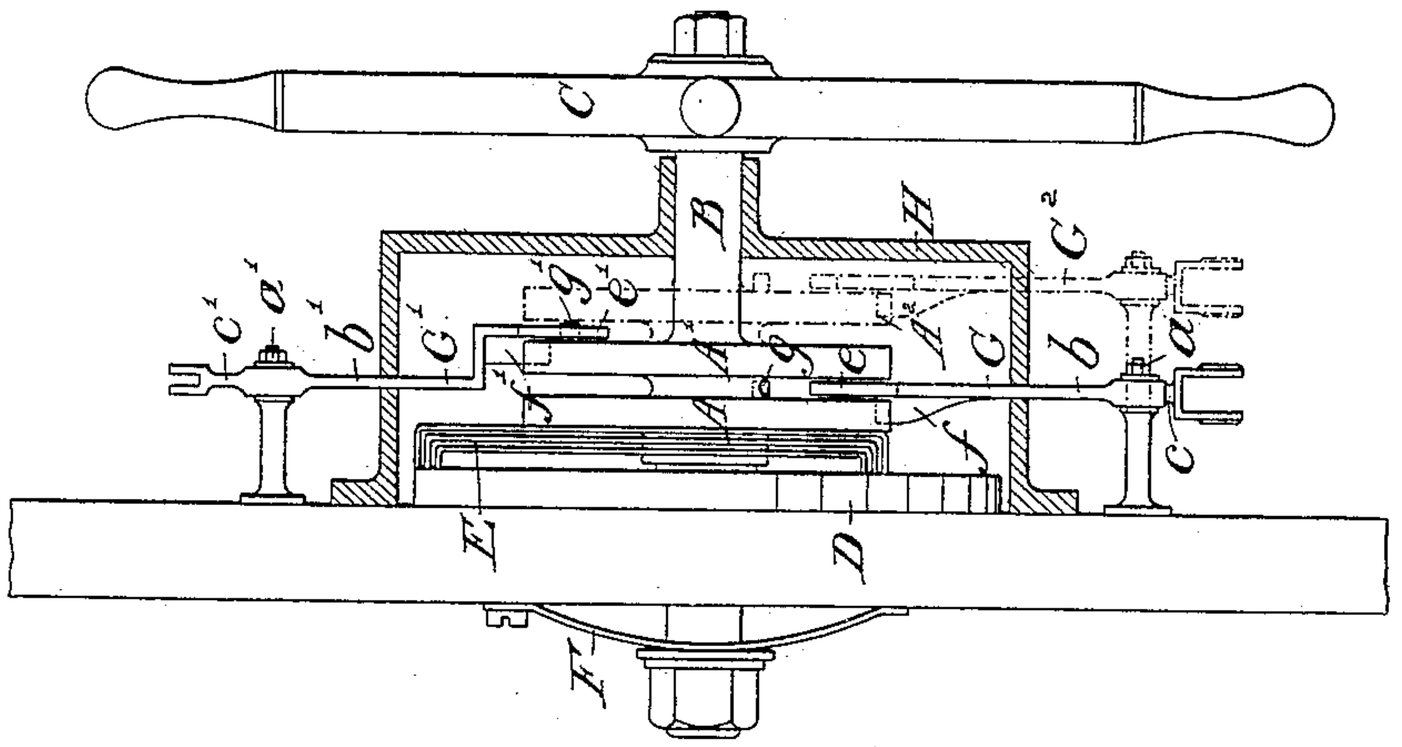

Fig. 2.

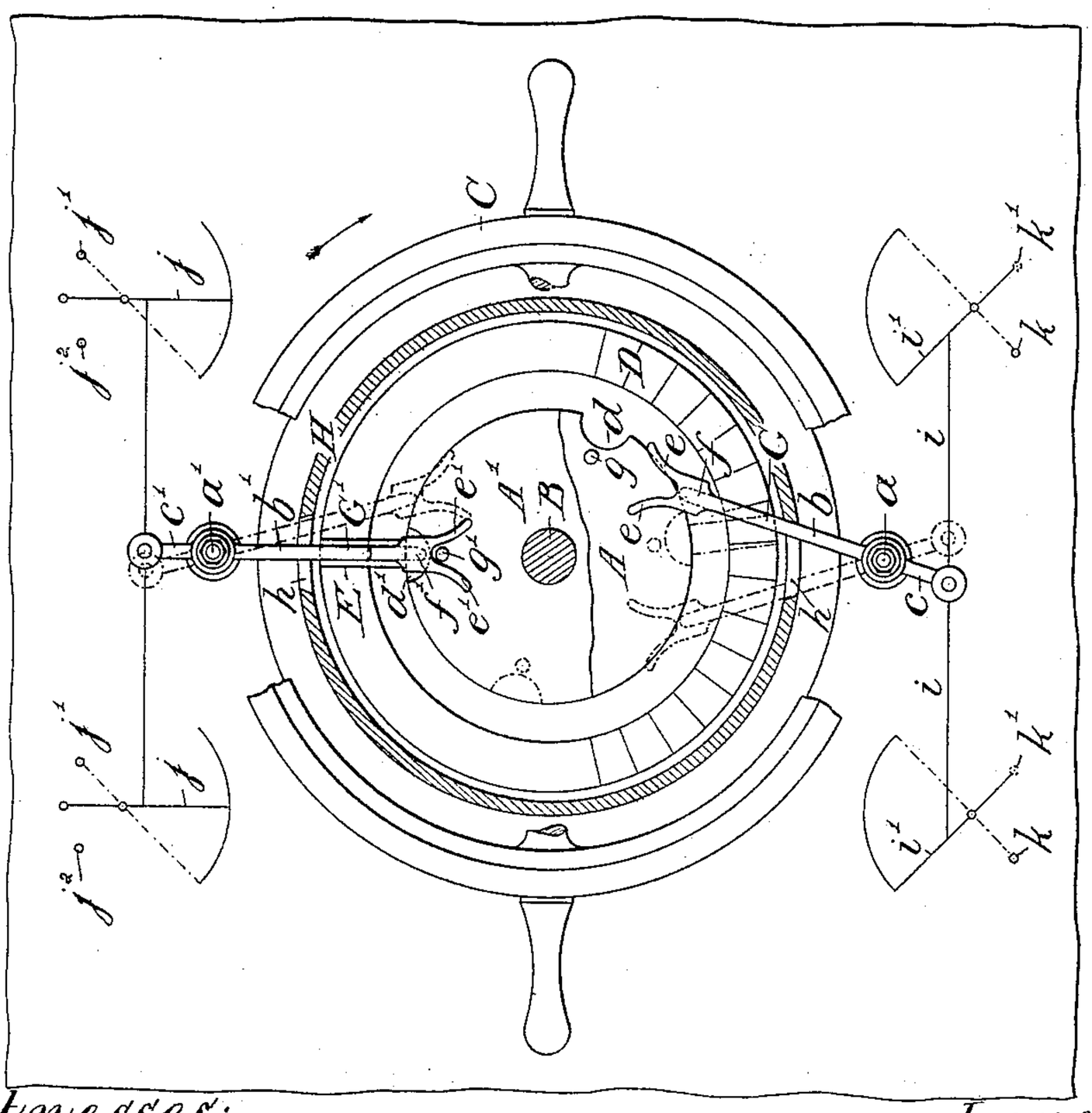

Fig. 1.

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(No Model.)

3 Sheets—Sheet 2.

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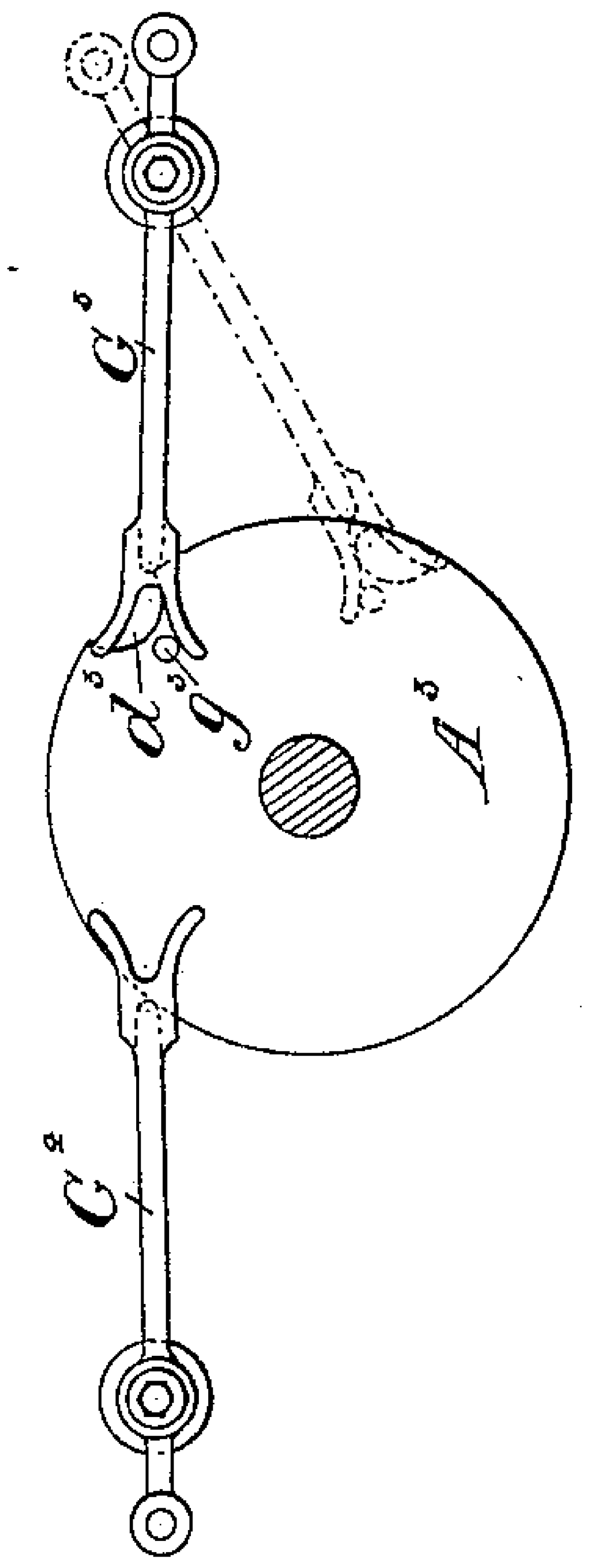

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

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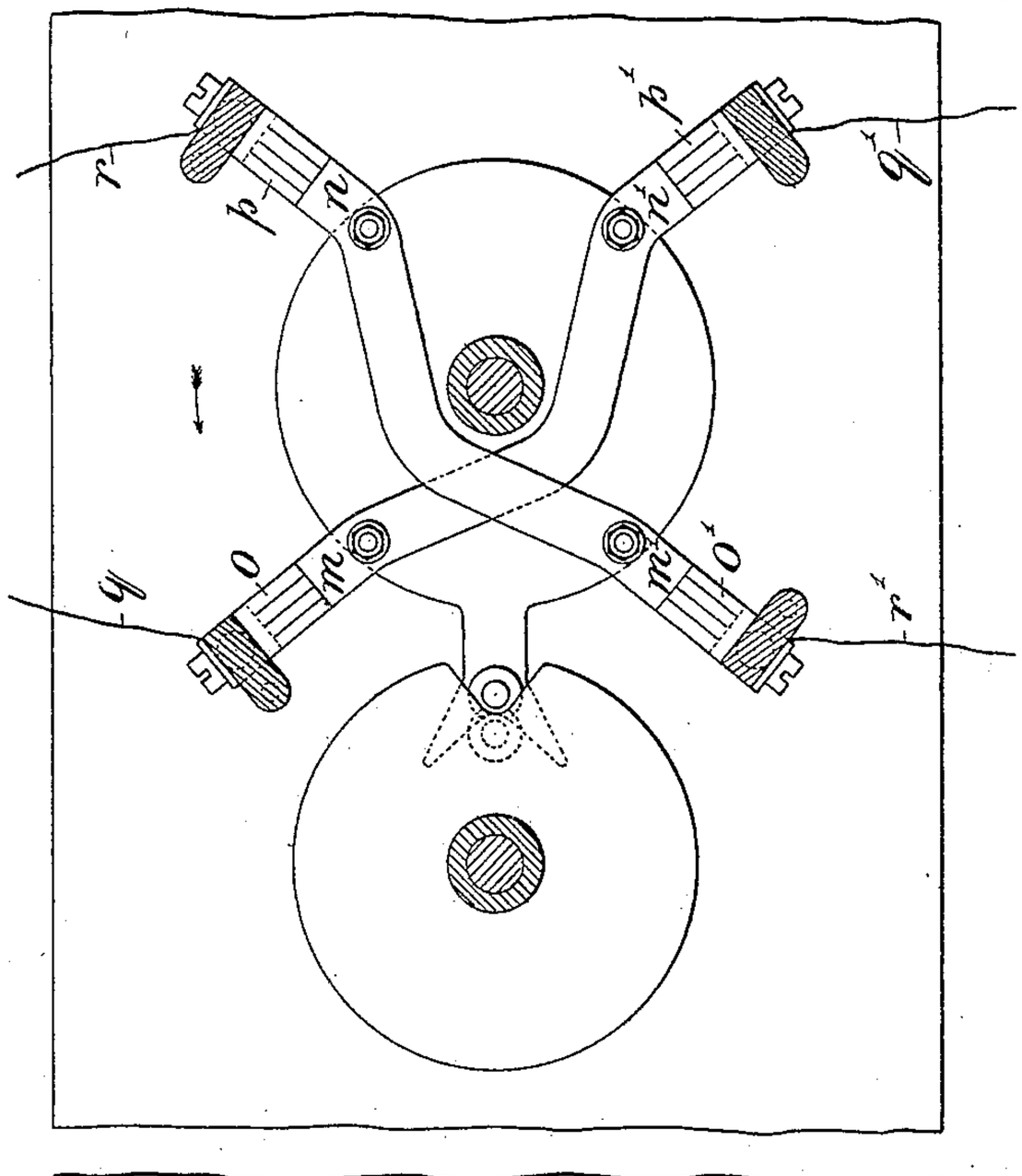

Fig. 3.

Fig. 4.

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UNITED STATES PATENT OFFICE.

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MEANS FOR USE IN OPERATING ELECTRICAL SWITCHES.

SPECIFICATION forming part of Letters Patent No. 598,679, dated February 8, 1898.

Application filed December 9, 1897. Serial No. 661,238. (No model.)

To all whom it may concern:

Be it known that I, THOMAS HUGH PARKER, a subject of the Queen of Great Britain, residing at Tettenhall, near Wolverhampton, in the county of Stafford, England, have invented certain new and useful Improved Means for Use in Operating Successively Two or More Electrical Switches or Sets of Switches, of which the following is a specification.

The object of this invention is to operate in succession two or more switches or sets of switches, by a movement in a given direction, in a manner more convenient than has heretofore been the case, and the more especial purpose of the invention is to enable an electromotor to be started, stopped, and reversed by means of a single handle only, so as to avoid the need of using, as is customary, three or more handles for this purpose.

The main feature of the invention consists of a lever and roller escapement adapted to the purpose of operating and locking an electric switch.

A central spindle has the starting-handle or hand-wheel fixed thereto, and carries also a roller or disk, or two or more rollers or disks, having, or each having, a semicircular notch or gap formed in its edge and carrying, or each carrying, a stud or pin which projects from one of its side faces. In connection with such disk, or each disk, a lever or arm is mounted upon a fixed axis which is some distance outward from the periphery of the disk. An end of this lever is formed with a bifurcated portion which is formed of two outwardly-curved fingers, one or other of which is moved as the spindle is turned by the stud which is carried by the disk, or by the corresponding disk, according to the direction in which the spindle is turned, and the same end of the lever is also formed with an abutment, which by coming against the edge of the disk is prevented from moving in one direction, but which, when the notch or gap of the disk is brought opposite to it, can enter the notch or gap and be then moved, by the stud pressing against one of the curved fingers aforesaid, in the direction in which it was previously prevented from moving. The lever may be formed with a portion which projects beyond the fulcrum, and the outer end of such portion be connected by suitable means with a switch or with switches which are to be simultaneously operated by the movement of the corresponding disk, or the lever may be formed as an arm projecting from a circular plate which is concentric with the pivot-axis of the lever, and such plate be provided with radiating arms adapted for making electric contact with suitable terminals as the lever is moved in one direction and of breaking such contact as the movement is reversed, such radiating arms being electrically connected, two or more together, as may be required for the intended purpose. The central spindle aforesaid may carry also the arm of a rheostat-switch which moves as the spindle is turned, and thus may be operated by the spindle to cut out resistance which is placed in the armature-circuit to prevent too great a rush of current in starting. When two or more disks are used, each disk will operate as required through the medium of its respective lever the switch or set of switches with which the lever is connected, and by setting one disk to operate in advance of another as the spindle is turned one switch or set of switches will be operated in advance of another switch or set of switches.

In order that the invention may be clearly understood, I will proceed to describe, by way of example and with reference to the drawings herewith, certain practical applications thereof.

Figure 1 is a front elevation (in a somewhat diagrammatic form for the sake of clearness) showing the application of the invention for the purpose of starting, regulating, and stopping a shunt-wound electromotor; and Fig. 2 is a side view thereof, but shows in addition means for use also in reversing the motor. Fig. 3 is a front elevation showing the method of operating two levers by means of a single disk. Fig. 4 is a front elevation showing the arrangement in which a lever which is operated by a disk carries a number of radiating arms for making and breaking contact with a corresponding number of terminals; and Fig. 5 is a front elevation of a similar arrangement of lever and radiating arms to that shown by Fig. 4, but adapted for the reverse operation.

Referring first to the application shown by Figs. 1 and 2, A A′ are two disks mounted on

the spindle B, which is provided with a handle or hand-wheel C. In Fig. 1 a part of the disk A′ is broken away to expose a part of the disk A.

D is a rheostat-switch which is concentric with the spindle B, and E is the arm of the rheostat-switch and is mounted upon the spindle B. The outer end of this arm is pressed into contact with the rheostat D by means of the spring F, which tends to draw the spindle B backward.

G G′ are levers pivoted, respectively, at *a a′*, each having a long arm *b* or *b′* and a shorter arm *c* or *c′*. In the edge of the disk A is formed a notch or gap *d*, and in the edge of the disk A′ is formed a corresponding gap *d′*. The inner end of each lever is formed bifurcated, as shown—that is to say, with two outwardly-curved fingers *e* or *e′*. The bifurcated end of the lever G is capable of moving in front of the disk A and the bifurcated end of the lever G′ is capable of moving in front of the disk A′, and each lever is formed with an abutment *f* or *f′*, (shown by broken lines only in Fig. 1,) which by coming against the edge of the corresponding disk prevents the lever from moving in one direction, but which when the gap in the edge of the disk is brought opposite thereto may enter therein and permit of the lever being moved as the disk is moved in the direction in which it was previously prevented from moving. A stud *g* or *g′* projects at the face of each disk just inward of the gap in the edge thereof. The arm *c* of the lever G is connected by means of wooden or vulcanite rods *i* with the switches *i′*, which put into circuit and cut out the armature-coils, and the arm *c′* of the lever G′ is similarly connected with the switches *j*, by means of which the shunt-coils are put into and cut out of circuit.

The parts of the apparatus are shown by full lines in the relative positions they occupy when the armature-coils and the shunt-coils also are switched off.

When it is desired to start the motor, the spindle B is turned in the direction of the arrow, Fig. 1, whereby the stud *g′* is pressed against the inner face of one of the fingers *e′*, the abutment *f′* being at the time within the gap *d′* of the disk, which permits of the movement of the lever as the disk is moved. By the continued turning of the spindle, therefore, the lever G′ is moved until its abutment *f′* is moved by a side of the gap *d′* out from such gap, the lever being then in the position indicated by broken lines, Fig. 1, from which it is prevented from returning by the abutment *f′* bearing against the edge of the disk A′. This movement of the lever causes the switch-levers *j* to make contact with the terminals *j′*, as indicated by broken lines, whereby the shunt-coils are switched on. By the further turning movement of the spindle in the same direction the gap *d* is brought opposite to the abutment *f* of the lever G, and such lever is operated by the stud *g* of the disk A and by a side of the gap *d* similarly as the lever G′ is operated, whereby the switch-levers *i′* are caused to make contact with the terminals *k*, as indicated by broken lines, and the armature-coils to be thus switched on, and the lever G is prevented from returning similarly as the lever G′ is prevented. The relative positions of the gaps and studs in regard to the levers is such that the lever G is not moved to an extent which is sufficient to bring the switches *i′* into contact with the terminals *k* till the movement of the lever G′ has brought the switch *j* into contact with the terminals *j′*, so that the shunt-coils are switched on prior to switching on the armature-coils. The arm E of the rheostat-switch commences to pass over the rheostat D when the armature-coils have been switched on, and by continuing to turn the spindle B as much of the resistance as may be desired, or all of it, may be cut out without altering the positions of the levers G G′.

To stop the motor, the spindle B is of course turned in the reverse direction, with the effect that the arm E of the rheostat-switch first brings into the armature-circuit successive increments of resistance. After all the resistance has been thus brought in the continued movement of the spindle in the same direction moves the lever G back again into its original position by the reverse operation of the stud *g* and gap *d* to that above described, and the armature-coils are thus cut out of circuit. When back in this position again, the lever G is prevented, by its abutment *f*, coming against the edge of the disk, from moving again in a direction to switch on the current. The motor will of course come to a stop when the armature-coils are switched off. If it is desired to cut out the shunt-coils also, the turning back of the spindle B is continued until the lever G′ is moved back again into its original position, with the result that the shunt-coils are cut out of circuit.

The disks, rheostat, and arm thereof may be inclosed by means of a case H, (shown in section in both Figs. 1 and 2,) which has slotted openings *h* formed through the sides thereof for the passage of the levers G G′.

If it is desired to adapt the apparatus shown by Figs. 1 and 2 for the purpose also of reversing the motor, a third disk A^2 (shown by broken lines, Fig. 2, and which corresponds to the disks A A′) may be fixed upon the spindle B, and a lever G^2 (shown also by broken lines, Fig. 2) be used in association therewith in the manner in which the lever G is used in association with the disk A. In this arrangement the lever G, as shown in Fig. 1, may be regarded also as the lever G^2, its representation by broken lines, however, indicating its position when the switches it actuates are open. By such an arrangement the motor is reversed by simply turning the spindle B in the opposite direction to the arrow when the

parts are in their relative positions shown by Fig. 1. By doing this the lever G′ is first moved to the left and moves the switch-levers *j* into contact with the terminals j^2, with the effect, as before, that the shunt-coils are switched on, the two terminals with which a switch-lever *j* can make alternately contact being of the same pole. The continued movement of the spindle B in this direction causes the disk A^2 to operate the lever G^2, and thus to move switch-levers corresponding to the switch-levers *i′* to make contact with terminals *k′*, and thus switch on the armature-coils in the reverse direction to that in which they are switched on through the medium of the disk A when the spindle B is turned for the purpose in the direction of the arrow. The rheostat-arm E operates as the spindle is turned to reverse the motor in the same manner that it operates when the spindle is turned for running the motor forward.

A single disk, if made of sufficiently large diameter, may be adapted to operate two or more levers in the manner in which a single disk has been described above to operate a single lever. An example of such an arrangement in which a single disk is used to operate two levers is shown by Fig. 3. The disk A^3 is formed with a gap d^3 and has a stud g^3. The levers G^3 and G^4 may be operated by the gap and stud to follow one another in operating switches or sets of switches. For instance, one of them may be operated to switch on a current in one direction as the disk is turned one way and to switch off such current as it is turned back again, and the other be operated to switch on the current in the reverse direction when the disk is turned back beyond its zero position, or the disk may operate the levers in succession to switch on currents for different purposes and to switch off such currents in succession by its reverse movement.

It will now be obvious that any desired number of disks, each working in conjunction with a lever, as described, and, if desired, one or more of them working or each working in conjunction with more than one lever, as described, may be fixed upon the same spindle, and thus any desired number of switches or sets of switches may be operated in succession by a single movement of the handle. The enumeration of the various purposes for which switches may be operated in this manner would be an almost endless task.

In the arrangement illustrated by Fig. 4, A^4 is a disk which corresponds to the disks A A′, already described. The lever which is operated by the disk consists of a circular plate J, mounted upon a fulcrum-pin *l* and having a projecting arm *l′*, which corresponds to the outer end of the arm *b* or *b′* of the lever G or G′, before described, and is operated by the disk A^4 similarly as the lever G or G′ is operated by the disk A or A′. The circular plate J carries a number of radiating arms *m m′ n n′*, and when the lever is in the position shown by full lines the radiating arms *m m′* and *n n′* are respectively in contact with the terminals *o o′* and *p p′*. When the lever is moved by means of the disk in the direction indicated by the arrow, the radiating arms are moved out of contact with the terminals and the lever is locked against returning. This latter position of the lever and arms is shown by broken lines. The radiating arms *m m′* are electrically connected with one another, as shown, and the radiating arms *n n′* are similarly connected with one another. The terminals *o* and *p* are connected, respectively, with the negative and positive leads *q* and *r* from the battery or other source of electrical supply, and the terminals *o′* and *p′* are respectively connected with the negative and positive leads *q′ r′* to the motor. When, therefore, the lever J is in the position shown by full lines, the armature-current is switched on, the lever being locked in such position by the abutment thereof being within the gap of the disk, and when the disk has been moved to bring the lever out of the gap thereof—that is to say, into the position indicated by broken lines—the current is switched off from the armature.

The arrangement shown by Fig. 5 corresponds to that shown by Fig. 4, but is adapted for use in reversing the armature-current. In this arrangement the radiating arms *m n′* are electrically connected together, as are also the radiating arms *n m′*. The terminals *o* and *p* are respectively connected with the negative and positive leads *q* and *r* from the battery or other source of electrical supply, and the terminals *o′* and *p′* are respectively connected with the positive and negative leads *r′* and *q′* to the motor. Thus when the lever and radiating arms are in the position shown the armature-current is switched on in the reverse direction to that in which it is switched on in the arrangement shown by Fig. 4. The armature-current is switched off by operating the lever in the direction indicated by the arrow.

It will thus be seen that if the two disks shown by Figs. 4 and 5 are fixed upon the same spindle, as in the case of the disks illustrated by Figs. 1 and 2, the armature-current may be switched on in one direction by means of the disk A^4, and by turning the disk back again such current may be switched off, and by continuing to turn the handle in the same direction the current may be switched on in the opposite direction through the medium of the other disk. The disks are of course fixed upon the spindle with their gaps and studs in proper relative position, and the arms *m n′ n m′* are turned for switching the current on and off in the opposite directions, respectively, to those in which the arms *m m′ n n′* are turned for such purposes.

The applications of the invention described with reference to the drawings are given, as stated above, merely as examples, and it will now be obvious that any number of switches

may be operated for various electrical purposes by means of one disk or two or more arranged to be operated simultaneously by a single handle.

Having thus described my invention, I claim—

1. In apparatus for use in operating successively two or more electrical switches or sets of switches, a roller or disk having a notch or gap therein and a stud which projects therefrom, means for turning such disk axially, a lever or arm mounted upon a fixed pivot-axis and having a bifurcated end for engagement with the stud and an abutment which is at somewhat greater distance from the pivot-axis of the lever than the distance from such axis to the nearest point of the disk, and means by which the lever operates a switch or set of switches as it is moved by the disk, substantially as described.

2. In apparatus for use in operating two or more electrical switches or sets of switches, a roller or disk having a notch or gap therein and a stud which projects therefrom, means for turning such disk axially, a lever or arm mounted upon a fixed pivot-axis and having a bifurcated end for engagement with the stud and an abutment which is at a somewhat greater distance from the pivot-axis of the lever than the distance from such axis to the nearest point of the disk, arms rigidly connected with such lever and fixed terminals with which such arms may be made to make or break contact, as desired, by suitably operating the lever through the medium of the disk, substantially as described.

3. In apparatus for use in operating successively two or more electrical switches or sets of switches, the combination of two or more rollers or disks having notches or gaps therein and studs which project therefrom, means of turning such disks simultaneously, levers or arms each mounted upon a fixed pivot-axis and having a bifurcated end for engagement with a stud which is carried by a disk and an abutment which is at somewhat greater distance from the pivot-axis of the lever than the distance from such axis to the nearest point of the corresponding roller or disk, and means by which each lever operates a switch or set of switches as it is moved by its corresponding disk, substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

THOMAS HUGH PARKER.

Witnesses:

STEPHEN WATKINS,

ROBERT M. LISTER.