

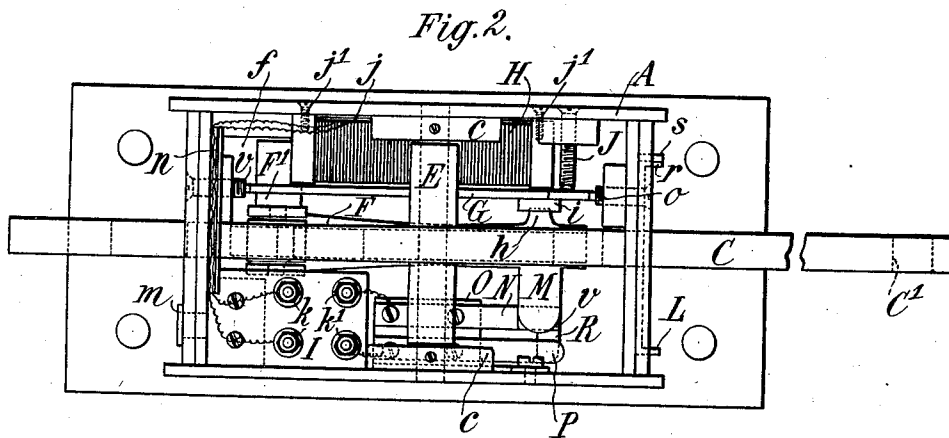
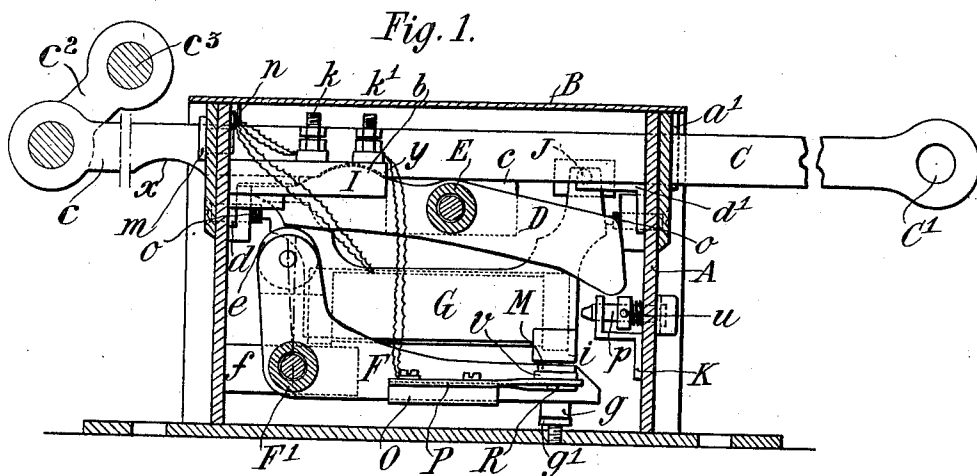
C. LEGRAND & A. ARMEL.
SAFETY BOLT TO LOCK AND RELEASE THE LEVERS SERVING TO OPERATE FROM A DISTANCE A
SWITCH, SIGNAL, &c., FOR RAILWAYS.

1,029,202.

APPLICATION FILED APR. 7, 1909.

Patented June 11, 1912.

2 SHEETS—SHEET 1.



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2 SHEETS-SHEET 2.

Fig. 3.

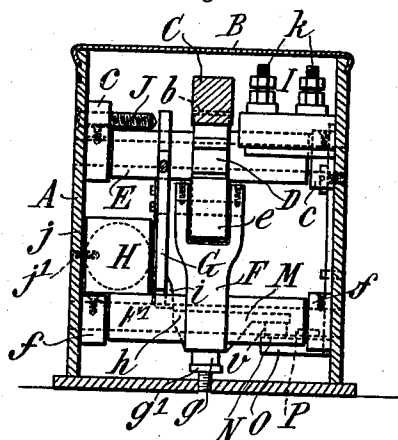


Fig. 5.

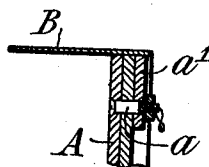


Fig. 4.

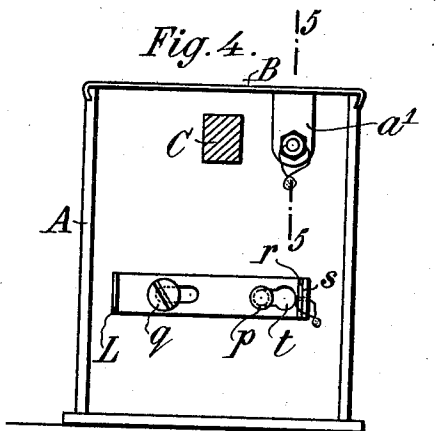
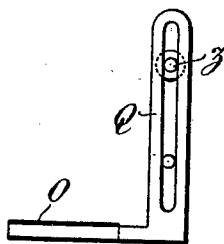


Fig. 6.



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UNITED STATES PATENT OFFICE.

CHARLES LEGRAND AND ALEXANDRE ARMEL, OF PARIS, FRANCE.

SAFETY-BOLT TO LOCK AND RELEASE THE LEVERS SERVING TO OPERATE FROM A DISTANCE A SWITCH, SIGNAL, &c., FOR RAILWAYS.

1,029,202.

Specification of Letters Patent.

Patented June 11, 1912.

Application filed April 7, 1909. Serial No. 488,509.

To all whom it may concern:

Be it known that we, CHARLES LEGRAND and ALEXANDRE ARMEL, both citizens of the Republic of France, and residents of Paris, France, have invented certain new and useful Improvements in Safety-Bolts to Lock and Release the Levers Serving to Operate from a Distance a Switch, Signal, &c., for Railways, of which the following is a description.

The safety bolt forming the subject of this invention is intended to lock and release a lever serving to operate from a distance a switch, signal, etc., for railways, tramways, lines of the type of the Paris Metropolitan Railway, etc. This bolt acts under the influence of an electric current in order to effect the release, the locking bar being rendered stationary until such time as an electro-magnet arranged in the apparatus has received a releasing electric current, transmitted either by an official in charge of these operations or by an automatic organ at a greater or smaller distance from the bolt.

In the apparatus forming the subject of the invention, the locking bar is locked optionally and with the greatest security by an intermediate rocking bar in connection with a bent lever fitted with a roller facilitating the displacement of this lever with relation to the intermediate rocking bar which effects the locking in conjunction with the sliding bar. The displacement of this locking bar is therefore effected without any resistance when the same is operated concurrently with the lever of the switch or signal. The construction of the bent lever, fitted with roller, the action of which is thus combined with that of the locking bar by means of the intermediate rocking bar, is such that the ratio between the two arms of the lever is very considerable, so that a very feeble action, which may be easily produced by an electric current, is sufficient to engage this lever at the end of the longer arm, the shorter arm, however, transmitting a considerable effort to the locking bar; a force of about $3\frac{1}{2}$ ounces produced by the electro-magnet is thus transformed into one of several hundred pounds acting on the locking bar.

The arrangement and operation of this

electric bolt will be readily understood from the following description, in relation to the accompanying drawing.

Figure 1 is a longitudinal elevation of the bolt, the front part of the outer casing having been removed; Fig. 2 is a plan with the cover taken off; Fig. 3 is an end view, the left side of the outer casing being assumed to have been removed; Fig. 4 is an outside view of the right hand side of the casing; Fig. 5 is a section through a detail along the line 5-5 of Fig. 4; Fig. 6 is a separate view of an angle piece serving to regulate the current for a warning signal.

The apparatus consists principally of a rectangular metal casing A fitted with a cover B that slides in two grooves cut in the upper part of the long sides of the casing A. This cover is kept closed by means of a single bolt a which passes through one end of the casing A, and a lug a' in one piece with the cover B. The bolt a may be sealed for security. This casing A contains the bolting members described below. In the upper part of each end it is pierced by a rectangular opening for the passage of the locking bar C, which has to undergo a movement of displacement in one or other direction along a predetermined course, to insure the proper working of the switch lever or signal lever to which it is connected, by the eye C' formed at one end, by means of a loop or other suitable device. The locking bar is actuated by a lever or arm C² on a shaft C³ rocked by hand or by any suitable mechanism. This locking bar C is provided on its lower face with two or more oblong rounded notches x and y in one of which (according to circumstances) there engages the rounded projecting part b of a rocking bar D mounted on a horizontal axis E. It is this rounded part b which, by engaging with one or other of the notches x or y of the lock bar B, impositively locks the said bar and renders it quite immovable, as long as the rocking bar D is held fixed. The axis E is preferably hollow so as to turn on a central shaft fixed in bosses c in one piece with the sides of the casing A. The upward movement of the rocking bar D is limited by one of the two plates d d' fixed to the casing A. The other end of the rocking bar D acts with a camming action

on a roller *e* mounted on the vertical limb of the bent lever F; this roller offers the great advantage of running very easily and thus preventing any injurious friction.

5 The bent lever is supported by a hollow axis F' pivoting in the same manner as the rocking bar D, that is to say about a shaft fixed on bosses *f* in one piece with the lower part of the casing A. This axis F' is parallel to the pivoting axis E of the rocking bar D. The bent lever F consists, as can be seen, of a vertical limb, forming a socket for the said roller *e*, and a horizontal limb. The end of this latter carries a lower heel

10 piece *g* intended to rest on a block *g'* screwing into the bottom of the casing A.

By adjusting the height of the heel piece *g* the descent of the lever F can be regulated. Thus the horizontal distance between the perpendiculars passing through the center of the axis F' and through the center of the roller *e* may be nicely determined. It is the end of the long arm of this lever F that is retained by the armature G of an electro-magnet H intended to receive the electric current, which on reaching the apparatus is to effect the release by enabling the locking bar C to be operated.

20 With this object one end of the lever F is fitted with a lateral lug *h* which makes contact with the underside of a lug *i* on the armature G when the latter is free, that is to say is not being attracted by the electro-magnet H. This is what happens when the

25 locking bar C is in locking position and when consequently the rounded projection *b* of the rocking bar D is engaged in one of the notches *x* or *y*. In this position the heel piece *g* of the lever F is resting on the block

30 *g'* at the bottom of the casing.

When the electro-magnet H attracts the armature G by its very wide polar extremities, on the passage of an electric current, the lug *i* of the armature releases the lug of the lever F. If, therefore, a pushing or a pulling effort be applied to the bar C, this latter acts, through the rocking bar D, on the roller *e* of the lever F. This lever swings at F', there being nothing to oppose

35 this movement. Furthermore the end of its horizontal member comes into contact with the corresponding end of the rocking bar D. In consequence of the resulting impact this bar is pushed upward and comes in contact

40 with the plate *d'*. Owing to this movement the rounded projection *b* is readily and effectually disengaged from the bar C and allows free passage to the latter.

By reference to Fig. 1 it will be clear that

45 by first removing the member G and consequently releasing the end of the long horizontal arm of the lever F, the vertical arm of this lever will move to the left. If we consider now the vertical line passing

50 through the axis of rotation of the bent le-

ver F and that passing through the axis of the roller *e*, the horizontal distance between these two vertical lines will be the greater as the vertical arm of the lever is displaced the more toward the left, that is to say, as the long horizontal arm of the lever is raised the more. It is this horizontal distance between the two vertical lines which constitutes the mathematical short arm of the lever. If the length of this short arm is m and the length of the long arm is M , then $\frac{M}{m}$ is the relation between the strong force which can be exerted on the roller *e* and the small force which is sufficient to move the end of the horizontal arm. This is an important feature of the apparatus.

It will be evident that the high ratio between the arms of the lever F enables the locking bar C to pass quickly and without resistance over the part *b* of the mechanism a distance separating the notches *x* and *y* on the said bar; the rocking of the intermediate bar D being also accentuated rapidly by the ascent of the horizontal limb of the lever F. As soon as the locking bar C has been moved and one of the notches has come into position opposite to the projection on the rocking bar D, all the parts return, of themselves, to their original positions without the aid of any return spring, an arrangement which prevents all risk of irregular working and does away with the necessity for adjustment.

The electro-magnet H, the power and resistance of which can be selected in accordance with requirements, enables the whole force of the magnetic field to be utilized, through the following devices. A copper plate *j* is interposed between the wall of the casing A and the magnet, and the fixing screws *j'* are also of copper. The electro-magnet H is connected to terminals *k* fixed on a piece of insulating material I, and the conducting wires pass to the outside through an opening *m* made in the casing A. A

55 trough *n* fixed above the bar C, supports the wires coming from the terminals to the magnet H and keeps them from rubbing against the bar C and retarding its action.

The armature G pivots at each end on hollow screws *o* mounted on the ends of the casing A, its stroke being regulated by a copper screw J fixed to the interior of the box and making contact with a notch in the armature G.

Should there be an accidental interruption of the current, the armature G may be fixed in a suitable position for enabling the locking bolt to have free play, by a device composed of a copper rod *p* guided in a support K fixed inside the casing A and by a hole pierced in one end of that casing. The inner end of the rod *p* is pointed and its outer end is provided with a head which is normally engaged by a grooved slide L,

fastened on the outside of the casing A by a screw *q* and arranged to slide sidewise. This slide is fitted with a lug *r* that strikes against a stop *s* mounted on the casing A, so that the slide L may be sealed. When a stoppage of current occurs from any cause, the slide L is released from its seal and is shifted to the left so as to bring the enlarged hole *t* into register with the head of the rod *p*, which latter is then drawn inward by the spring *u* and applies pressure to the armature G, thus leaving the mechanical members at liberty to move. The conical point of the rod *p* stands beyond the end of the armature G at such a position laterally that the advancement of the rod into the case under the action of its spring *u*, swings the armature to cause the application of it against the poles of the electro-magnet, and consequently to disengage the long arm of the lever F so as to permit the operation of the bar C.

In order to enable the working of the apparatus to be verified at a distance, the horizontal limb of the lever F is provided with a lateral stop M which when the lever F rests on the bottom of the casing A comes in contact with an insulator *v* in one piece with a flexible conducting strip N screwed on to an insulating piece O. On to this piece O there is also screwed a non-flexible conducting strip P underneath which an extension R of the strip N makes contact. The strips N and P receive current through two wires connected to two terminals *k'* mounted on the insulating piece I and connected in turn with the two poles of a warning apparatus, lamp or bell.

It will be evident that when the lever F is resting, by the piece *g*, on the bottom of the casing A, the lateral stop M rests against the insulating piece *v* and therefore on the strip N, so that there is no contact between the two strips N and P and the warning apparatus does not come into operation. On the other hand when the draw bar C is in motion, the lever F swings and as the stop M no longer exerts pressure on the flexible strip N, this latter tends to rise so as to bring the part R into contact with the underside of P; contact is thus established and the warning apparatus acts for a moment until the lever F has returned to its working position.

The insulating piece O is mounted in the lower part of a slide Q held by a clamping screw *z* under which it can move up or down in order that the stop M may exert sufficient pressure on the strip N to keep the same out of contact with the strip P when the lever F is engaged. Hence this contact can be adjusted with ease.

The casing A which contains all the organs, may be of sheet metal, the walls and bottom being fastened together by rivets.

It may also be made of cast steel, the internal bosses being then cast along with the outer shell.

The locking bar C, which is usually provided with two notches, may also be provided with a larger number, so as to enable successive and optional lockings to be effected.

What we claim and desire to secure by Letters Patent is:—

1. The combination of a locking bar, a rocking lever having locking engagement with said locking bar, a locking lever, one arm of which is nearly normal in direction to the rocking lever and holds the same against the locking bar so that the back pressure of said rocking lever on said arm is in a direction nearly coincident with the length of said arm, said rocking lever having a camming engagement with the end of said arm by which, when the arm is free, the rocking lever can be forcibly moved from its locking position, an armature adapted to lock or release said locking lever, and an electro-magnet controlling said armature.

2. The combination of a locking bar, a rocking lever having locking engagement with said locking bar, a locking lever, one arm of which is nearly normal in direction to the rocking lever and holds the same against the locking bar so that the back pressure of said rocking lever on said arm is in a direction nearly coincident with the length of said arm, said rocking lever having a camming engagement with the end of said arm by which, when the arm is free, the rocking lever can be forcibly moved from its locking position, said locking lever having also a long arm, an armature adapted to lock or release the long arm of said locking lever, and an electro-magnet controlling said armature.

3. The combination of a locking bar having rounded notches therein, a rocking lever fixed against bodily movement with said locking bar, a projection thereon adapted to engage the notches in the locking bar, a bent lever, one arm of which is nearly normal in direction to the rocking lever so that the bent lever is swung on its pivot when the rocking lever is depressed by the sliding of the locking bar over the rounded notches, a vibrating armature adapted to lock or release the bent lever, and an electro-magnet controlling said armature.

4. The combination of a locking bar, rounded notches in said locking bar, a rocking lever fixed against bodily movement with said locking bar, a projection thereon adapted to engage the notches in the locking bar, a bent lever one arm so far displaced from a right angular position in regard to the rocking lever that the bent lever is swung on its pivot when the rocking lever is

depressed by sliding the locking bar over the rounded notches, a vibrating armature adapted to lock or release the long arm of the bent lever, an electro-magnet for displacing said armature to permit the release of the bent lever whereby the movement of the locking bar is permitted, a stop on the long arm of the bent lever, a stop on the vibrating armature, said stops serving to lock the bent arm and through it the whole of the mechanism including the locking bar when the armature is unattracted.

5. The combination of a locking bar, rounded notches in said locking bar, a rocking lever, a projection thereon adapted to engage the notches in the locking bar, a bent lever one arm so far displaced from a right angular position in regard to the rocking lever that the bent lever is swung on its pivot when the rocking lever is depressed by sliding the locking lever over the rounded notches, a vibrating armature adapted to lock or release the long arm of the bent lever, an electro-magnet for displacing said armature to permit the release of the bent lever whereby the movement of the locking bar is permitted, a stop on the long arm of the bent lever, a stop on the vibrating armature, said stops serving to lock the bent arm and through it the whole of the mechanism including the locking bar when the armature is unattracted, a stop adapted to push the armature to attracted position and means for operating said stop from the exterior of the apparatus whereby the mechanism and locking bar may be released in case of accident, and means for sealing said external means against improper use.

6. The combination of a locking bar, rounded notches in said locking bar, a rocking lever, a projection thereon adapted to engage the notches in the locking bar, a bent lever one arm so far displaced from a right angular position in regard to the rocking lever that the bent lever is swung on its pivot when the rocking lever is depressed by sliding the locking lever over the rounded notches, a vibrating armature adapted to lock or release the long arm of the bent lever, an electro-magnet for displacing said armature to permit the release of the bent lever whereby the movement of the locking bar is permitted, a stop on the long arm of the bent lever, a stop on the vibrating armature, said stops serving to lock the bent arm and through it the whole of the mechanism including the locking bar when the armature is unattracted, a stop adapted to push the armature to attracted position and means for operating said stop from the ex-

terior of the apparatus whereby the mechanism and locking bar may be released in case of accident, and means for sealing said external means against improper use, contacts made and broken by the long arm of the bent lever, warning apparatus actuated by said contacts and electrical circuits whereby said warning apparatus is actuated at a distance, and indicates the position of the mechanism.

7. The combination of a locking bar, a rocking lever having locking engagement with said locking bar, a locking lever, one arm of which is nearly normal in direction to the rocking lever and holds the same against the locking bar so that the back pressure of said rocking lever on said arm is in a direction nearly co-incident with the length of said arm, said rocking lever having a camming engagement with the end of said arm by which, when the arm is free, the rocking lever can be forcibly moved from its locking position, an armature adapted to lock or release said locking lever, an electro-magnet controlling said armature, and means for preventing said armature from holding said locking bar in operative position.

8. The combination of a locking bar, a rocking lever having a rounded projection near one end, said bar presenting on its under faces notches designed to receive in two of its positions said rounded projection, a bent lever having one end located under the end of the rocking lever, said lever having arms of unequal length, the short arm of said bent lever occupying a position almost normal to the direction of the locking bar, so that when said rounded projection is completely engaged in one of the notches of the locking bar, a considerable pushing or pulling force may be exerted on the locking bar to assure the complete and perfect locking of said locking bar in one or the other of its positions, the ratio of the long arm of the bent lever to its short arm being considerable, so that a very slight force will effect a quick unlocking and permit the instantaneous oscillation of the rocking lever no matter how great a strain is exerted upon the extremity of the short arm of the bent lever.

In witness whereof, we have hereunto signed our names in the presence of two subscribing witnesses.

CHARLES LEGRAND.
ALEXANDRE ARMEL.

Witnesses:

H. C. COXE,
RENÉ BARDY.