No. 837,857. PATENTED DEC. 4, 1906.

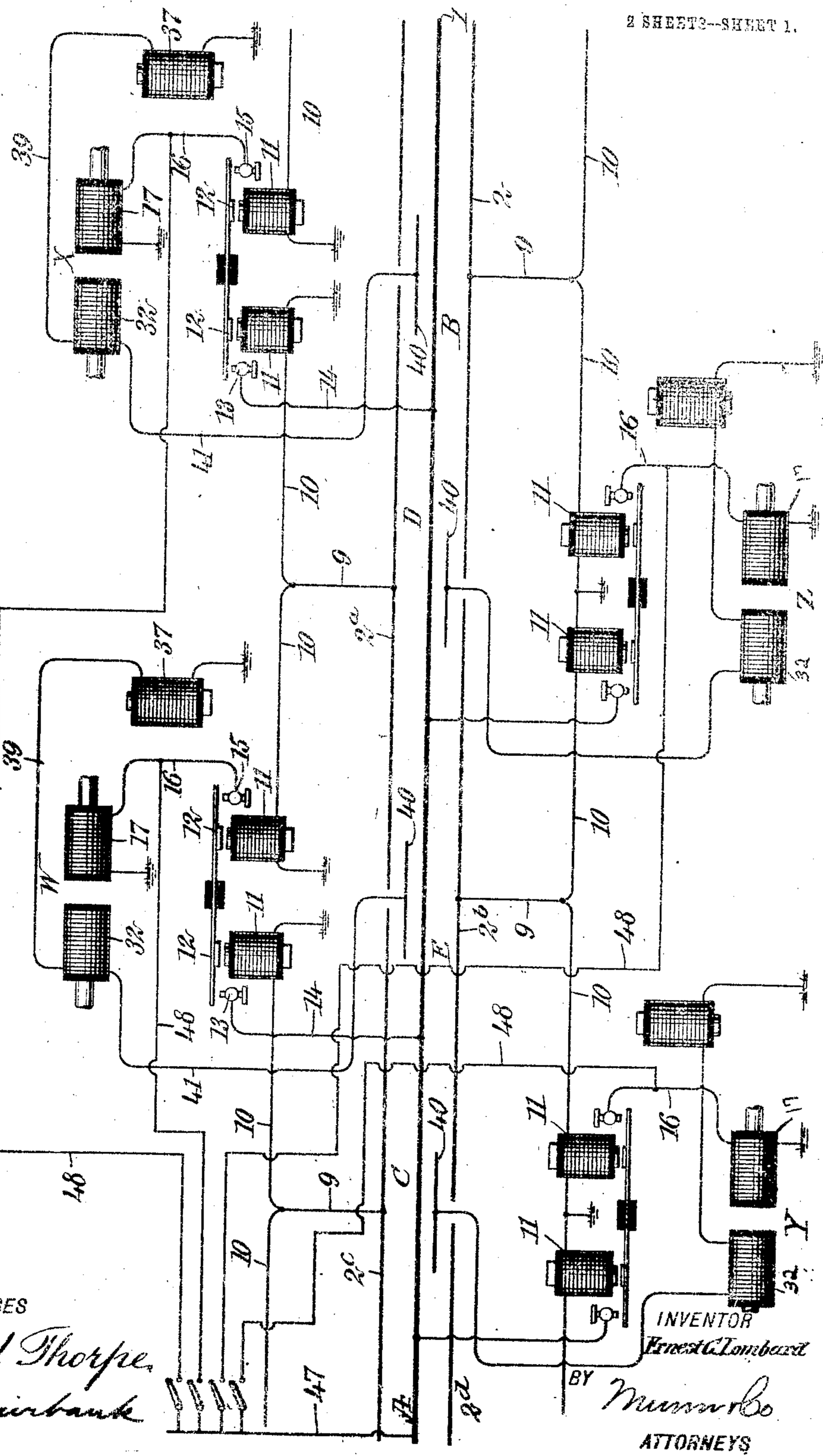
E. C. LOMBARD.

RAILROAD SIGNAL.

APPLICATION FILED SEPT. 22, 1906.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

Edward Thorpe.

C. W. Fairbanks

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2 SHEETS—SHEET 2.

Fig. 2,

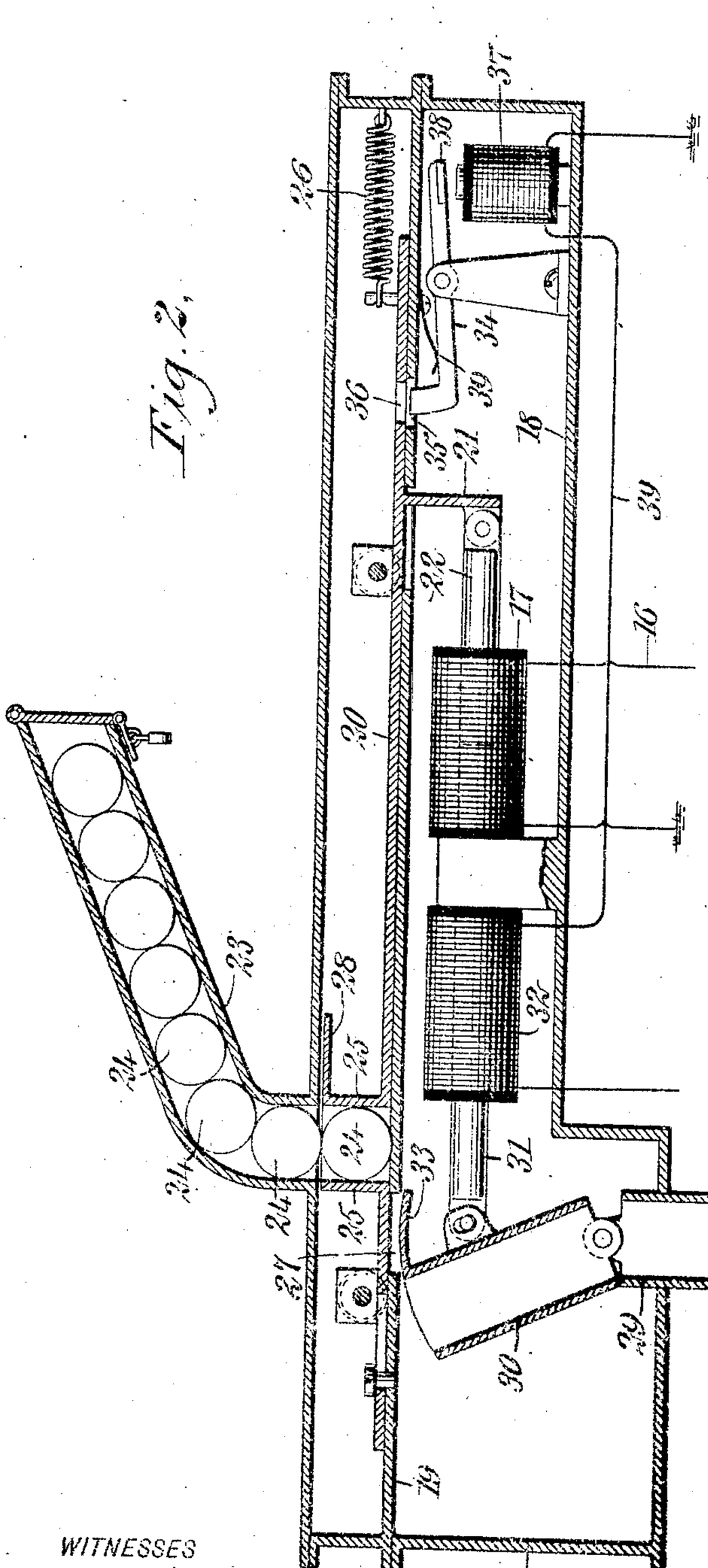
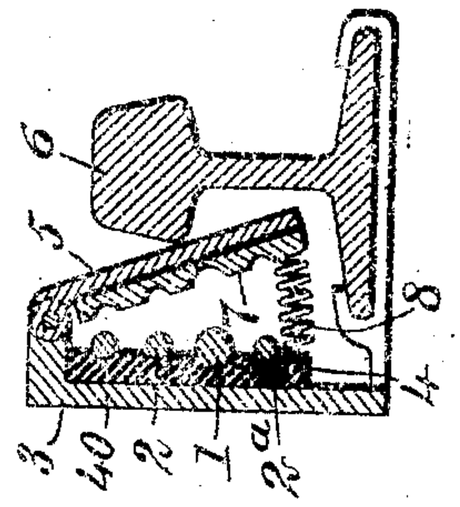


Fig. 4.



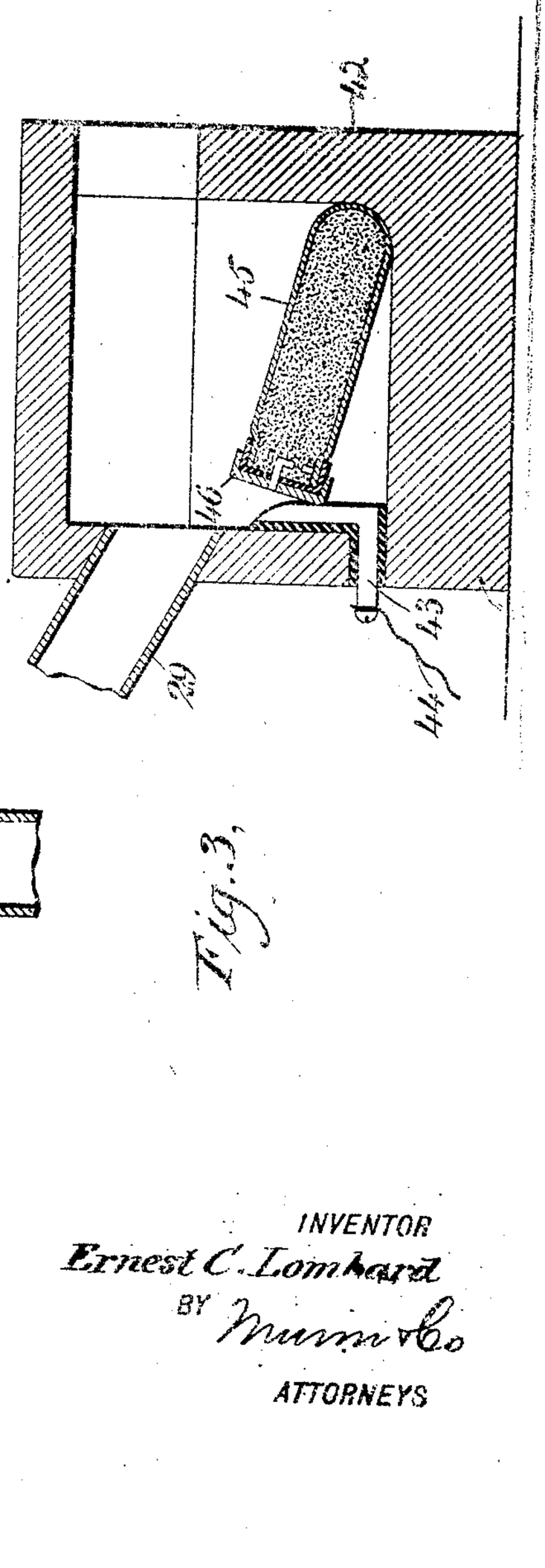


Fig. 3,

WITNESSES

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INVENTOR

Ernest C. Lombard

BY Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

ERNEST CYRUS LOMBARD, OF PEORIA, ILLINOIS.

RAILROAD-SIGNAL.

No. 837,857. Specification of Letters Patent. Patented Dec. 4, 1906.

Application filed September 22, 1906. Serial No. 335,728.

To all whom it may concern:

Be it known that I, ERNEST CYRUS LOMBARD, a citizen of the United States, and a resident of Peoria, in the county of Peoria and State of Illinois, have invented a new and Improved Railroad-Signal, of which the following is a full, clear, and exact description.

This invention relates to railroad-signals of the type in which the signal is operated to warn the engineer in case two trains are on the same track within a given distance of each other, irrespective of whether they are going in the same direction or in opposite directions.

The signal is entirely automatic in its operation and comprises certain important means for placing a torpedo and for exploding the same, together with the necessary parts and electric wiring to operate it in the manner hereinafter set forth.

According to my invention a train may pass freely along the track without affecting the signal in any way; but should two trains get within the same section the torpedo is immediately placed, and when either train gets within a short distance of said torpedo it is exploded to warn the engineer of the impending danger. In connection with the torpedo placing and exploding device electric lights may be employed to operate simultaneously therewith and serve as an additional signal, such lights and the necessary connections therefor not being shown in the drawings.

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

Figure 1 is a diagram showing the relative arrangement of parts and the necessary wiring for accomplishing the results desired. Fig. 2 is a vertical section through the torpedo-placing device. Fig. 3 is a vertical section through one form of the torpedo-exploding device; and Fig. 4 is a vertical section through one of the railroad-rails and the mechanism lying adjacent thereto, whereby the device may be operated by the passage of a train along the track.

In my improved system of railroad signaling I provide a plurality of signals and operating mechanism therefor at points along the track approximately one mile apart and provide an electric feed-wire parallel to one of the rails and adjacent thereto. Alongside the feed-wire and adapted to be placed in communication therewith upon the passage of a train are a plurality of shorter wires approximately two miles in length and extending from each signal to the next alternate one, thus passing the adjacent signal without communicating therewith in any way.

Referring to the drawings, in which a specific embodiment of my invention is illustrated, I employ a main feed-wire 1, extending the entire length of the track and having shorter sections 2 2^a 2^b 2^c, &c., arranged closely adjacent thereto and adapted to be placed in communication therewith by any suitable means operated by the passage of the train.

In Fig. 4 I have illustrated one form of circuit-closer which may be employed and which comprises a vertical plate 3, having a facing 4, of insulating material, carrying the main feed-wire 1 and two of the shorter wires, as 2 and 2^a, which wires will hereinafter be referred to as the "two-mile wires," although it is evident that such wires may be of any length desired and depending upon the distance between the signals.

Hinged to the upper end of the plate 3 is a second plate 5, lying closely adjacent to the railroad-rail 6 and in the path of the flanges of the car or engine wheels. The plate 5 carries a bridge 7, insulated therefrom, which latter is held away from the wire-carrying plate 4 by a spring 8 or in any other suitable manner. This spring holds the bridge 7 away from the wires and prevents the passage of a current from the feed-wire to any of the others, while upon the passage of a train the flange of the wheel on the locomotive presses between the plate 5 and the rail 6 and forces the bridge 7 into contact with all of the wires, whereby a current may flow from the feed-wire 1 through the bridge 7 to each of the two-mile wires lying adjacent the feed-wire.

It is evident that various different means may be employed for closing the circuit from the feed-wire to the two-mile wires, and I do not wish to be limited to the specific form shown in Fig. 4.

Each of the two-mile wires is provided with a branch 9 at a point intermediate its length, which branch connects with wires 10, extending approximately one mile in each direction from said branch—in other words, to points in the vicinities of the ends of the two-

mile wire. At the end of each of the wires 10 there is placed an electromagnet 11, the opposite end of whose coil is grounded, so that upon the closing of the circuit by the passage of a train the current may flow from the feed-wire 1 to one of the two-mile wires and thence to the branch 9 and wires 10, to the electromagnets 11, and to the ground. As each wire 10 terminates at a point in the vicinity of the end of the two-mile wire and is connected thereto through the wires 10 and 9 at a point only a very short distance from the next two-mile wire, it will be seen that the electromagnets 11 are grouped in pairs at points approximately a mile apart along the track. In each pair the electromagnets are arranged closely together, and the two armatures 12 thereof are connected together at a point intermediate the two. One of the stops 13, in engagement with which one of the armatures is forced upon the energizing of its magnet, is connected by a wire 14 to the main feed-wire, while the stop 15, into engagement with which the other armature is forced by the energizing of the other electromagnet, is connected by a wire 16 to an electromagnet 17, located in a signal-placing device, and the opposite end of the coil on this electromagnet is also grounded. It will thus be noted that it is impossible for a current to get from the feed-wire to the electromagnet 17 in a signal without passing from the stop 13 to one armature and from the other armature to the stop 15. This necessitates the energizing of both of the electromagnets 11 in the same pair, and as each of the electromagnets in any one pair is connected to a separate two-mile wire it will be seen that it is necessary for two adjacent two-mile wires to be simultaneously placed in contact with the feed-wire in order to energize the magnet 17.

Various specific forms of signals may be so located as to be operated upon the energizing of the magnet 17; but I prefer to employ the signal illustrated in Figs. 2 and 3, which comprises a torpedo-storage chamber and means for placing the torpedo in position to be discharged. The specific form of this, as illustrated in the drawings, comprises a casing or box 18, having a partition 19 located in the upper part thereof and adapted to support a slide 20, connected by an arm 21 to the core 22 of the solenoid-magnet 17. A torpedo-supplying chamber 23 of any suitable form is supported above the top of the casing 18 and is in open communication therewith by a passage of substantially the same size as one of the torpedoes. The slide 20 carries upwardly-extending flanges 25, forming a chamber of substantially the same size as a torpedo and so located that when the slide 20 is drawn back to the limit of its movement by the action of a suitable spring 26 the chamber formed by the flanges or walls 25 is in direct communication with the passage leading from the torpedo-storage chamber. The partition 19 is provided with an opening 27 out of alinement with the passage from the storage-chamber, but in alinement with the outlet from the chamber in the torpedo carrier or slide when the latter is moved to its opposite extreme position by the action of the magnet 17 and in opposition to the action of the spring 26. To prevent the remaining torpedoes in the storage-chamber 23 from falling into the casing when the magnet 17 is energized and the slide moved, I provide a flange 28 on one of the walls 25 and adapted to close the discharge-passage from the torpedo-storage chamber 23.

Within the main casing and below the partition 19 is a conduit 29 of a size designed to receive a single torpedo and conduct it to the firing mechanism. The upper end 30 of the conduit is hinged or pivoted to the main portion and is connected to the core 31 of a second magnet 32, which when energized draws the upper end of the conduit into communication with the passage 27 of the partition 19 and permits a torpedo in the carrier to drop down the conduit if the carrier has been previously moved by the energizing of the magnet 17. One side wall of the hinged section 30 of the conduit is provided with a flange 33, adapted to close the passage 27 and prevent a torpedo falling from the carrier when the hinged section 30 has not been moved to the proper position by the energizing of the magnet 32.

It will thus be noted that in order to permit of the passage of a torpedo from the torpedo-storage chamber 23 to the conduit 29 it is necessary that the two electromagnets 17 and 32 should be energized simultaneously, and, furthermore, by reason of the mechanism about to be described it will be seen that the magnet 17 must be energized before the magnet 32; otherwise the device is locked, and the passage of a torpedo is prevented. This safety mechanism comprises an arm 34, pivoted on a suitable support at the opposite end of the device from the conduit 29 and having one end bent at an angle and adapted to pass through an opening 35 in the partition 19 and an opening 36 in the slide 20 when a suitable magnet 37 is energized and the opposite end 38 of the lever-arm 34 is drawn down by said magnet. Upon the energizing of the magnet 37 the end of the arm 34 is raised in opposition to the action of a suitable spring 39, and the end in passing through the openings 35 and 36 locks the slide of the partition and prevents the movement thereof by the magnet 17. The magnet 37 may be connected in series with the magnet 32 by means of a wire 39, and the opposite end of this wire is grounded. Thus if the magnet 32 is energized before the magnet 17 the pivoted section 30 of the conduit will be

moved into position to receive a torpedo; but the magnet 37, which was energized simultaneously with the energizing of the magnet 32, will lock the slide 20 in position and prevent a torpedo being moved into position to pass down the conduit. The object of this locking mechanism will be seen from an inspection of the diagram shown in Fig. 1.

Bridging the gap between the ends of each of the two-mile wires, but not in communication with either of them, is a short wire 40, adapted to be placed in communication with the main feed-wire upon the passage of a train in the same manner as the two-mile wires are placed in communication therewith. This short wire 40 is connected to the electromagnet 32 in the signal by a branch 41, and the current in flowing from the feed-wire to the short wire 40 passes on to the branch 41, electromagnet 32, wire 39, electromagnet 37, and to the ground, as illustrated in the diagram. Thus, if a single train in passing along the track reaches the end of one of the two-mile wires and is of sufficient length to bridge the gap between this wire and the next two-mile wire it will be seen that were it not for the locking mechanism a single train could place two two-mile wires in communication with the feed-wire, and thus energize both electromagnets of the corresponding pair and permit the energizing of the electromagnet 17. As the wire 40 would also be simultaneously placed in communication with the feed-wire, a torpedo would be discharged from the storage-chamber down the conduit 29 every time a train passed the end of each section; but as the locking mechanism is operated as soon as a train strikes the end of the wire 40 and before it reaches the end of the next two-mile wire the slide is locked before the electromagnet 17 is energized, and the passage of a torpedo down the conduit 29 when but a single train is on the track is thus prevented.

The torpedo-firing mechanism may be of any suitable kind, but preferably operating on the same principle as that illustrated in Fig. 3. In this figure I have illustrated a receiving-chamber 42, of conducting material, in communication with the conduit 29 and resting upon the ground or in electrical contact therewith. Extending in through the side of the receiving-chamber is a terminal 43, insulated from the walls of the receiving-chamber and connected to the feed-wire 1 by a wire 44. No current can pass from the feed-wire to the ground through these connections unless connection is made between the terminal 43 and the wall of the receiving-chamber 42. The specific torpedo which I prefer to employ comprises a thin metal body portion 45, having the metal cover 46 insulated therefrom and having a suitable spark-plug, the terminals of which are connected to the cover and body portion, respectively. The torpedo is filled with the desired explosive, and as it lands in the receiving-chamber 42 after having slid down the conduit 29 one portion thereof comes in contact with the wall of the receiving-chamber, while the other portion, usually the cover, comes in contact with the terminal 43. A current now passes from the feed-wire to the terminal 43 and cover 46 and thence jumps across the short space between the terminals of the sparking plug and to the body portion 45 of the torpedo-wall of the casing and then to the ground. The spark in jumping at the spark-plug ignites the explosive, and the engineer of the approaching train is thus warned of his danger.

To more fully disclose the preferred method of locating the signal, further reference should be made to Fig. 1, from which will be noted that at any point along the track the train by pressing down on the plate 5 causes the feed-wire to communicate with two separate two-mile wires, and as each two-mile wire is connected to two electromagnets 11 it will be seen that at practically all the time four of these electromagnets 11 are energized, but that no two in the same pair will be energized by the passage of a single train.

Assuming one train to be at the point A and a second train to be at the point B and lettering the four signals shown as W, X, Y, and Z, the train at A would cause the wires 2^d and 2^c to be placed in communication with the feed-wire, and the left-hand electromagnet of the signal W and left-hand electromagnet 11 of the signal Y would be energized, together with two more, (not shown on the drawings,) while the train at B would place the wires 2 and 2^a in communication with the feed-wire and cause the energizing of the left-hand electromagnet of the signal X, the right-hand electromagnet of the signal W, the right-hand electromagnet of the signal Z, and one other connected to the wire 2 and not shown. Thus both the electromagnets of the signal W are energized when the trains are nearly four miles apart and the electromagnet 17 of the signal W is energized and a torpedo moved over the plate 33 of the hinged section 30 of the conduit. As soon as the train which was at A reaches the point C the left-hand electromagnet of the signal Z is energized, as is also the right-hand electromagnet 11 of the signal Y. This causes the energizing of the magnets 17 of the signal Z, as the other electromagnet of this signal is already energized by the train at B; but no torpedo will be placed at the signal Y, as the wire 40 has conducted a current to the locking mechanism 37 and prevented the placing of a torpedo. As soon as the train which was at B reaches D, or, in other words, the end of the wire 40 of the signal Z, and as soon as the train which was at A reaches the point E, or, in other words, the end of the wire 40 of the

signal W, both of the electromagnets 32 of these signals will be energized, and a torpedo will immediately drop at both points to the receiving-chamber 42 and be immediately exploded just as the two engineers are passing the two points. The exploding of the signals warns the engineer on one train that there is a train ahead on the same track and not less than a mile away, so that he may instantly apply his brakes and bring the train to a stop; but there is no danger of colliding with the other train, which has been similarly warned. As the train reaches the end of any forty-foot wire it operates the electromagnet 37 simultaneously with the operating of the electromagnet 32; but if the electromagnet 17 has been previously operated by two trains on the two adjacent two-mile wires the operating of the electromagnet 37 will have no effect whatever, for the end of the arm 34 will merely abut against the slide 20 after the latter is moved, so that the openings 35 and 36 no longer are in alinement.

The improved signal system above described is equally as efficient for notifying engineers of trains traveling in the same direction as it is for warning engineers approaching each other, for as soon as one train catches up to within a given distance of the one ahead it operated the signals in the same manner as though the train ahead were traveling in the opposite direction, and the engineer of the back train is warned to slow up.

The device herein described is designed for an automatic operation of the signals in case of danger; but it is evident that each one of the signals may be connected to the adjacent station and adapted to be controlled by a key, whereby the train despatcher or telegraph operator may place the torpedo at any particular signal he desires and cause the discharge of the torpedo when a train approaches the signal. For accomplishing this I provide a branch wire 47, leading from the feed-wire to a plurality of keys at the train despatcher's or telegraph operator's desk, and from this a plurality of wires 48 extend to the several wires 16, which lead to the torpedo-placing electromagnet 17. By pressing any one of the keys the operator thus permits the passage of a current from the feed-wire through the branch wire 47 and the desired wire 48 to energize the electromagnet 17. As the train approaches this signal and reaches the end of the wire 40 a current will pass to the electromagnet 32 and cause the discharge of the torpedo to warn the engineer to stop his train.

If desired, all of the keys at the station may be pressed and held in their pressed position to stop all trains along that section of the road in case of any general danger.

Various changes may be made in the specific form of the apparatus which I have shown for carrying out my improved system, but without departing from the spirit of my invention.

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

1. A railroad-signal, comprising means adapted to be operated by a train at one point on the track, similar means adapted to be operated by a train at another point on the track, and means controlled by the coöperation of both of the first-mentioned means for placing and automatically firing a torpedo.

2. A railroad-signal, comprising an electromagnet, means whereby it may be energized when a train is on a certain portion of the track, a second electromagnet, means for energizing said second magnet when a second train is on another portion of the track, and means controlled by the coöperation of the two magnets for permitting the placing and automatically firing of a torpedo.

3. A railroad-signal, comprising an electromagnet adapted to be energized when a train is on a given portion of the track, a second electromagnet adapted to be energized when a second train occupies another portion of the track, means adapted to be controlled by the coöperation of the two magnets for placing a torpedo, and independent means for ejecting said torpedo.

4. A railroad-signal, comprising a feed-wire located adjacent a railway-track, a plurality of separate wires adjacent thereto and adapted to be placed in electrical contact therewith by the passage of a train along the track, an electromagnet controlled by each of said wires, and means controlled by the coöperation of two of said magnets and the approach of a train to said signal for firing a torpedo.

5. A railroad-signal, comprising a feed-wire located adjacent one rail of a railroad-track, a plurality of wires placed end to end and located adjacent said feed-wire, means for conducting a current from the feed-wire to each of said wires in succession as a train moves along the track, means controlled by the passage of a current simultaneously through two adjacent wires for placing the signal in operative position, and means controlled by the approach of a train to the end of one of said wires for operating the signal.

6. A railroad-signal, comprising a feed-wire, two wires located parallel thereto and insulated therefrom, each of said wires being made up of sections, and the sections of one wire spacing the gap between the sections in the other wire, two electromagnets connected to each of said sections and one located adjacent each end thereof, and means controlled by the energizing of two adjacent magnets on different sections for placing a signal in operative position, whereby the signal may be operated when two trains are on the same track and opposite adjacent sections of the

same wire and either train reaches the vicinity of the signal.

7. A signal, comprising a feed-wire, two wires located parallel thereto and adapted to be placed in communication with said feed-wire by the passage of a train, each of said wires being made up of separate sections, an electromagnet located adjacent each end of each section and in communication therewith, means controlled by the coöperation of two adjacent magnets for placing a signal in operative position, whereby the signal may be operated when two trains are on the same track and opposite adjacent sections and either train approaches said signal, and means for preventing the operation of the signal as a signal-train passes from one section to the next.

8. A railroad-signal, comprising two electromagnets adapted to be independently energized by trains at different points along the track, a third electromagnet, means whereby the simultaneous energizing of the two first-mentioned magnets permits the energizing of the third electromagnet, means controlled by said third electromagnet for placing a torpedo, and independent means adapted to be operated as the train passes said signal for ejecting and firing said torpedo.

9. A signal, comprising a torpedo-storage receptacle, means controlled by the presence of two trains in the vicinity thereof for removing a torpedo therefrom, and means controlled by the approach of a train to said signal for ejecting and firing said torpedo.

10. A railroad-signal, comprising a torpedo-storage receptacle, means adapted to receive a torpedo therefrom, an electromagnet for controlling said torpedo-removing means, means controlled by the presence of two trains on the track and at suitable distances from said signal for energizing said magnet, means for permitting the ejection of a torpedo, means controlled by the presence of a train adjacent said signal for energizing said magnet, and means for automatically discharging said torpedo after it has been ejected.

11. A railroad-signal, comprising a torpedo-storage receptacle, means for removing torpedoes therefrom, said means being controlled by the presence of two trains at suitable distances from said receptacle, means controlled by the approach of a train to said receptacle for ejecting a torpedo therefrom, means for automatically discharging said torpedo after its ejection, and means for preventing the ejection of a torpedo when but a single train passes along the track.

12. A railroad-signal, comprising a casing, a torpedo-storage receptacle located adjacent thereto, a receiver within said casing and in communication with said receptacle, electrically-operated means for moving said receiver to separate one torpedo from the remainder, electrically-operated means for permitting the ejection of said separated torpedo, and means for automatically firing said torpedo after its ejection.

13. A railroad-signal, comprising a torpedo having a cover and a body portion insulated from each other, a spark-plug within said torpedo and having the terminals thereof in contact with the body portion and cover respectively, means for ejecting said torpedo, and means adapted to receive said torpedo, said receiving means comprising two parts insulated from each other, one of said parts adapted to come in contact with the body of the receiver and the other part to come in contact with the cover of said torpedo, whereby an electric current may pass from one part through the torpedo to the other part, thus causing a spark within the torpedo and exploding the same.

14. A railroad-signal, comprising a casing, a torpedo-storage receptacle located adjacent thereto, means adapted to separate one torpedo from said storage-receptacle, means for operating said separating means, a conduit, one portion of which is pivoted, means for moving said pivoted part to permit the ejection of a torpedo which has been previously separated, and means for automatically discharging said torpedo after its ejection.

15. A railroad-signal, comprising a casing, having a torpedo-storage receptacle located adjacent thereto, an electromagnet adapted to separate one torpedo therefrom, a second electromagnet adapted to permit the ejection of said torpedo, and a third electromagnet adapted to prevent the removal of a torpedo when said third electromagnet is energized prior to the energizing of the first-mentioned magnet.

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

ERNEST CYRUS LOMBARD.

Witnesses:
CLAIR W. FAIRBANK,
F. D. AMMEN.