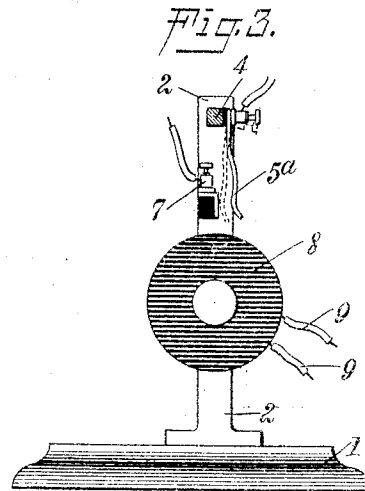
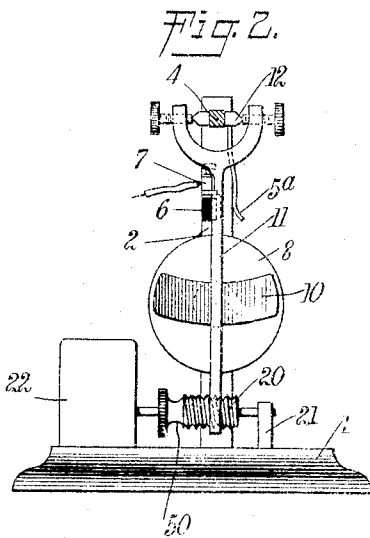
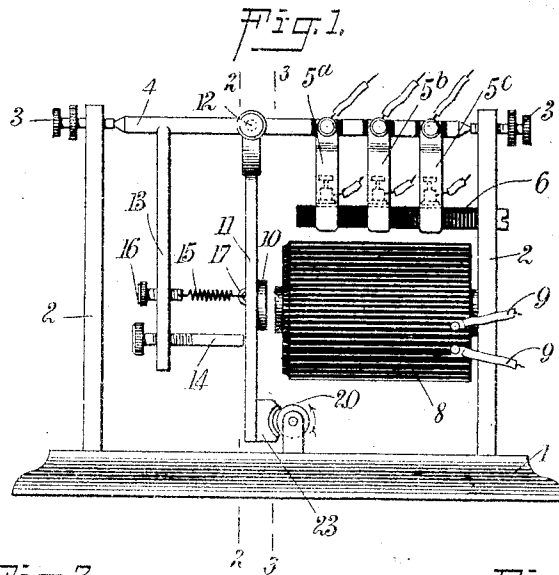


C. A. CASTLE.
CIRCUIT CLOSER.
APPLICATION FILED DEC. 19, 1911.

1,040,883.

Patented Oct. 8, 1912.

2 SHEETS—SHEET 1.



WITNESSES

William P. Goebel.
R. J. Gallagher.

INVENTOR

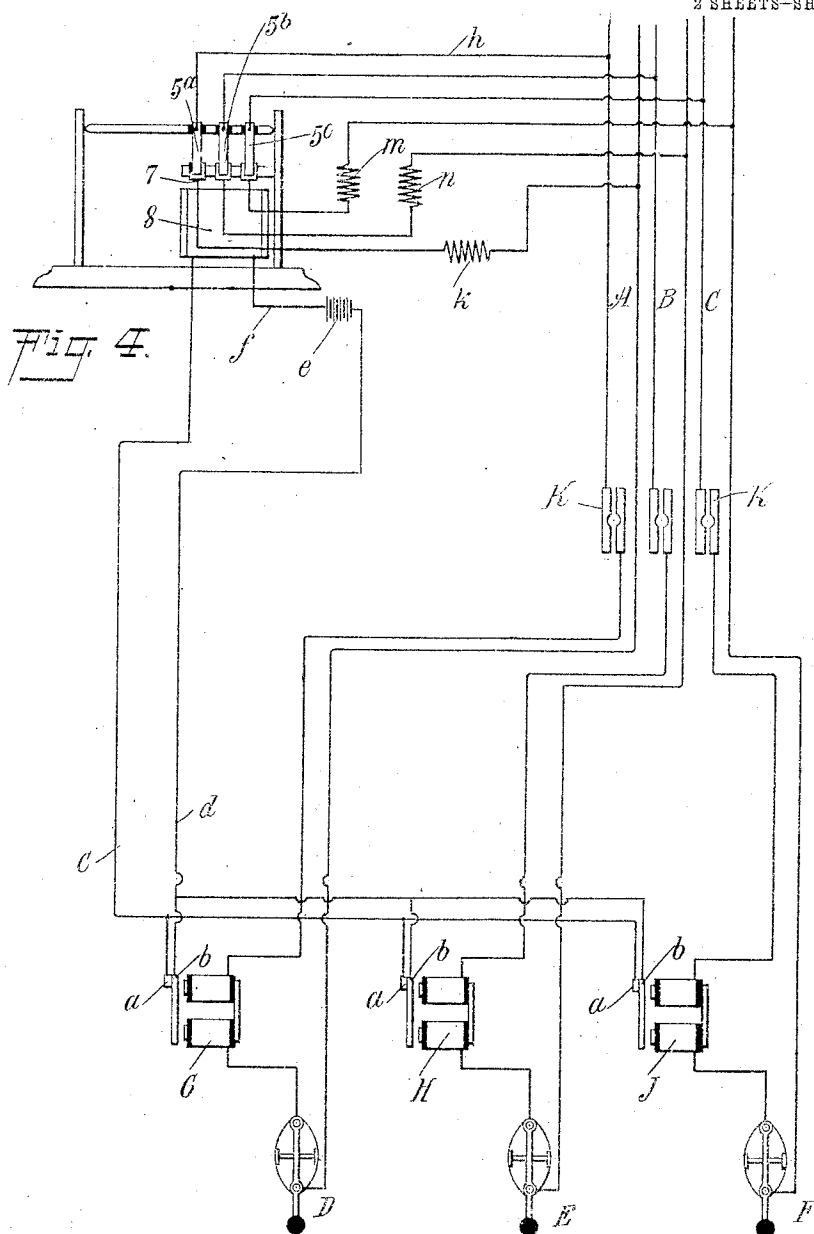
Clyde A. Castle

BY *Mumford*
ATTORNEYS

CIRCUIT CLOSER.

1,040,883.

2 SHEETS—SHEET 2.



William P. Goebel.
L. J. Gallagher.

Clyde A. Castle
BY *Munroe*
ATTORNEYS

UNITED STATES PATENT OFFICE.

CLYDE A. CASTLE, OF OLDHAM, SOUTH DAKOTA.

CIRCUIT-CLOSER.

1,040,883.

Specification of Letters Patent.

Patented Oct. 8, 1912.

Application filed December 18, 1911. Serial No. 666,655.

To all whom it may concern:

Be it known that I, CLYDE A. CASTLE, a citizen of the United States, and a resident of Oldham, in the county of Kingsbury and State of South Dakota, have invented a new and Improved Circuit-Closer, of which the following is a full, clear, and exact description.

My invention relates generally to circuit closers and more particularly it relates to a device which, while capable of general application, is especially adapted for use in connection with telegraph circuits.

The principal object of my invention is to provide a new and improved form of circuit closing device adapted to be connected across the lines of a telegraph circuit at a station whereby, if the key within the station should be left open or a plug between the key and the connections to the circuit closer be removed, thereby opening the line, the device will be actuated by means of a local circuit in order to close the line.

A further object of the invention is to provide a circuit closer of new and improved construction comprising a number of movable contacts and a number of fixed contacts adapted to be brought into electrical connection with each other, the said contacts being connected to the lines of telegraph circuits, there being a suitable electro-magnetic device for actuating mechanical means whereby the before-mentioned contacts are engaged so that if any of the lines should be open in the station the device will operate to close them, thereby permitting messages to be sent over the lines.

Other objects and advantages of the invention will appear as the description thereof proceeds, all of which is particularly pointed out and included in the appended claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference denote corresponding parts in all the views, and in which—

Figure 1 is a side view of the circuit closer; Fig. 2 is a sectional view thereof on the line 2—2 of Fig. 1; Fig. 3 is a sectional view thereof on the line 3—3 of Fig. 1; Fig. 4 is a diagrammatic view showing the wiring diagram of a telegraph station embodying three circuits with three keys and three relays.

The circuit closing device comprises a suit-

able base 1 having uprights 2 thereon carrying adjustable bearings 3 between which a spindle 4 is adapted to be movably carried, the spindle being provided at one side thereof with a number of contacting fingers 5^a, 5^b, 5^c, carried on suitable pieces of insulation whereby they are out of electrical contact with the spindle. Suitably supported adjacent the lower ends of the fingers 5^a, 5^b, 5^c is a member 6 having a number of contacting points 7 thereon, which are adapted to be placed in electrical contact with the fingers 5^a, 5^b, 5^c, when the spindle is turned a suitable distance, the member 6 being conveniently carried by the upright 2.

Suitably secured at a convenient point on the device is an electro-magnet 8 having terminals 9 thereon adapted to be placed in communication with a suitable battery through movable contacts, there being a movable armature 10 adjacent the pole face of the electro-magnet, the armature being carried on a lever 11 pivotally secured at 12 to the spindle 4 whereby the armature may move closely to or remote from the pole face. In order to adjust the range of movement of the lever 11, thereby preventing the armature from moving out of the field of influence of the pole, a suitable device is employed which may consist of a fixed arm 13 having an adjustable screw 14 at its lower end which limits the left-hand position of the lever 11, the lever being held in engagement with the end of this screw through the medium of a helical spring 15, one end of which is secured to an adjustable screw 16, the other end of which is secured at 17 to the lever 11. It is to be noted that the lever 11 may partake of a pendulum-like movement about the support 12 through the influence of the magnet 8 on the armature 10, it being also noted that any turning of the spindle 4 will also cause the lever 11 to move in a plane at a right angle to the plane of the said pendulum-like movement.

Referring particularly to Fig. 2 it will be noted that a worm gear 20 is suitably supported at one end by a bearing 21 carried on the base 1, the other end of the gear being in operative engagement with any suitable means whereby it may be turned, the said means preferably comprising a clock-work or other actuating device 22. On the lower end of the lever 11 and positioned opposite the worm gear 20 is a concave worm screw 23, the threads of which are of the same

pitch as the threads on the worm gear 20 whereby they are adapted to mesh with each other.

Referring particularly to Fig. 4 which is typical of the wiring of a telegraph station having three lines entering therein it will be noted that each of these lines is designated A, B, C; the keys D, E, F, are included within these lines, together with relays G, H, J; suitable plugs or lightning arresters K may be included in each of the lines if so desired. It will be noted that each of the relays or equivalent devices G, H, J, comprises a fixed contact *a*, together with a movable contact *b*, each of these parts being in contact in the figure and the said contacts being connected in multiple with the leads C, D; the lead C is in circuit with the electro-magnet 8 while the lead D is connected to any suitable battery E, the battery and the electro-magnet being connected together through a wire *f*. From one of the wires of the line A a conductor *h* is run to one of the contact fingers 5^a on the circuit closer, the fixed contact 7 adapted to engage with the movable contact 5^a being connected to the other wire of the line A through a suitable resistance *z*. Similarly one wire of each of the lines B, C, is connected to the movable contacts 5^b, 5^c, the fixed contacts 7 adapted to make electrical connection with these movable contacts being connected to the other wires of these lines through suitable resistances M, N.

Since a telegraph circuit is a closed one it is essential that the stations along any line have the keys thereon closed when messages are not being sent, the opening of any key opening the whole line and thereby putting it entirely out of commission. The purpose of my circuit closing device is to prevent the opening of a line for any length of time through the failure to close the key, or by reason of any movable contact or plug dropping accidentally from place, the operation thereof being substantially as follows. The clock or other actuating device 22 on the circuit closing device is continuous in its operation, that is, is running all the time, the worm gear 20 thereby constantly turning; now, if the key D in the line A is left open, the flow of current through the relay G will stop, the movable contact *b* thereby coming into engagement with the fixed contact *a* and closing the circuit through the electro-magnet 8 of the circuit closer whereby current from the battery *e* will energize the core of the magnet, the armature 10 being attracted thereto, the lever 11 being also moved whereby the worm screw 23 at the lower end thereof comes into engagement with the worm gear 20; since this worm gear is constantly turning, the engagement between the worm screw and the gear will move the lever 11 to the rear of Fig. 1,

thereby turning the spindle 4 and bringing the movable contacting fingers 5^a, 5^b, 5^c, into engagement with the fixed contacts 7, whereby the lines A, B, and C, are closed through these contacting fingers, together with the resistances M, N, K. Thus it will be seen that should any of the lines A, B, C, be left open through the keys D, E, F, or should any of the plugs K or equivalent devices fall out of place the line will be interrupted only for a short period until the worm gear 20 can move the lever 11 in order to bring the contacting fingers 5^a, 5^b, 5^c, to closed position, in which case the lines are again in operative relation. It is to be noted that at the left end of the worm gear 20 (Fig. 2) is a removed portion 50, the length of such removed portion being substantially equal to the width of the worm screw 23 so that when the screw has advanced to the left through movement of the gear it will come into engagement with such removed portion, thereby allowing the worm gear further turning without damage to the parts by reason of the engagement or otherwise.

Each key D, E, or F, and each relay G, H, or J, comprises an appreciable resistance to the flow of the current therethrough and in order to provide for normal operation of the line with the circuit closing device the resistances M, N and K are determined with respect to the resistance of the keys and the relays; since each of these resistances is in multiple with a single relay and key in each line efficient operation of each line requires that the current divide in such proportions that in the event of using the key and the relay in transmitting messages that the current pass through the key and relay and not through the resistance; also that in the event of any of the keys D, E, and F, being closed after having been accidentally left open that the closing of such key will permit the current to flow through either of the relays G, H, and K, and not continue through any of the resistances M, N, or K, so that the circuit closing device may return to inoperative position when such key is closed. It is to be noted that in a line comprising a number of stations each of which is provided with a circuit closer operable through a local battery, opening of the line in any station will cause the circuit closers in each station to act, consequent closing of the line returning each of the relays to inoperative position by reason of the current then passing through the keys and relays rather than through the resistances used with the circuit closer.

Of course the number of circuits which the device is adapted to handle may be varied at will and the value of the resistance used with the device will depend upon particular conditions to be met, such changes being those of design and included within the spirit of the appended claims.

Having thus described my invention, I claim as new, and desire to secure by Letters Patent:—

1. A circuit-closing device comprising a fixed contacting element, a movable contacting element, a lever movably mounted in position, a constantly turning screw, means on the lever adapted to engage the screw, whereby the lever may be swung and the contacts brought into engagement with each other, an armature on the lever, and an electro-magnet for coöperation with the armature for bringing the screw-engaging means on the lever into engagement with the screw.
2. A circuit-closing device comprising a fixed contacting element, a movable spindle, a contacting element carried by the spindle and adapted to engage the first contacting element, a lever movably connected to the spindle, an armature on the lever, a constantly turning screw adjacent the lever, another screw of equal pitch carried by the lever adapted for engagement with the constantly turning screw, means for keeping the lever remote from the said constantly turning screw, and an electro-magnet coöperating with the said armature in order to bring the screws into engagement with each other.
3. A circuit-closer comprising a fixed contacting element, a movable spindle, a contacting element thereon and moving therewith, the said contacting elements being adapted to engage each other, a lever mov-

ably carried by the spindle, an armature on the lever, a rotating worm, a screw on the lever adapted to engage the worm, a spring engaging the lever and keeping the worm and screw out of engagement, and an electro-magnet for coöperation with the said armature in order to bring the worm and the screw into engagement, whereby the lever and the spindle may be moved, thereby bringing the contacting elements into electrical connection.

4. A circuit closer comprising fixed contacts, a spindle movably mounted in position, contacts carried by the spindle and adapted to engage the said fixed contacts when the spindle moves, a lever movably carried by the spindle and turning therewith, a constantly turning worm, a coöperating element on the said lever adapted to engage the worm, an armature on the lever, and an electro-magnet for coöperation with the armature whereby, when the coöperating element on the lever engages the worm, the said lever will move and with it the spindle, whereby the said contacting elements will engage each other.

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

CLYDE A. CASTLE.

Witnesses:

F. B. CARTER,
H. G. JANS.