(No Model.) 2 Sheets—Sheet 1.

P. SYNNESTVEDT.

TRAIN SIGNALING APPARATUS.

No. 465,396. Patented Dec. 15, 1891.

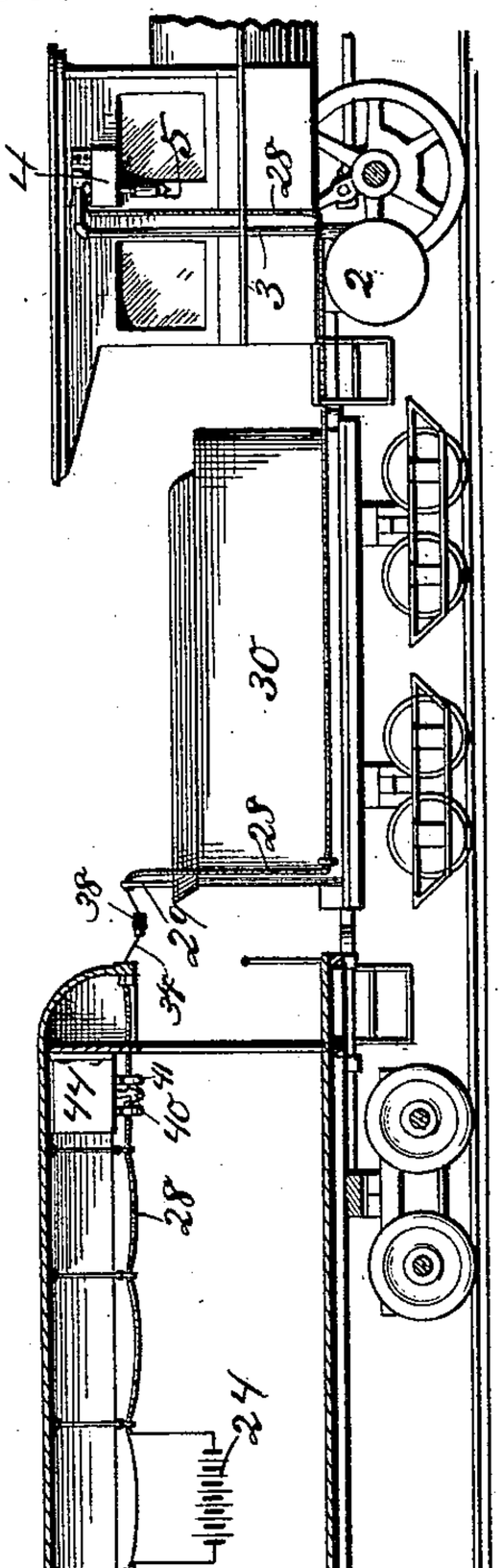

Fig. 1.

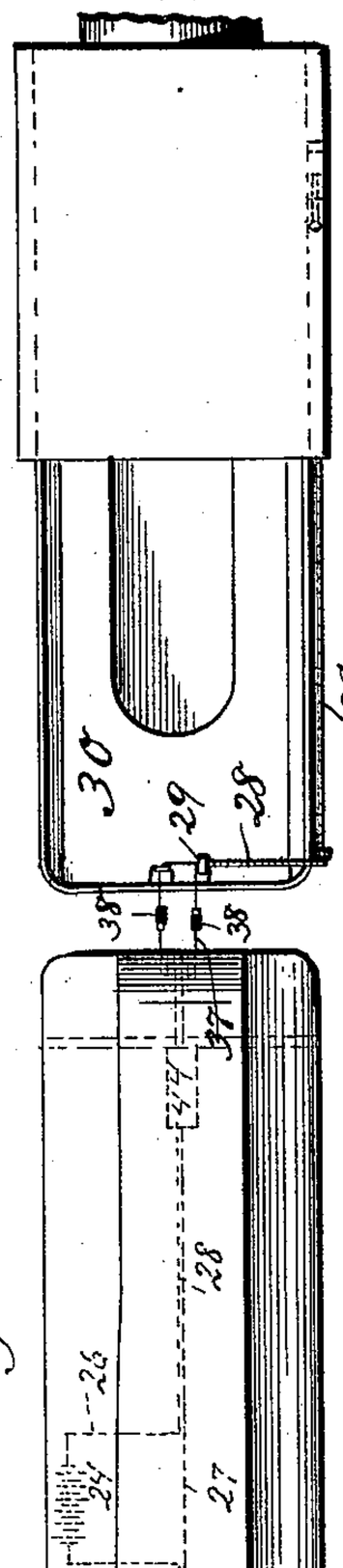

Fig. 2.

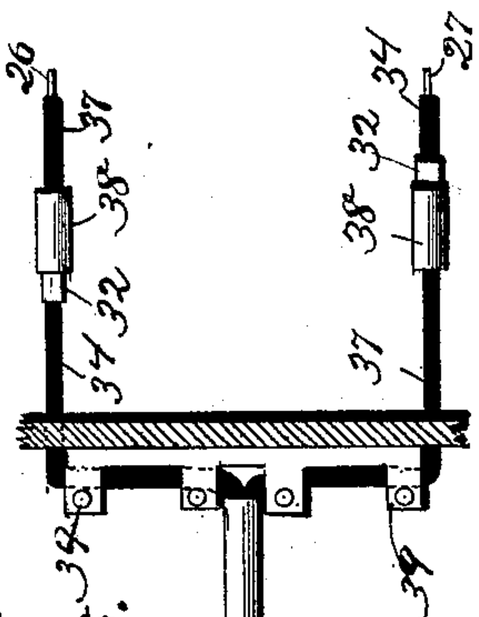

Fig. 5.

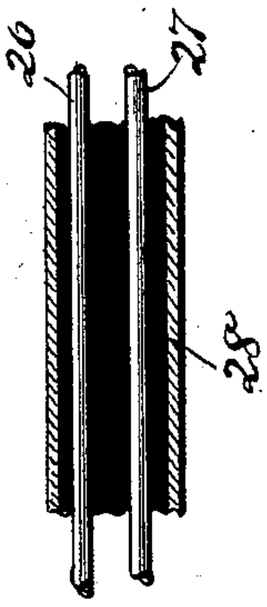

Fig. 4.

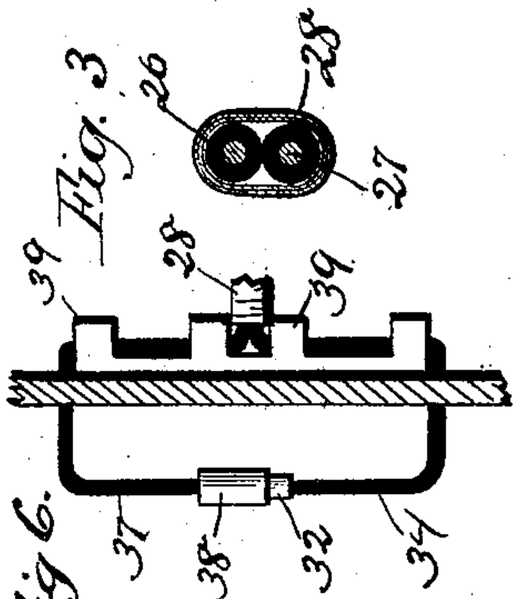

Fig. 3

Fig. 6.

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(No Model.) 2 Sheets—Sheet 2.

P. SYNNESTVEDT.

TRAIN SIGNALING APPARATUS.

No. 465,396. Patented Dec. 15, 1891.

Fig. 7.

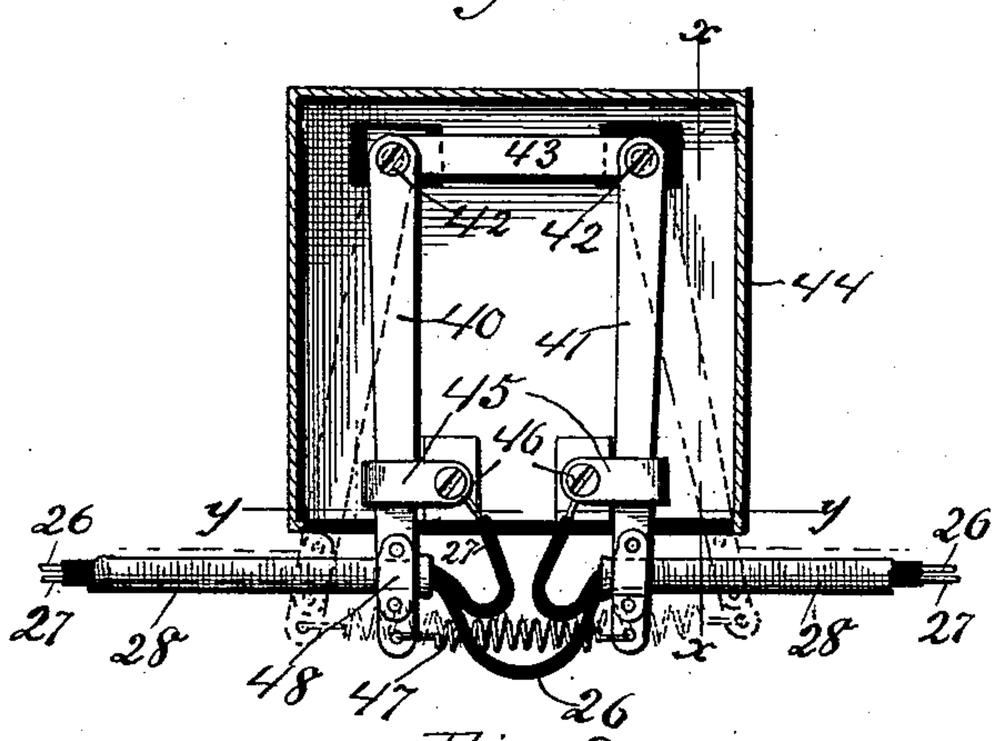


Fig. 8.

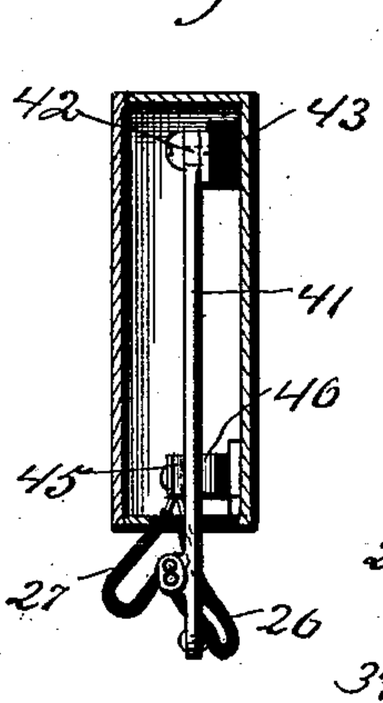


Fig. 11.

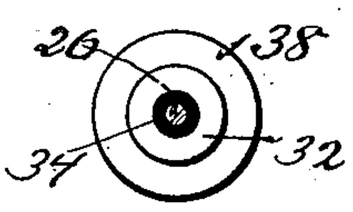


Fig. 9.

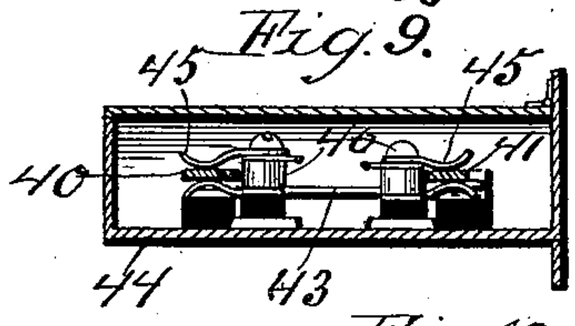


Fig. 10.

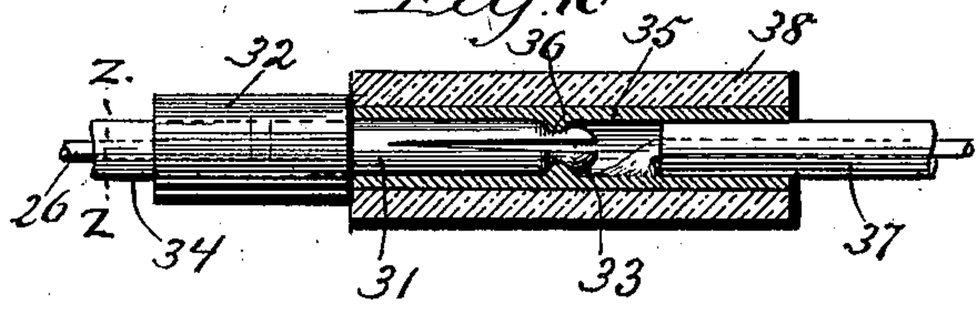


Fig. 12.

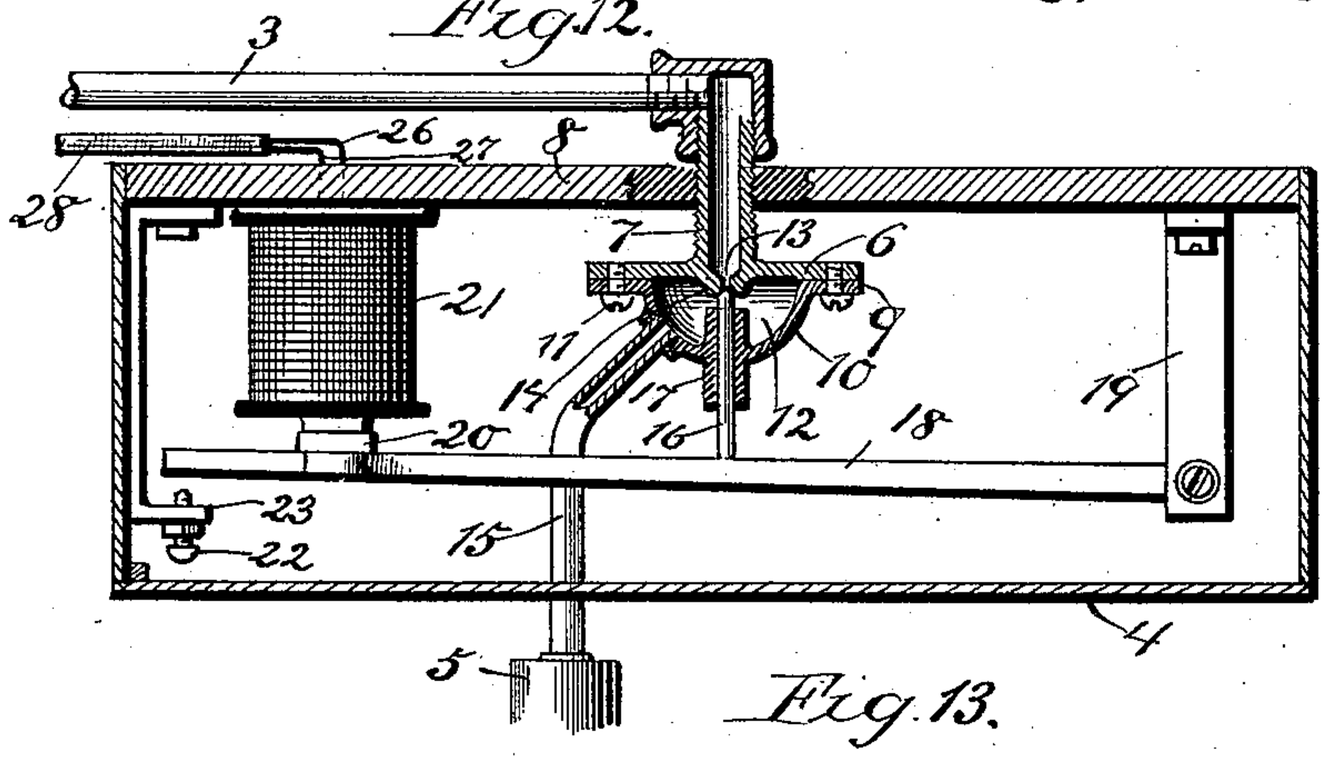
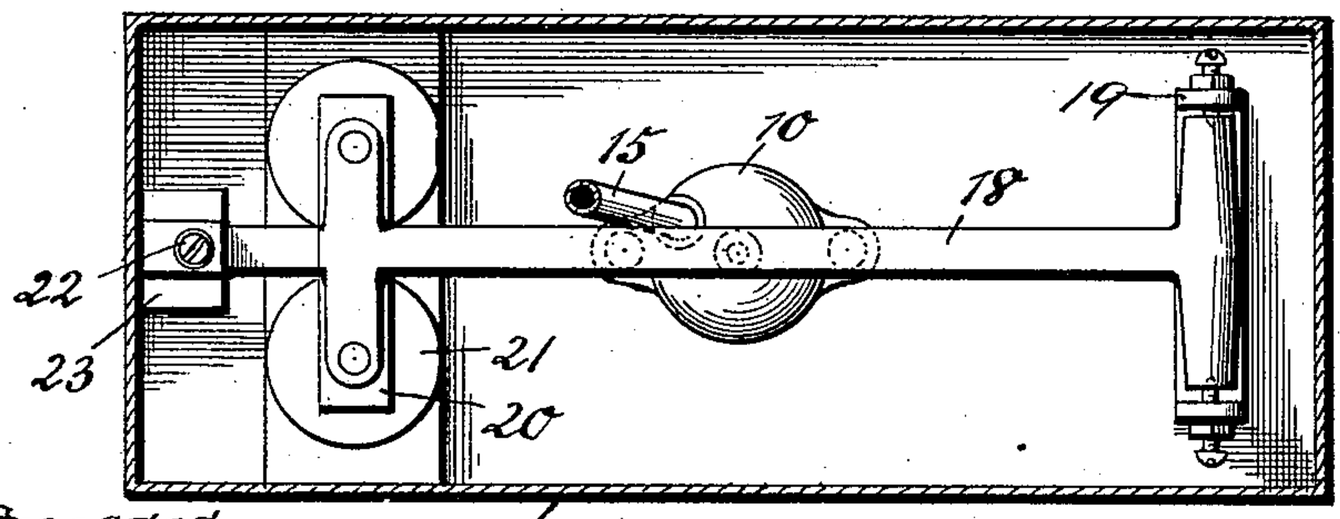


Fig. 13.



Witnesses.
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UNITED STATES PATENT OFFICE.

PAUL SYNNESTVEDT, OF CHICAGO, ILLINOIS.

TRAIN SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 465,396, dated December 15, 1891.

Application filed April 27, 1891. Serial No. 390,610. (No model.)

To all whom it may concern:

Be it known that I, PAUL SYNNESTVEDT, of Chicago, in the county of Cook and State of Illinois, have invented certain Improvements in Train Signaling Apparatus, of which the following is a specification.

My invention relates to train signaling apparatus, and especially to electrically-controlled means for signaling to the locomotive engineer from any one of the coaches making up the train.

The object of my invention is to provide an absolutely reliable electrically-operated compressed-air or steam train-signal which, in addition to its general adaptability for transmitting instructions to the engineer, will be so arranged as to give instant notice of any defect occurring within itself, and which, owing to its simple and durable construction, may easily and economically be kept in order.

My invention consists in a novel electromagnetic compressed-air valve located upon the engine-cab and in direct communication with a pressure-reservoir, in combination with a suitable signaling device adapted to be operated by the escape of compressed air through said valve, means for maintaining a closed electric circuit from said valve through the various cars or coaches of the train, a battery included in said circuit, and circuit-breakers provided in the several cars and included in said circuit, whereby upon opening or breaking said circuit said valve is opened to allow the passage of compressed air through said signaling device, and in various constructions and in combinations, all as hereinafter described, and particularly pointed out in the claims.

My invention will be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is a sectional view showing a train equipped with apparatus embodying my invention. Fig. 2 is a plan view thereof. Figs. 3, 4, 5, and 6 are details showing the bell-cord circuit and the arrangement of the same in the cars. Fig. 7 is a sectional elevation showing the novel circuit-breaker which I employ. Fig. 8 is a section thereof on the line $x\ x$ of Fig. 7. Fig. 9 is a section on the line $y\ y$ of Fig. 7. Fig. 10 is a sectional detail showing my connecting-plug and plug-socket for use between the cars. Fig. 11 is an end view of the same on the line $z\ z$ of Fig. 10. Fig. 12 is a longitudinal section of my electric compressed-air valve. Fig. 13 is a plan view of the same from beneath, the bottom of the box being removed.

Figs. 1 and 2 show the general arrangement of my apparatus upon the coaches, tender, and locomotive.

2 represents the large compressed air cylinder or reservoir carried upon the locomotive and employed in connection with the air-brakes. From this reservoir a pipe 3 leads directly to a pin-valve contained in the box 4 and adapted to control the passage of compressed air through the whistle 5, located in close proximity to the engineer's window. These parts make up all the compressed-air apparatus used, and it will be noted that they are all carried upon the engine.

The valve above mentioned is of the form shown in Figs. 12 and 13. The valve-seat plate 6 is provided with a long threaded thimble or neck 7, which, being firmly screwed in the strong top 8, holds the rest of the valve in place. The plate 6 is broad, so as to receive the flanges 9 of the cup 10, secured thereunder by screws or bolts 11. The cup thus forms a small chamber 12 beneath the plate 6, into which the compressed air may enter through the small round port 13. This port 13 is preferably formed in the nipple 14, extended downfrom the plate 6, so as to as far as possible prevent the creeping of moisture or gum into the port. An outlet-opening is provided in the wall of the cup 10, and the pipe 15 extends therefrom to the whistle 5. The pin 16 has a conical or pointed upper end adapted to enter and close the port 13, being held concentric therewith by long sleeve 17, provided in the cup-casting. The lower end of the pin 16 rests loosely on the upper side of the long armature-lever 18, pivoted on the ports 19 in the ordinary way. The lever 18 has the soft-iron armature 20 provided in proximity to the core of the electro-magnet 21, which is fastened on the under side of the top piece 8. The downward movement of the free end of the lever 18 is limited by the adjustable stop-screw 22 provided in bracket 23. The pipe 3 is suitably connected with the thimble 7 so that when the pin is down the compressed air

passes directly from the reservoir 2 out through the whistle 5. The pressure area of the pin-valve is so small that only a slight power is needed in the magnet 21 to overcome the ninety or one hundred pounds pressure in the pipe 3.

It will be seen that to keep the air-valve closed a current of electricity must be continuously maintained in the windings of the electro-magnet 21 so as to hold up the lever 18 and pin 16. This requires a closed circuit.

It is not practicable to carry any battery on the locomotive on account of its general inaccessibility, the battery necessarily being stored under some seat or floor of the cab, and on account of the heavy jarring of the locomotive and disconnection of the parts. Hence I locate my battery 24, preferably of the storage type, in the baggage or express car. From the electro-magnet 20 on the cab two wires 26 and 27 extend, in several sections back through the whole train, and are united at their rear ends to complete the circuit. The battery 24 is included in one branch wire or side of the circuit, as diagrammatically shown in Fig. 1. Each wire or side is necessarily broken between the several cars to allow their separation. The wires or strands 26 and 27 of each car are insulated and bound together in one flexible cord 28, which is suspended in the top of the car in the place of the usual bell or pull cord. Similar cords carrying the forward ends of the wires 26 and 27 pass from the standards 29 on the tender 30 to the electro-magnet in the valve-box 4 on the locomotive-cab.

At the ends of the cars and the engine-tender I provide flexible terminal cords containing single electric conductor-strands, and these cords are in turn provided with terminal plugs and plug-sockets adapted to be secured together to complete the electric circuit through all parts of the train. A terminal plug and a terminal plug-socket are provided on each car, and the plugs are all arranged to the one hand, while the sockets are placed on the other hand. Whatever ends of the car are brought together, therefore, a plug will always be found opposite a socket, and vice versa. At the rear end of the last car the circuit is completed by forcing the plug and socket thereon together, the flexible cords being long enough to admit of the same. In Figs. 10 and 11 I have shown a plug and socket especially designed for this purpose. The plug consists in the shank 31, screwed into the insulating-handle 32 and having the split free end provided with the head 33. The end of the conductor-strand in the flexible cord 34 is soldered or otherwise electrically secured to the handle end of the shank. The plug-socket consists in the double-ended tube 35, having the internal rib 36 adapted to engage the neck of the plug-shank, as shown. The conductor-strand of the cord 37 is soldered in the inner end of the socket-tube 35, and the whole tube is covered with an insulating-sleeve 38 to prevent the possibility of a shock to a person handling the connections. The ends of the cords 28 may be secured in any suitable manner, as by means of clamping-blocks 39. (Shown in Figs. 5 and 6.) A break in the circuit thus established will cause the de-energization of the electro-magnet 21, and hence allow the pin 16 to fall away from its seat, thereby letting out the compressed air and sounding the signal-whistle. Hence the separation of the cars, or an electrical defect in the apparatus, resulting in a deflection of current from the magnet, will be immediately announced to the engineer by a long blast of the small whistle. I provide circuit-breakers in the several cars, so arranged that by pulling on the cords 28 the metallic circuit may be opened or closed any number of times to transmit any desired signal. Such a circuit-breaker is shown in Figs. 7 and 8. The two levers 40 and 41 are pivoted on posts 42 and are connected by the metal strap 43, extending between the same. These are inclosed in a box 44, preferably of wood. The lower portions of the levers 40 and 41 are adapted to slip between the contact clasps or fingers 45, provided on the binding-posts 46. A coiled spring 47 is attached to the lower ends of the levers and holds the same normally in contact with the fingers 45. The insulating-covering of the strands 26 and 27 is divided at this point and stripped off. The ends of the cord 28 thus formed are secured on the lower ends of the levers or bars 40 and 41 by clamps 48 or other convenient means. Considerable slack is left in wires 26 and 27 between the levers, as indicated. The strand 27 is cut, and its ends are fastened in the binding-posts 46. Thus it will be seen that one side of the circuit is at this point completed through the levers 40 and 41 and the strip 43. By pulling on either end of the cord 28 the circuit may be broken by the withdrawal of the lever from the contact-fingers 45. Upon releasing the cord the lever is instantly pulled back by the spring 47.

It is obvious that steam might be employed in place of air altogether, although the latter, being less apt to gum up the signal-valve, is preferable, and, further, that instead of the whistle 5 I may employ any other audible signal device adapted to be operated by compressed air or steam.

The advantages of my apparatus as herein described lie in its simplicity, cheapness, and durability. The fact that a continuous blast of the whistle gives notice of the occurrence of any defect in the apparatus prevents all possibility of finding it useless when most needed. If the battery gives out, the engineer is immediately notified, so that there is no excuse for at any time having an inoperative train-signal. A further advantage lies in the peculiar construction of my air-valve, which makes unnecessary the use of the costly reducing-valve and low-pressure reservoir heretofore employed between the main high-pressure reservoir and the signal-valve.

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

1. The combination, in a train signaling apparatus, of the reservoir 2 with an electro-magnetic signal-valve provided in direct connection therewith, the electro-magnet of said valve, two wires or strands extending therefrom through the train, means for uniting the rear ends of said strands, a battery located on one of the cars and included in one of said strands of the circuit, said strands in each car formed into a single cord extended between the ends thereof, a circuit-breaker provided in each car and adapted to be operated by a pull exerted upon said cord, said circuit-breakers consisting in two electrically-connected levers or bars having their free ends connected with said cord, binding-posts 46, having fingers adapted to make contact with said levers, the strand 27 being cut and having its ends secured in said binding-posts, and means for normally holding said levers in contact with said fingers, substantially as described.

2. The combination, in a circuit-breaker adapted for the use specified, of the levers 40 and 41, pivoted on posts 42, with the coiled spring 47, the binding-posts 46, the contact-fingers 45, and the cord 28, containing the strands 26 and 27, said cord clamped on the ends of said levers, the strand 27 being cut and the ends thereof being secured on said binding-posts and said levers electrically connected, substantially as described.

3. The combination, in a train signaling apparatus, of the high-pressure reservoir 2, in connection with the locomotive, with a pipe leading therefrom and provided with a whistle arranged in proximity to the engineer's station, the electro-magnetic signal-valve provided in said pipe, the electro-magnet thereof, two wires or strands extending therefrom through the train, means for uniting the rear ends of said strands, a source of electricity located on one of the cars and included in one of said strands, said strands in each car being formed into a single pull-cord extending between the ends thereof, a circuit-breaker provided in each car and adapted to be operated by a pull exerted upon the cord therein, the parts of said circuit-breaker being directly connected with exposed ends of the strands of the cord, substantially as described.

4. The combination, in an electro-magnetic valve for the use specified, of a horizontal plate or disk 6, having the thimble or neck 7 and provided with the annular port 13, opening into the same, with the cup-disk 10, jointed and secured to the under side of said plate 6 and having the long guide-sleeve 17, the small pin 16, loosely movable in said sleeve 17 and having a point to close said port 13, the whistle and the whistle-pipe 15, the long lever 18, upon which said pin 16 rests, said lever pivoted on a support 19 and provided with an armature 20, the electro-magnet 21, and a stop 22, arranged beneath the free end of the lever 23, said magnet, when energized, being adapted to uphold said lever and therewith the upper end of the pin-valve against the seat in the plate 6, substantially as described.

5. The combination, in a train signaling apparatus, of a high-pressure reservoir carried on the locomotive with an electro-magnetic valve and an audible compressed-air signal device provided in direct connection with said reservoir, a closed metallic circuit extending from the electro-magnet of said valve through the several cars or sections of the train, the strands of said circuit being carried through each car in a suitable cord, circuit-breakers included in said strands and adapted to be operated by said cord or cords, and a source of electricity provided on one of said coaches or cars and included in said circuit, substantially as described.

In testimony whereof I have set my hand this 11th day of April, 1891.

PAUL SYNNESTVEDT.

In presence of—
B. MALLOY,
J. E. MORRIS.