

(No Model.)

2 Sheets—Sheet 1.

T. PARKER, J. H. WOODWARD & E. S. G. REES.  
CIRCUIT CONTROLLER.

No. 531,961.

Patented Jan. 1, 1895.

Fig. 1

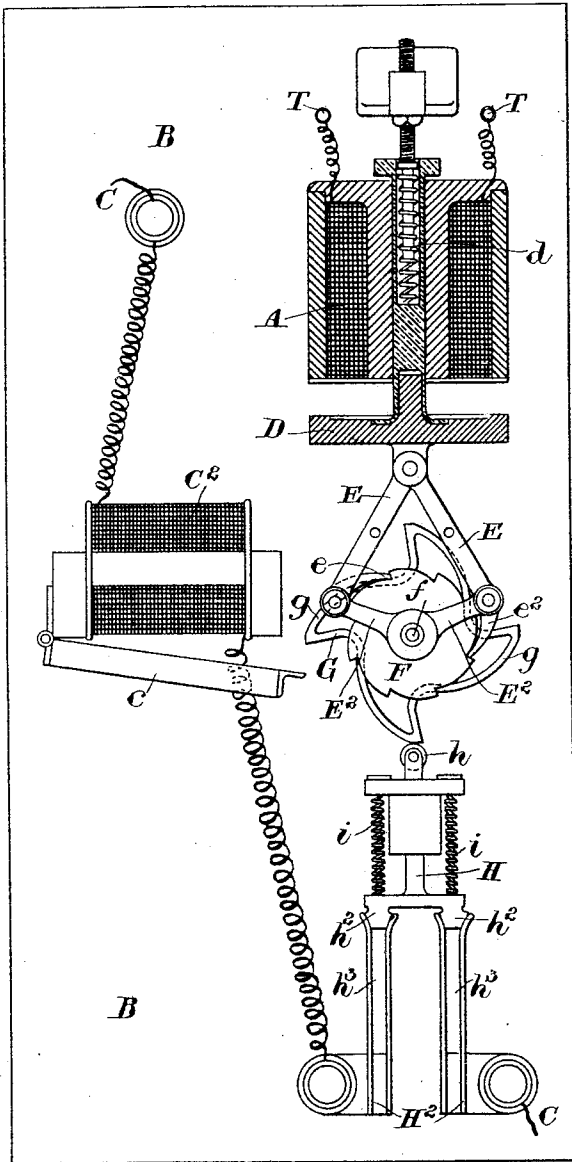
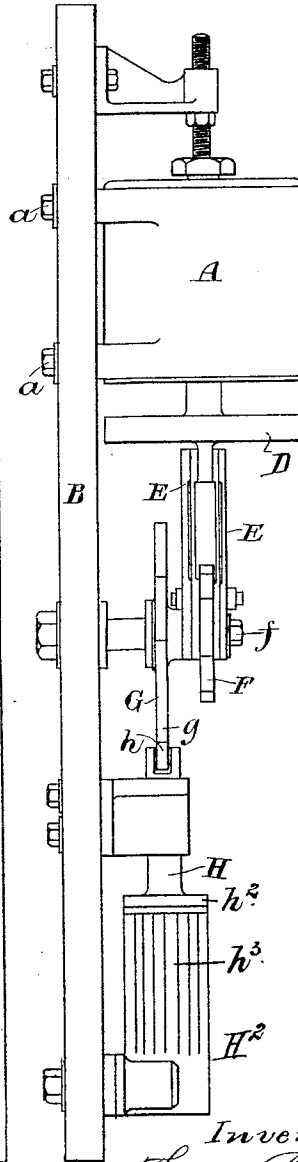


Fig. 2.



Witnesses

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James Gracie

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By their Attorneys  
Howson & Howson

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Fig. 3.

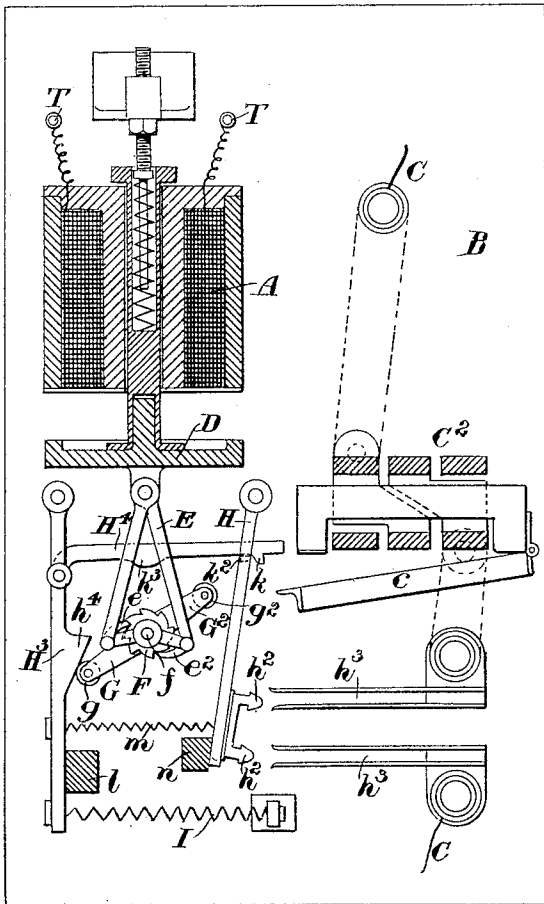
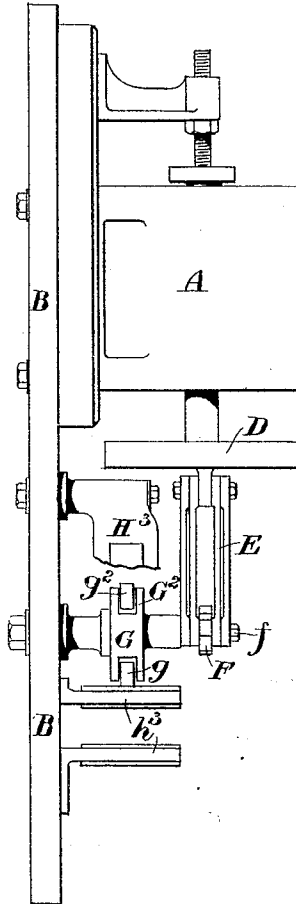


Fig. 4.



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# UNITED STATES PATENT OFFICE.

THOMAS PARKER, JOHN HAROLD WOODWARD, AND EDMUND S. G. REES,  
OF WOLVERHAMPTON, ENGLAND.

## CIRCUIT-CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 531,961, dated January 1, 1895.

Application filed February 24, 1892. Serial No. 422,687. (No model.) Patented in England August 18, 1891, No. 13,942.

*To all whom it may concern:*

Be it known that we, THOMAS PARKER, works-director of the Electric Construction Corporation, Limited, and JOHN HAROLD WOODWARD and EDMUND SCOTT GUSTAVE REES, electrical engineers, of Wolverhampton, in the county of Stafford, England, subjects of the Queen of Great Britain and Ireland, have invented certain Improvements in or Connected with Apparatus for Completing and Interrupting Electric Circuits, (for which we have obtained a patent in Great Britain, No. 13,942, dated August 18, 1891,) of which the following is a specification.

This invention has reference more especially to apparatus for completing and interrupting electric circuits controlled from a distant point for instance arrangements such as are described in the specification of British Letters Patent No. 16,110 of 1890.

According to this invention we provide an electro magnet which can be energized from any desired distance by completing the circuit in which the coils of the electro-magnet are situated the said magnet when so energized and then demagnetized operating a device by which a switch is moved so as to complete or break any required electric circuit. In proximity to the said device another electro magnet is arranged with its coils in series with or as a shunt across the said circuit and with an armature so adjusted that when the current or potential in the said circuit is not above normal the said armature remains stationary but should the current or potential in the said circuit become excessive the armature is attracted and in its movement acts upon the aforesaid device so as to break the said circuit.

In order that our invention may be well understood we will describe with reference to the accompanying drawings the best arrangements with which we are acquainted for carrying our invention into effect as applied to a system of distribution such as is described and illustrated in the specification of British Letters Patent No. 16,110 of 1890, and in an application for Letters Patent of the United States filed by us February 24, 1892, Serial No. 422,685; but we do not limit ourselves to

the application of the devices to this purpose nor to the precise details shown in the drawings.

Figure 1 is a front elevation (partly in section) of one arrangement of apparatus according to our invention, and Fig. 2 is a side elevation of the same. Figs. 3 and 4 are similar views showing a slight modification in the arrangement for actuating the switch.

Referring to Figs. 1 and 2, A is a solenoid or electro magnet the terminals T of which are in circuit with a dynamo, or other source of electricity, which may be situated at any desired distance from the magnet, a suitable switch being provided at the distant station by means of which the circuit through the magnet A may be completed and broken as required. The current passing through this electro magnet A controls the switch for connecting or disconnecting the supply to the distributing main, the circuit containing the coils of the electromagnet A being in its action independent of the said distributing main or other circuit which is to be completed or broken through the medium of the said electro-magnet.

The electro magnet A which is fixed by screws *a* or otherwise to a board B or other suitable support is provided with an armature D which is normally kept away from the magnet under the action of a spring *d* or its equivalent. This armature is connected by double arms or links E E<sup>2</sup> with the axis *f* of a ratchet wheel F the said links carrying pawls *e e*<sup>2</sup> engaging with the teeth of the ratchet wheel. Upon the axis *f* and preferably secured to the ratchet wheel F is a wheel G with projections or cams *g* which act upon a pulley *h* carried on the movable part H of a switch so as to force contact pieces *h*<sup>2</sup> thereon into or onto the contacts *h*<sup>3</sup> on the fixed part H<sup>2</sup> of the switch to complete the circuit through C. When the movable part H of the switch is not depressed by the cams *g* the contacts *h*<sup>2</sup> *h*<sup>3</sup> are kept apart or separated by weights or springs *i* the circuit through C being then broken. In the circuit C and in proximity to the ratchet wheel F and the cam wheel G may be an electro magnet C<sup>2</sup> the armature *c* of which is suitably weighted (or acted on by

a spring or springs) so as to normally keep it away from, or out of contact with, the magnet when the current through C is normal. When the current through C becomes excessive the magnet C<sup>2</sup> becomes sufficiently energized to overcome by its attraction the resisting weight of the armature *c* thereby causing it to engage with one of the projections or cams *g* on the wheel G (or with the teeth of the ratchet wheel F) so as to move out of engagement with the movable part of the switch the cam or projection *g* which at the time is acting thereon and allow the contacts *h*<sup>2</sup> *h*<sup>3</sup> to separate under the action of the springs *i* and thus break the circuit through C. To complete the circuit through C from the distant station the switch at the said distant station is operated so as to complete the circuit through the magnet A so that the armature D is attracted and the pawl *e* caused to partly turn the ratchet wheel F and also the cam wheel G to the extent of one half of a tooth of the wheel F. The switch at the distant station is then moved so as to break the circuit through the magnet A whereupon the armature D under the action of the spring *d* is forced from the magnet, causing the other pawl *e*<sup>2</sup> to further turn the ratchet wheel F to the extent of one half of a tooth so as to bring one of the projections or cams *g* on the wheel G into position to force the contact pieces *h*<sup>2</sup> into contact with the contacts *h*<sup>3</sup> and thus complete the circuit through C.

The circuit C may be broken from the distant station by means of the switch at that point, by again operating it so as to complete the circuit through the magnet A thereby attracting its armature and by means of the pawl *e* as hereinbefore described, partly turning the ratchet wheel F and the cam wheel G so as to remove the cam *g* from the movable part H of the switch and allow the springs *i* to move the part H so as to separate the contacts *h*<sup>2</sup> *h*<sup>3</sup> thereby breaking the circuit through C. The circuit through the magnet A is then again broken thereby allowing the armature D under the action of the spring *d* to be again forced from the magnet and by means of the other pawl *e*<sup>2</sup> still further rotate the ratchet wheel F and cam wheel G the parts being then in a position to readily complete the circuit through C at any time desired as previously described. According to the arrangement shown in the drawings in order to break and remake the contact at *h*<sup>2</sup> *h*<sup>3</sup> the ratchet wheel F requires to be rotated to the extent of two of its teeth and to effect this the magnet A requires to be twice energized and broken.

If desired the spring *d* may be dispensed with the armature D being made sufficiently heavy to impart rotation to the ratchet wheel F and cam wheel G, when it is released from the magnet A, and the circuit through the magnet being alternately completed and broken by means of the switch at the distant station, so as to impart to the wheels F and

G the necessary extent of rotation to make and break the contacts at *h*<sup>2</sup> *h*<sup>3</sup> as required. In the arrangement illustrated by Figs. 3 and 4 the wheel G is dispensed with and in place thereof there is mounted on the axis *f* of the ratchet wheel F arms G G<sup>2</sup> carrying at their outer ends friction pulleys *g* *g*<sup>2</sup> which when the ratchet wheel F is rotated by alternately completing and breaking the circuit through the magnet A as hereinbefore described, act upon a lever H<sup>3</sup> and an arm H<sup>4</sup> hinged thereto so as to make and break the contacts at *h*<sup>2</sup> *h*<sup>3</sup> as required to complete and break the circuit through C. In the drawings the parts are shown in the position they occupy when the circuits through C and through the magnet A are broken the contacts *h*<sup>2</sup> *h*<sup>3</sup> being separated and the armature D away from the magnet A. To complete the circuit through C the magnet A is first energized by closing the circuit therethrough by means of the switch at the distant station as hereinbefore described whereupon the armature D is attracted and imparts through the pawl *e* a partial rotation to the ratchet wheel F and the arms G G<sup>2</sup> causing the arm G to come into contact with a projection *h*<sup>4</sup> on the lever H<sup>3</sup> so as to force the said lever outward against the power of a spring I.

To the lever H<sup>3</sup> is hinged an arm H<sup>4</sup> having thereon a projection *k* which when the lever H<sup>3</sup> is forced outward as described, engages with a projection *k*<sup>2</sup> on a lever H carrying the contact pieces *h*<sup>2</sup>. The circuit through the magnet A is then broken by means of the switch at the distant station whereupon the armature D moves out of contact with the said magnet and imparts through the pawl *e*<sup>2</sup> a further partial rotation to the ratchet wheel F and the arms G G<sup>2</sup>, the arm G moving over and out of engagement with the projection *h*<sup>4</sup> on the lever H<sup>3</sup> which lever being released is pulled by the spring I against a stop *l* carrying with it the arm H<sup>4</sup> which by its engagement with the projection *k*<sup>2</sup> on the lever H moves the said lever forward causing the contact pieces *h*<sup>2</sup> thereon to engage with the brushes *h*<sup>3</sup> thereby completing the circuit through C. The lever H<sup>3</sup> may be released at the end of the upward movement of the armature D the return movement of D putting G ready for breaking the circuit at *h*<sup>2</sup> *h*<sup>3</sup> on the next upward movement.

We have also shown with this switch a safety device in which should the current in the circuit C rise above the normal the magnet C<sup>2</sup> will be sufficiently energized to attract the armature *c* thereof and cause it to raise the arm H<sup>4</sup> out of engagement with the lever H whereupon the said lever under the action of a spring *m* is drawn backward against a stop *n* thereby breaking the contact between the pieces *h*<sup>2</sup> and the brushes *h*<sup>3</sup> and consequently breaking the circuit through C. If it be desired at the distant station to break the circuit through C this may be done by completing, and again breaking, the circuit

through the magnet A so as to further partially rotate the ratchet wheel F and the arms G G<sup>2</sup> as before described as to cause the arm G by coming into contact with a projection *h*<sup>3</sup> on the hinged arm H<sup>4</sup> to raise the projection *k* out of engagement with the lever H which will then be drawn back by the spring *m* as hereinbefore described, and so break the circuit through C by separating the contact *h*<sup>2</sup> from the brushes *h*<sup>3</sup>. The arm G<sup>2</sup> is then in the position to operate by the rotation of the ratchet wheel in the same manner as described with reference to the arm G.

It will be understood from the foregoing description and drawings that any required circuit may be completed and broken in one place or more places than one as desired from a distant point, while when the safety device is used, should the current or potential in the said circuit exceed the normal the circuit will be automatically broken.

We have described the arrangements as applied to safe guarding against excessive current but should it be necessary to safe-guard against excessive potential the magnet in C would be wound with a shunt coil instead of being inserted in the main circuit.

The said switch may be arranged it will be evident as either a single or double pole

switch or as a throw over switch to make one circuit when it breaks another.

We claim—

In an apparatus for completing or breaking an electric circuit, the combination of a circuit independent of the circuit to be completed or broken, an electromagnet in the independent circuit, and an armature therefor, with devices operated by the said armature to either make or break the main circuit by first magnetizing and then demagnetizing the said electro-magnet, and an electro-magnet in the main circuit, having an armature adapted to act upon the said device to break the main circuit upon a predetermined increase of the current in the said main circuit.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

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EDMUND S. G. REES.

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