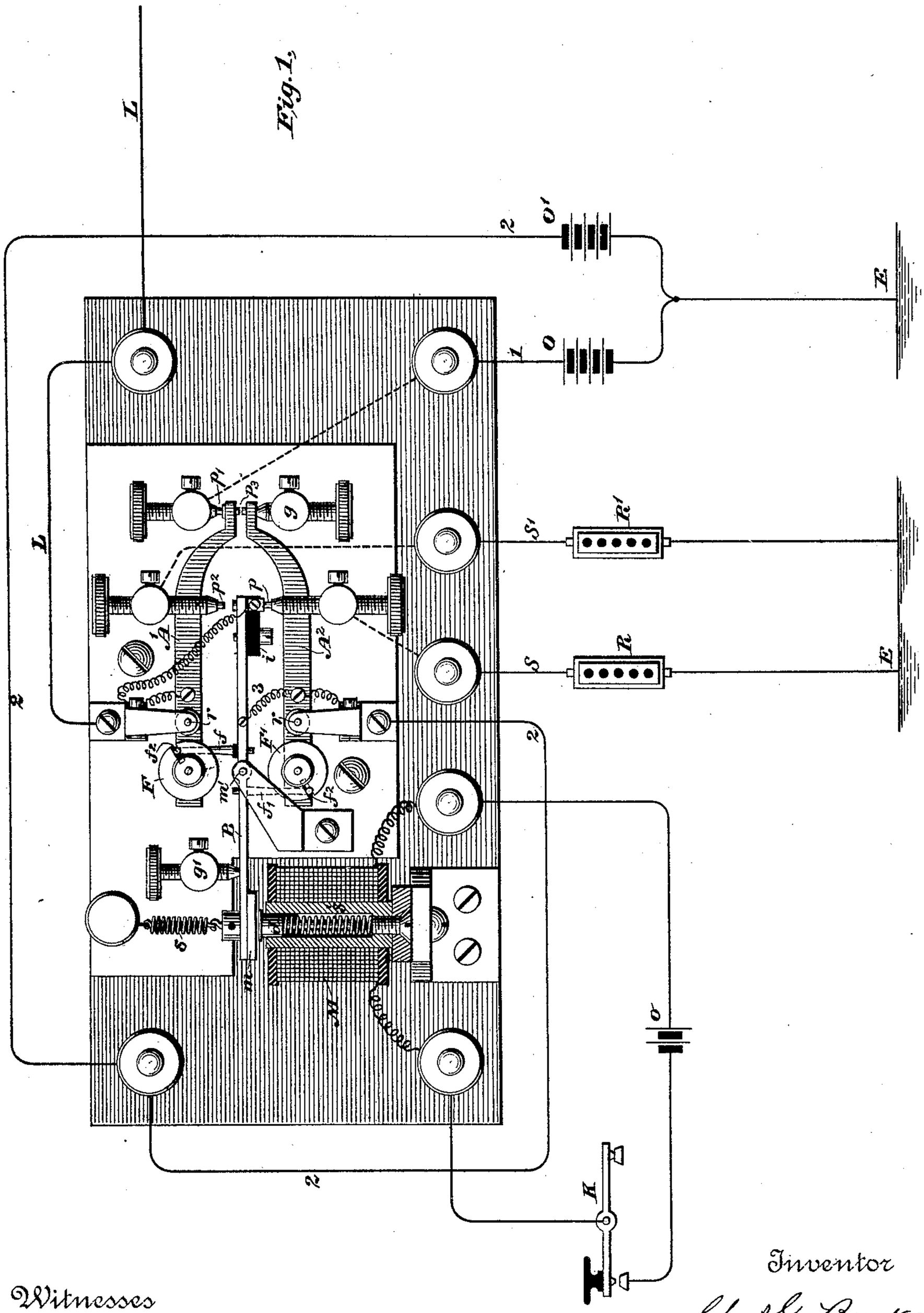
(No Model.) 2 Sheets—Sheet 1.

C. G. BURKE.

TELEGRAPH INSTRUMENT.

No. 405,985. Patented June 25, 1889.

Fig. 1.



Witnesses
Geo. W. Breck.
Carrie E. Ashley

Inventor
Chas. G. Burke

By his Attorneys
Pope Edgecomb & Terry

(No Model.) 2 Sheets—Sheet 2.

C. G. BURKE.

TELEGRAPH INSTRUMENT.

No. 405,985. Patented June 25, 1889.

Fig. 2.

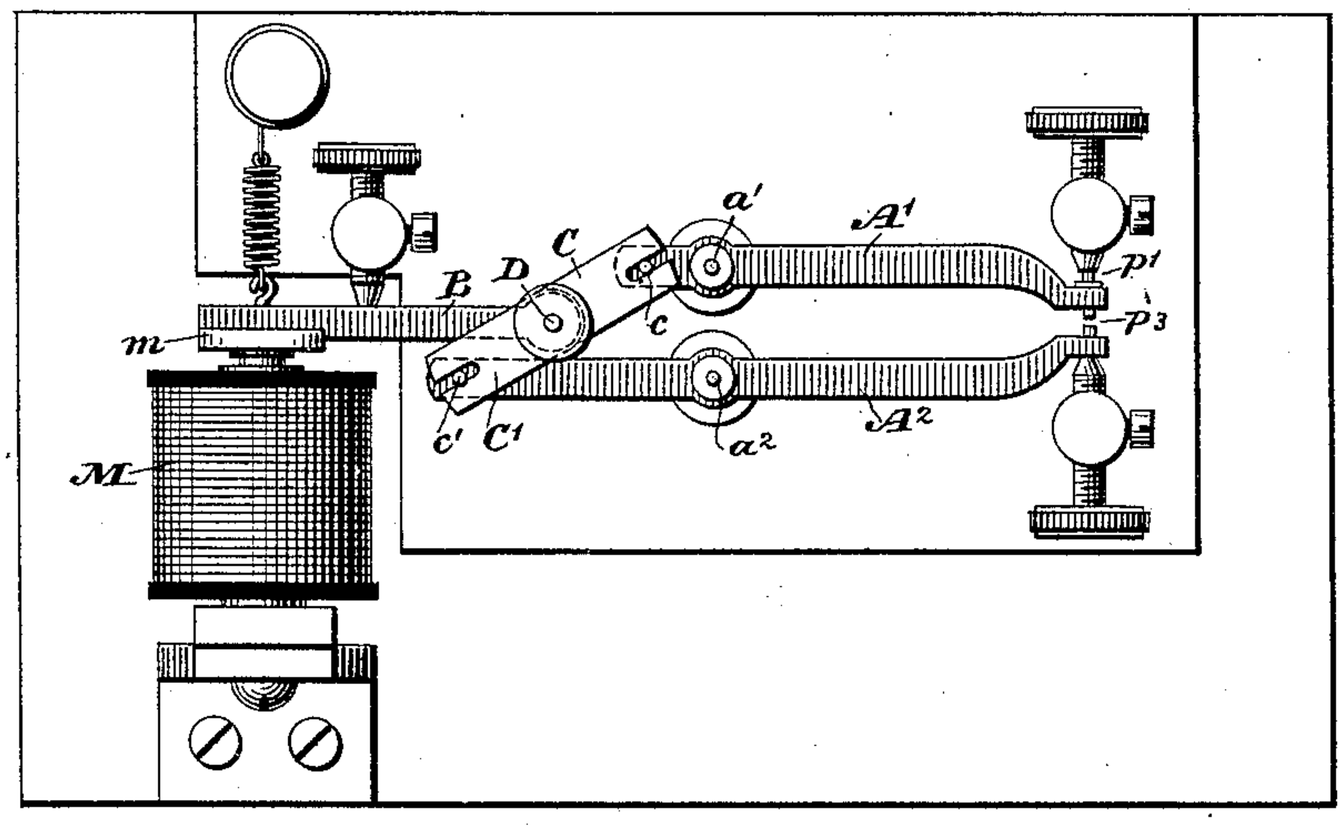
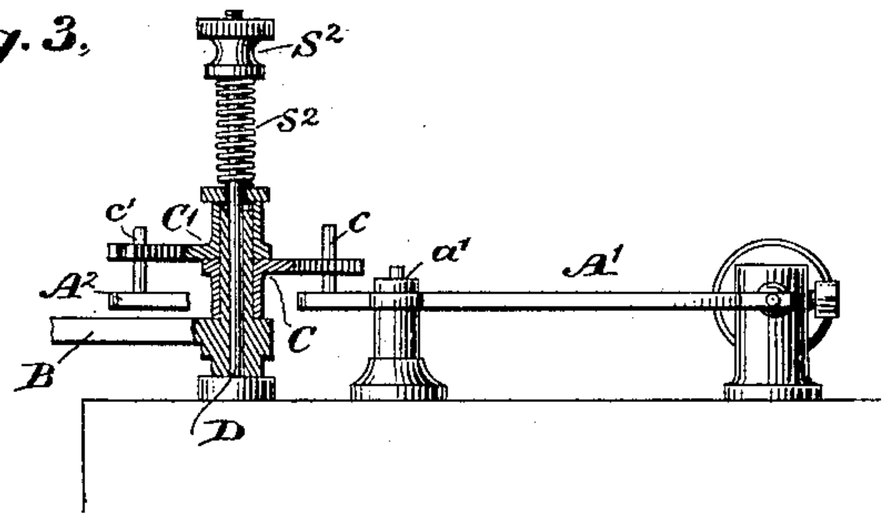


Fig. 3.



Witnesses
Geo. W. Breck.
Carrie E. Ashley

Inventor
Chas. G. Burke
By his Attorneys
Pope Edgecomb & Terry

UNITED STATES PATENT OFFICE.

CHARLES G. BURKE, OF RICHMOND HILL, ASSIGNOR TO FREDERICK WOLFFE, TRUSTEE, OF NEW YORK, N. Y.

TELEGRAPH-INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 405,985, dated June 25, 1889.

Application filed September 8, 1888. Serial No. 284,892. (No model.)

To all whom it may concern:

Be it known that I, CHARLES G. BURKE, a citizen of the United States, residing in Richmond Hill, in the county of Queens and State of New York, have invented certain new and useful Improvements in Telegraph-Instruments, of which the following is a specification.

The invention relates to that class of instruments employed in the transmission of messages where the code is expressed by electrical impulses differing in length or duration, and is more particularly adapted for use in transmitting messages in such code over long submarine cables.

As is well known, cables of large inductive capacity charge and discharge slowly, and the time required for discharging a large cable increases with increase or length of battery-contact. The employment of signals involving long battery-contacts has therefore been objectionable on such cables, and as a consequence the use on such cables of what is known as the "Morse code" has not heretofore been commercially practicable.

The object of this invention is to neutralize the detrimental effects of contacts required in the transmission of Morse dashes; and it consists in a means by which any prolongation of contact or potential in excess of that actually needed to produce the required signal is cut off or diverted from the line or cable.

The general principle upon which the invention is constructed consists in arranging at the transmitting-station a main-line circuit and two shunt-circuits, all three circuits being controlled by one operation of the circuit-closing device. The main circuit is connected with the cable or line and the shunt-circuits are connected with both main line and the earth, a variable resistance being placed in such shunt-circuits between their connections with the line and the earth. The transmitting device is preferably connected with a divided battery arranged in a well-known way with an earth-connection at or near its center, thus presenting opposite poles. The moving portions consist of a main arm and two auxiliary arms so organized that the movement of its main arm causes the simultaneous movement of the two auxiliary arms, which are attached to such main arm, to and from each other. The movements of the main arm and of the auxiliary arms control the main and shunt circuits. The range of motion of the main arm may be greater than that of the auxiliary arms, and the contacts made by the auxiliary arms are effected quicker and always occur in advance of those made by the main arm. Motion in the main arm is preferably effected by the attraction of an electro-magnet made and broken in the usual way by a local battery controlled by an ordinary Morse key. The power of this electro-magnet on the armature, which forms part of the main arm of the circuit-closing device, is opposed by a retractile spring, or some other suitable power of opposition, attached to said armature and by other springs or opposing powers not attached thereto, but so arranged as to exercise strength immediately after such armature has been drawn toward such magnet. The main and auxiliary arms have independent centers and free motion thereon; but the motion of the auxiliary arms is entirely dependent upon the motion of the main arm and is limited in extent. The main arm, however, may be free to move after the limit of motion in the auxiliary arms has been reached. The attachment of the auxiliary arms to the main arm is through an adjustable friction, and a greater or less degree of rigidity of attachment can therefore be effected.

The invention will be described in detail in connection with the accompanying drawings, in which Figure 1 illustrates the general principles upon which the invention is constructed and the circuits arranged, and Figs. 2 and 3 illustrate a modification of the circuit-closing device.

Referring to Fig. 1, the magnet M is included in a local circuit having the battery *o* and the key K. The armature *m* is attached to the armature-lever or main arm B, which is pivoted at *m'*. The armature is held away from the poles of the magnet by the retractile spring *s*. The core of the magnet is hollow, and through it extends the plug *d*, and this is held in place by the spring *s'*. A small space exists between the armature *m* and the head of the plug *d*, so that the first movement of the armature downward or toward the magnet

when the latter is energized is only opposed by the spring *s;* but after moving a short distance the armature comes in contact with the plug *d*, and after that its motion is opposed by both springs *s* and *s'*.

A' and A² are auxiliary arms pivoted at *r*. The ends farthest from the magnet are curved so as to approach each other and carry the contact-points p^3. These auxiliary arms are connected with the main arm B by means of the friction-wheels F and F', the posts *f* and *f'*, and the pins f^2 f^2, which latter engage the friction-wheels by means of radial slots, as shown. It will be seen that the posts *f* and *f'* are attached to the main arm B on opposite sides of its pivot, and the motion, therefore, of the armature *m* toward the magnet will cause the two curved ends of the auxiliary arms and the contact-points at p^3 to approach each other.

Further description will be given in connection with the operation of the apparatus.

The main line L is connected with the auxiliary arm A' and to the contact *p* on the insulating-piece *i* at the end of the armature-arm B. The battery O may be called the "clearing-battery" and the battery O' the "marking" or "operating" battery. In the position shown in the drawings, with the key K open, the circuit can be traced from the battery O through the line 1 to the contact-points *p'*, the arm A', whence it divides, part going to the line L and part to the insulated contact-point *p*, then through the line S and resistance R, which is adjustable, to the earth. If the key K is depressed for a period, say, sufficient to send the shortest impulse or dot, then upon the approach of the armature *m* to the magnet the contact at *p* is separated, and by means of the connections between the arm B and the auxiliary arms A' and A² the contact-points at p^3 are brought together, while the contact-point at *p'* is also separated. As a result, the circuit of the clearing-battery is broken at the point *p'*, and the circuit of the battery O' can be traced through the wire 2 to the arm A², through the contact-points at p^3 and the arm A' to the line L. If the contact were prolonged, the lever B would continue to move until the contact at p^2 was closed; but as the key K is again instantly opened the lever B will not have time to close the contact at p^2; but the slightest backward movement of the armature *m* upon the opening of the key will cause the points at p^3 to separate, the points at *p* and *p'* to be again closed, and the battery O is automatically thrown to line, as already described.

It will be noticed that the arms A' and A² are pivoted at points *r*, and are connected with the arm B in such a manner that the slightest possible motion of the armature *m* will cause the points at p^3 to be brought together or separated; hence when dots alone are transmitted over the line by the operation of the key K the contact-points at *p*, *p'*, and p^3 are alternately opened and closed, so that the batteries O' and O are alternately thrown to line. If, now, the key K is held down long enough to send a dash, the first operation is precisely the same as in the case of sending a dot—that is, the contact-points at p^3 are first brought together and the battery O' is sent to line. As the contact of the key K continues, the main arm B continues its motion until the contact-point at p^2 is closed. As soon as this takes place the current from the battery O' is divided, and while a portion continues to line, as before, through the arm A², contact-points p^3, and arm A', another portion passes through the wire 3, arm B, contact-points p^2, line S, and resistance R' to earth. The result is that much less of the battery O' goes to the line after a portion of the time required to make the dash has passed than when the contact is first made. This facilitates the clearing of the line.

When the key K is lifted after making the dash, the first operation is to open the points at p^3 and to close the point at *p'*. The result is that the clearing-battery O is immediately thrown to the line, and the clearing effect begins and continues while the armature continues to be drawn away from the magnet, and while the arm B is passing through the considerable distance from the points p^2 to the point *p*. It will be seen, therefore, that not only is the main battery automatically diverted from the line after a certain period in making a dash, but that after the dash the clearing-battery is longer kept to the line; or, in other words, the clearing-battery is kept to the line in proportion to the time that the main or marking battery has previously been kept to the line.

The resistances R and R' are both adjustable, and can therefore be adapted to the requirements of the circumstances.

The stops *g* and *g'* limit the movement of the auxiliary and main arms, respectively.

It will be seen that the lines S and S', which include the resistances R and R', are shunts upon the main line, and that their closing is automatically effected by the instrument after the closing of the main line.

Referring now to Figs. 2 and 3, it will be seen how the method of action between the auxiliary arms A' and A² and the main arm B may be modified. The arms A' and A² are pivoted at *a'* and *a²*, and are connected with the main arm B by the two levers C and C' and the pins *c* and *c'*. The arm B and the levers C and C' are all free to move upon the spindle D, and are sufficiently united by friction by means of the spring s^2 and the nut S^2 to produce the desired movement upon the attraction of the magnet M upon the armature *m*. The effect is just the same as in the case shown in Fig. 1, where the connection is through the arms *f* and *f'* and friction-wheels F and F'.

I claim as my invention—

1. In a circuit-closing device, the combination of a main arm and two auxiliary arms

frictionally attached thereto, said auxiliary arms carrying circuit-closing points which are caused to simultaneously approach or separate from each other by the motion of the main arm.

2. The combination of a local battery, a Morse key, an electro-magnet, an armature-lever, and two auxiliary arms frictionally connected therewith and carrying circuit-closing points which are caused to simultaneously approach or separate from each other according to the motion of the armature-lever.

3. The combination of a local battery, a make-and-break key, an electro-magnet, an armature-lever, and two auxiliary arms frictionally attached to such armature-lever and carrying circuit-closing points which are made to simultaneously approach or separate from each other by the movement of the armature-lever, the range of motion of the armature-lever being greater than that of the auxiliary arms.

In testimony whereof I have hereunto subscribed my name this 7th day of September, A. D. 1888.

CHARLES G. BURKE.

Witnesses:
DANL. W. EDGECOMB,
CAROLINE E. DAVIDSON.