A. MAJOR.

ELECTRIC SIGNALING SYSTEM FOR MINES.

APPLICATION FILED JUNE 14, 1919.

1,405,853.

Patented Feb. 7, 1922.

3 SHEETS—SHEET 1.

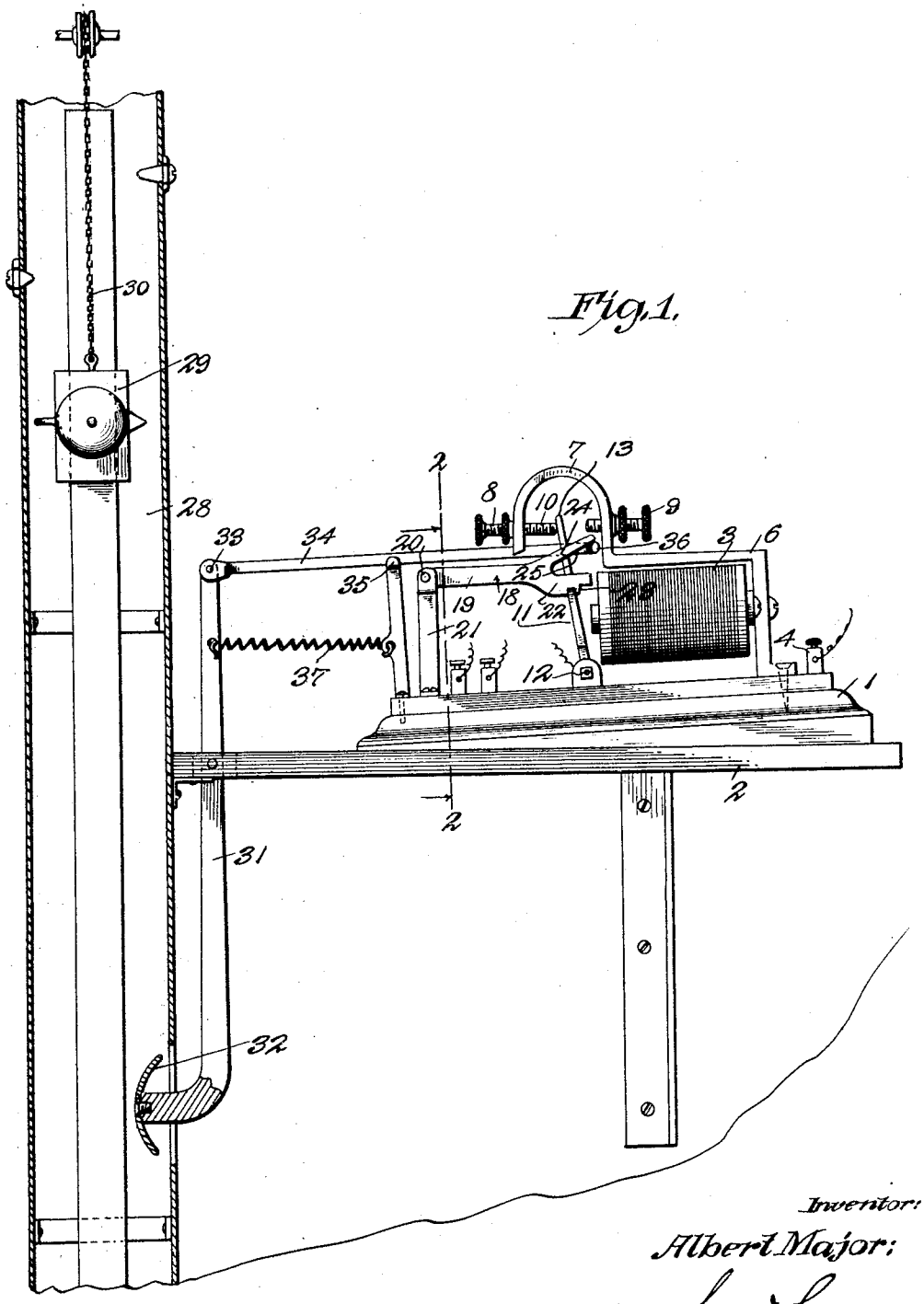


Fig. 1.

Inventor:
Albert Major:
by Lacey & Lacey,
Attys.

A. MAJOR.

ELECTRIC SIGNALING SYSTEM FOR MINES.

APPLICATION FILED JUNE 14, 1919.

1,405,853. Patented Feb. 7, 1922.

3 SHEETS—SHEET 2.

Fig. 2.

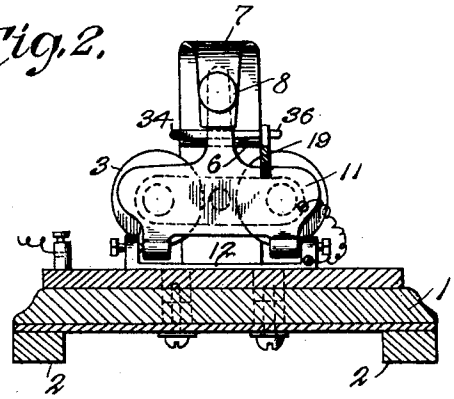


Fig. 4.

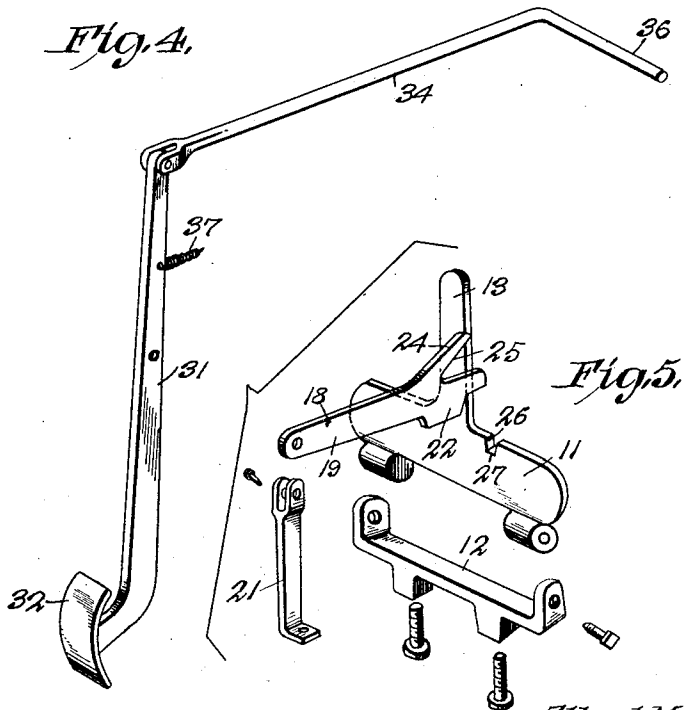


Fig. 5.

Inventor.

Albert Major:

by Lacey & Lacey,

Attys.

A. MAJOR.

ELECTRIC SIGNALING SYSTEM FOR MINES.

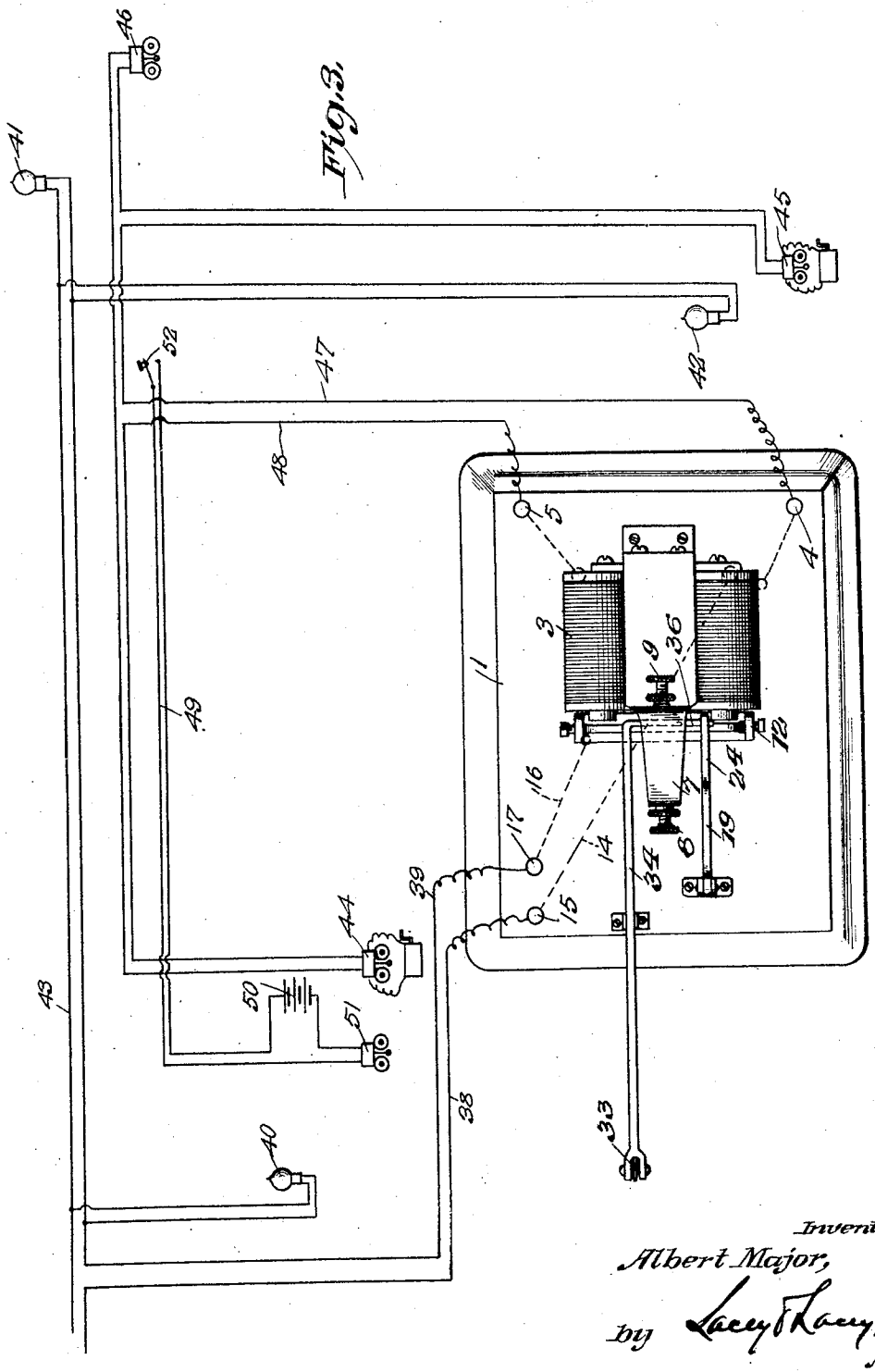
APPLICATION FILED JUNE 14, 1919.

1,405,853.

Patented Feb. 7, 1922.

3 SHEETS—SHEET 3.

Fig. 3.



Inventor:
Albert Major,
by Lacey & Lacey,
Attys.

UNITED STATES PATENT OFFICE.

ALBERT MAJOR, OF SHENANDOAH, PENNSYLVANIA.

ELECTRIC SIGNALING SYSTEM FOR MINES.

1,405,853. Specification of Letters Patent. Patented Feb. 7, 1922.

Application filed June 14, 1919. Serial No. 304,228.

To all whom it may concern:

Be it known that I, ALBERT MAJOR, a citizen of the United States, residing at Shenandoah, in the county of Schuylkill and State of Pennsylvania, have invented certain new and useful Improvements in Electric Signaling Systems for Mines, of which the following is a specification.

This invention relates to electric signaling systems for mines.

In coal and other mines it is customary to employ signaling devices in order that those in charge of the work may intelligently supervise the hoisting of the products of the mine and the workmen in the mine. Ordinarily a man is stationed at the bottom of the slope or shaft and one at the top of the slope or shaft, in addition to the engineer, and in the course of the work, the attendant at the bottom of the shaft, when conditions are proper, will press a button ringing an electric bell at the top of the shaft, this bell being usually so positioned that it will be heard by the attendant at the top of the shaft and also by the engineer. Then if the attendant at the top of the shaft finds that conditions are proper he presses a button which rings an electric bell which is heard by the engineer who then either starts on his trip or sets in motion the hoisting machinery. It not infrequently happens, however, that for one reason or another some time must elapse between the giving of the signal by the attendant at the bottom of the shaft and the engineer's performance of his duties with the result that because of the delay on the part of the engineer, the attendant at the bottom of the shaft will be taken unawares or conditions will have changed in the meantime so that the arrival of the mine train or cage will result in accident. Also there is frequently misunderstanding as to whether or not the attendant at the bottom of the shaft has actually given his signal and if he has not, and the attendant at the top of the shafts acts on the belief that he has, there is, of course, likelihood of accident. In consideration of the foregoing the present invention has as its primary object to provide an electric signaling system for mines constructed to operate in such a manner that there can be no misunderstanding on the part of the attendants responsible for operation thereunder, the signals displayed being maintained until the engineer has begun to perform his duties and being automatically discontinued when the train has started on its trip into the mine or the cage has started to lower, thus giving ample warning to the attendant at the bottom of the shaft or slope that he is to maintain conditions accordingly.

In the accompanying drawings:

Figure 1 is a view in side elevation of a portion of the mechanism embraced in the system embodying the present invention;

Fig. 2 is a vertical transverse sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a plan view of the electro-magnetic circuit closer shown in Figs. 1 and 2 of the drawings, the view also illustrating the wiring of the circuits embraced in the system;

Fig. 4 is a perspective view illustrating a portion of the structure shown in Fig. 1;

Fig. 5 is a perspective view illustrating a portion of the electro-magnetic circuit closing device.

The invention comprehends a novel arrangement of signal circuits whereby momentary audible signals may be given, and prolonged visible signals may be displayed, an electro-magnetic circuit closing device being interposed in the audible signal circuit and designed to be actuated, when this circuit is energized, so as to close the visible signal circuit and maintain the same closed position for a more or less prolonged period of time, or more specifically until conditions are such that the display of the visible signals is no longer required or desired, means being provided for automatically, at such time, actuating the said electromagnetic circuit closing device to open the visible signal circuit.

As a matter of convenience I will first describe the electro-magnetic circuit closing device and then describe the signal circuits and the manner in which the system is to operate.

In the drawings the numeral 1 indicates in general the base of the electro-magnetic switch device, which base is supported in any suitable manner as for example by a bracket 2 and preferably in the inclined position shown in Fig. 1 of the drawings, for a purpose to be presently explained. Mounted upon this base 1 are a pair of electro-magnets 3 wired to binding posts 4 and 5 upon the said base. The numeral 6 indicates a bridge-piece which is secured to the

base 1 and extends above the magnets 3 and is provided with an arch 7 through which are adjustably threaded screws 8 and 9. The screw 8 is provided with a fiber tip 10 and constitutes an abutment for the armature for the magnets, which armature is indicated by the numeral 11 and is mounted for rocking movement upon the usual bracket 12 upon the base 1. The armature is provided with an upstanding finger 13 designed in one position of the armature to strike against the fiber point 10 of the abutment screw 8 and in the other position of the armature to strike against the end of the screw 9 which constitutes an electrical contact. The bridge 6 which is in electrical contact with the contact screw 9, is connected by a wire 14 with a binding post 15 upon the base 1, the armature being electrically connected by a wire 16 with a binding post 17 upon the said base as clearly shown in Fig. 3 of the drawings. At this point it will be evident that when the armature is not attracted by the electro-magnets 3, it will, by reason of the inclined disposition of the base 1, rest by gravity against the abutment screw 8 as shown in Fig. 1 of the drawings, but of course, when the electro-magnets are energized and the armature is attracted to the cores thereof, it will be brought into contact with the contact screw 9 and consequently with the bridge piece 6. In order to hold the armature in its last mentioned position for an indefinite period of time, a detent is provided and is indicated in general in the drawings by the numeral 18. This detent comprises an arm 19 which is pivoted as at 20 at one end to the upper end of a bracket 21 upon the base 1 and at its free end the arm is provided with a nose 22 having a beveled shoulder 23. The arm is provided above the nose with a finger 24 which is inclined upwardly and has its lower edge correspondingly disposed, the inclined lower edge of the said finger being indicated by the numeral 25. A notch 26 is formed in the upper edge of the armature 11 and has an inclined bottom wall 27. As illustrated in Fig. 1 of the drawings, the nose 23 normally rests at its lower edge in the notch 26 with its shoulder 23 located in advance of the armature plate 11, or in other words, in advance of that face of the plate which is presented toward the cores of the electro-magnets 3. However, when the electro-magnets are energized, and the armature is attracted to the cores thereof, the detent arm 18 will drop as the shoulder 23 of its nose 22 rides into engagement with the inclined bottom wall 27 of the notch 26 and thus the armature will be held in attracted position and consequently in electrical contact with the contact screw 9. As a result, a momentary energization of the electro-magnets will move the armature to position closing the circuit in which it and the screw 9 are located, and the armature will be held in this position even after deenergization of the electro-magnets.

In order that the armature may be released for return to its normal position under conditions to be presently made clear, means are provided which will now be described. The numeral 28 indicates the guide member of an indicator such as is employed in connection with mine elevators or cages, and similar mechanisms, to indicate the position, for example, of the cage within the shaft, and 29 indicates the slide which is mounted in this guide and which is connected by a chain or cable 30 with the mechanism of the indicator which is automatically controlled by the cage hoisting and lowering devices. A rocking lever arm 31 is mounted at one side of the guide 28 and at its lower end carries a shoe 32 which is positioned in the path of downward movement of the slide 29. To the upper end of the arm 31 there is pivotally connected as at 33, one end of the stem of a lifting member 34 resting slidably in a guide or support 35 upon the said base 1. The free end of this member is bent laterally to provide a finger 36 which extends transversely beneath the inclined lower edge 25 of the finger 24 of the detent member 18 as clearly shown in Fig. 1 of the drawings. A spring 37 is connected to the guide and support 35 and to the lever arm 31 above the pivot for the latter and it will now be understood that while this spring normally holds the lever rocked to substantially the position shown in Fig. 1 of the drawings in which position the finger 36 will be located beneath the forward end of the finger 24, when the slide 29 rides past the shoe 32, the said lever arm 31 will be rocked against the tension of the spring 37 thus pulling the finger 36 longitudinally inwardly beneath the finger 24, and as the said finger 36 rides against the inclined lower edge of the said finger 24, the detent 18 will be lifted thus causing the shoulder 23 of its nose 22 to clear the bottom wall of the notch 26 in the upper edge of the armature plate and permitting the armature plate to drop to the position shown in Fig. 1 of the drawings.

A line wire 38 connects with the binding post 15, and a wire 39 leads from the binding post 17 to lamps 40, 41 and 42 located respectively in the engine room, at any convenient point at the top of the shaft, and at any convenient point at the bottom of the shaft or slope. A second line wire 43 also leads to these lamps and it will be evident that when this circuit is closed through the contact of the finger 13 of the armature with the contact screw 9, all of the lamps will be lit and will remain lighted so long as the armature is held in contact with the said

screw. The numeral 44 indicates a generator and bell located in the engine room; the numeral 45 indicates a generator and bell located at the bottom of the shaft or slope; and, the numeral 46 indicates an electric bell located at the top of the shaft at any convenient point. These bells are in an electric circuit including the wires 47 and 48, which wires are connected with the binding posts 4 and 5 respectively.

The numeral 49 indicates in general an electric circuit in which is arranged a battery 50, a bell 51, located in the engine room, and a switch 52, such for example as a push button, located at any convenient point at the top of the shaft.

The operation of the system is as follows: When conditions at the bottom of the shaft are favorable for the operation of the mine train or the hoisting mechanism, the attendant at the bottom of the shaft or slope will operate the generator 45 thus momentarily closing the circuit in which this generator is located and sounding the audible signals comprising the bells 44 and 46 and also energizing the electro-magnets 3. Thus the attendant at the top of the shaft and the engineer will be apprised by the bells 46 and 44 respectively, of the fact that the way is clear at the bottom of the shaft or slope. The attendant at the top of the shaft will, if he then wishes to direct the engineer to proceed, close the switch 52 so as to ring the bell 51 in the engine room. When the attendant at the bottom of the shaft operates the generator 45, to sound the audible signals and to close the circuit through the electromagnets 3, the electric light circuit heretofore referred to will be closed in the manner previously stated so that the lamps 40, 41 and 42 will all be lighted, this circuit being maintained closed until the slide 29 of the indicator heretofore referred to, rides against the shoe 32 thereby lifting the detent 18 so as to release the armature 11 and breaking the light circuit. Therefore all three lights will be kept burning so that the attendant at the bottom of the shaft will know that his signal has been received and the engineer and attendant at the top of the shaft will know that the attendant at the bottom of he shaft has given his signal. Of course, when the slide 29 reaches the shoe 32 and the light circuit is opened and the lights therefore extinguished, the attendant at the bottom of the shaft will be warned that the mine train or cage is approaching the bottom of the shaft or slope, and likewise the attendant at the top of the shaft will be apprised of this fact.

It will be understood that due to the inclination of the base 1 so as to cause the armature 11 to assume by gravity the position shown in Fig. 1 of the drawings, the provision of a spring for the armature is rendered unnecessary.

Having thus described the invention, what is claimed as new is:

1. In an electro-magnetic circuit-closing device, a magnet, an armature therefor arranged to move therefrom by gravity, a contact for engagement by the armature, the armature and contact constituting elements of a circuit-closing means, a detent extending over the armature and having a shoulder to engage the outer face of the armature and hold the armature in engagement with the contact, and means operable to lift the detent to inactive position, the said means comprising a rocking member and a reciprocating member connected therewith and having a lateral finger engaging under an inclined portion of the detent at the free end of the same.

2. In a device of the class described, the combination of an electro-magnet, an armature therefor pivotally mounted at its lower end and arranged to swing from the electro-magnet by gravity, a contact arranged to be engaged by the armature whereby to close an electric circuit, a detent pivotally mounted at that side of the armature remote from the electro-magnet and having its free end bearing constantly on the edge of the armature, the said detent and the armature having inter-engaging surfaces whereby when the magnet is energized the armature will be caused to engage the said contact and the detent will bear upon the outer face of the armature and prevent return movement of the armature after the magnet is deenergized, and a releasing member slidably engaging the detent and operable to release the same from locking engagement with the armature and permit the armature to move out of engagement with said contact.

3. In a device of the class described, the combination of an electro-magnet, an armature therefor, a contact to be engaged by the armature upon energization of the magnet whereby to close a circuit, a pivoted detent bearing at its free end constantly upon the armature and having a stop shoulder to engage the outer face of the armature and hold the same in engagement with the said contact after the magnet is deenergized, a finger extending upwardly and inwardly from said detent, and a reciprocatory releasing device engaging under said finger and operable to lift the free end of the detent from the armature and permit the armature to recede from said contact.

4. The combination of an electro-magnet, an armature therefor pivoted at its lower end and arranged to permit its upper end to swing from the electro-magnet by gravity, said armature having an upstanding finger, an electrical contact to be engaged by said

finger when the electro-magnet is energized, a pivotally mounted detent at the outer side of the armature and having its free end riding on the upper edge of the armature and provided with a shoulder to bear against the outer face of the armature and hold the armature against the contact when the electro-magnet is deenergized, an upwardly inclined finger extending from the upper edge of the detent, a vertically disposed rocking lever, a lifting member pivoted to the upper end of said lever and provided at its free end with a lateral finger engaging the under edge of the finger on the detent, a support for said lifting member, means acting to yieldably hold the lifting member finger at the free end of the finger on the detent, and means for rocking said lever whereby to cause the lifting member finger to ride under the detent finger and lift the detent to permit release of the armature from the electric contact.

In testimony whereof I affix my signature.

ALBERT MAJOR. [L. S.]