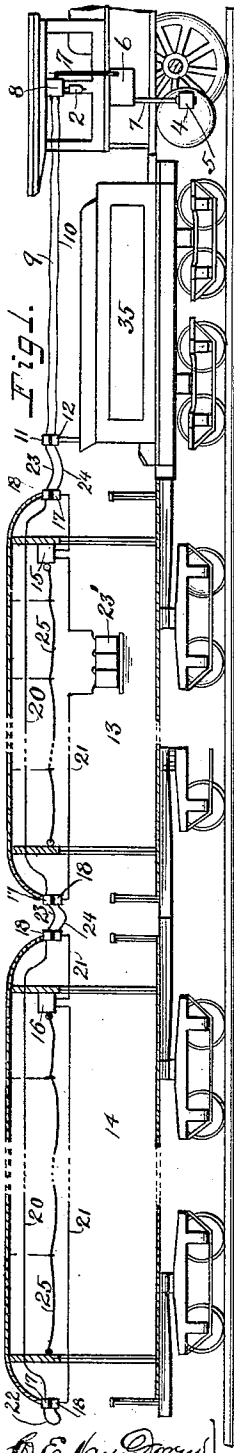


(No Model.)

P. SYNNESTVEDT.
TRAIN SIGNALING APPARATUS.

No. 465,501.

Patented Dec. 22, 1891.



G. C. Paulson
A. Hawley

Witnesses.

Fig. 2.

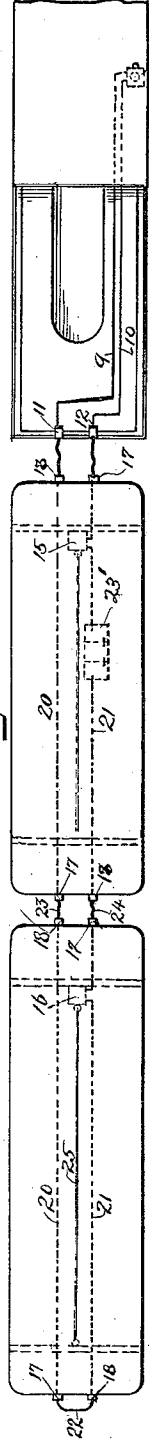
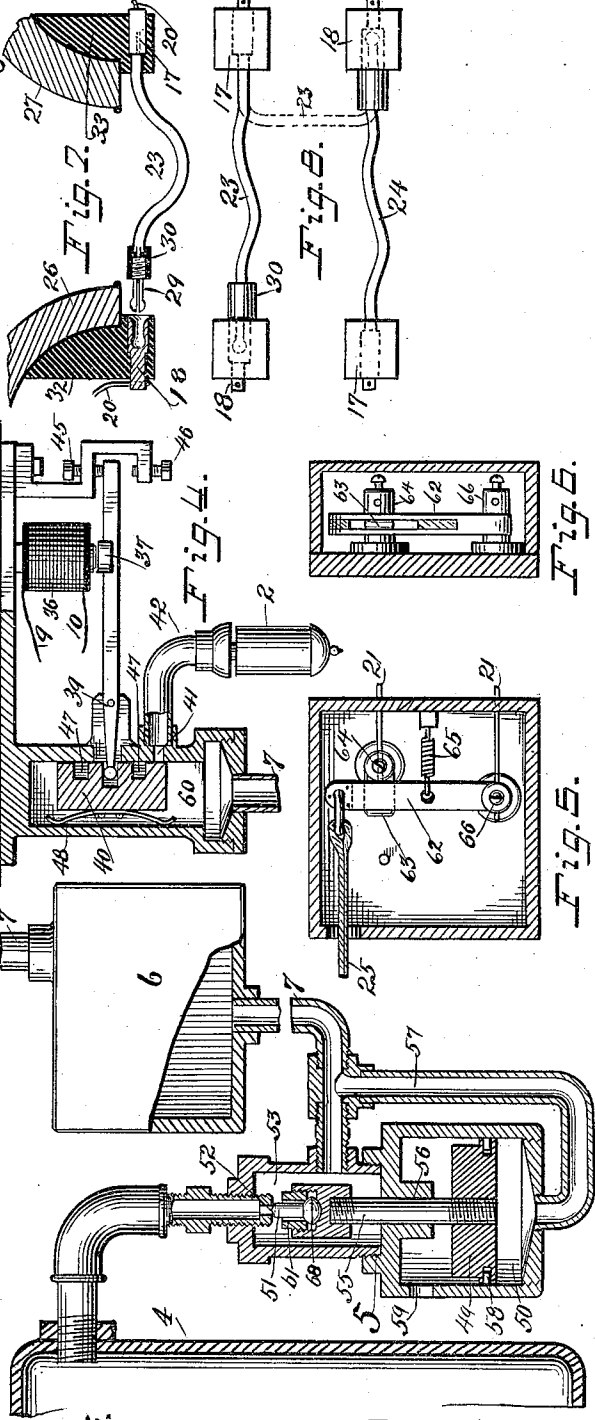


Fig. 3.



Inventor.
Paul Synnestvedt
By *Paul & Merwin* Attys.

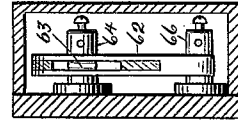


Fig. 4.

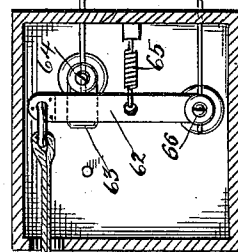


Fig. 5.

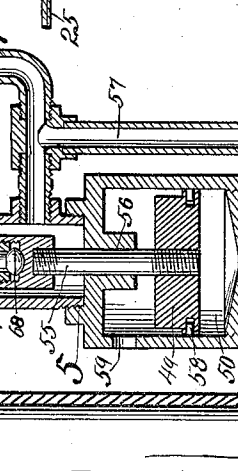


Fig. 6.

UNITED STATES PATENT OFFICE.

PAUL SYNNESTVEDT, OF CHICAGO, ILLINOIS.

TRAIN SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 465,501, dated December 22, 1891.

Application filed October 13, 1890. Serial No. 368,037. (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 an electrically-controlled compressed-air or steam apparatus by the use of which persons in the coaches are enabled to signal the engineer in the cab of the locomotive, and to means whereby immediate notice is given of any defect in the apparatus which would render it unreliable.

The objects of my invention are to provide an absolutely reliable train-signal which shall be of very simple and cheap construction and adapted to be operated at will through the medium of signal-cords provided in the usual position in each car, which will instantly give notice of any defect in the apparatus or in the electrical connections thereof, and which, though in constant operative condition, may be very economically maintained and that with the slightest degree of attention from the train-men.

My invention consists, in general, in the constructions and combinations hereinafter described and, particularly pointed out in the claims.

In the accompanying drawings, forming a part of this specification, Figure 1 is a general view illustrating signaling apparatus embodying my invention and clearly showing the electric circuits employed. Fig. 2 is a plan view taken from Fig. 1 and more accurately indicating the position occupied by the several parts of the apparatus. Fig. 3 illustrates a novel pressure-reducing valve which I employ in connection with and between the high-pressure compressed-air reservoir and a smaller reservoir connected with the audible signal device. Fig. 4 shows the whistle-valve-operating device. Fig. 5 illustrates a circuit-breaker adapted for use in connection with my apparatus. Fig. 6 is a side view of the same. Figs. 7 and 8 are details showing the devices employed for making the electrical connections between the several parts of the train.

Heretofore many electrical and several compressed-air train-signals have been in-

vented and used; but the great difficulty in the successful use of these has been either inability to immediately give notice of a defect or failure of apparatus or that the same have been too complicated or too expensive either in original cost or in that of maintaining the same in good working order. In my device I have aimed to overcome these difficulties by simplifying the necessary apparatus and its use. In the first place I combine both the electrical and the compressed-air systems; but instead of carrying compressed-air pipes and connections back through the train I have substituted therefor inexpensive and durable insulated wire, while upon the engine I have substantially retained the successful compressed-air signal, thus doing away with the expensive and easily-injured rubber-hose connections and the couplings ordinarily used with the compressed-air systems, and, on the other hand, doing away with the storage-battery and the extra circuit heretofore provided upon the engine to operate the electric bell thereon as ordinarily employed in connection with a secondary electric circuit provided upon the coaches. Secondly, I have provided each side of the circuit in each coach with entirely separate terminal connections and couplings, which serve as connectors between the coaches or the tender, thus doing away with the trouble heretofore experienced in the use of the single electric couplers formerly used with metallic circuits on trains, which trouble was due to water getting into the coupling and short-circuiting the parts. With my device the moisture would only serve to make better electrical contact. Moreover, the arrangement of my couplers is such that they cannot possibly be disarranged or misconnected by employes, and such that the uncoupling of the same is automatic when the cars are separated.

As shown in the drawings, I provide a whistle 2 upon the engine 3. This whistle is a small one and is preferably placed upon the engineer's side of the cab, so that a signal therefrom could not possibly be unnoticed by him, the usual compressed-air reservoir 4 communicating with the whistle 2 through the reducing-valve 5, the low-pressure reservoir 6, and the pipes 7, as indicated.

In the box 8 is provided the electric valve controlling the outlet of compressed air through the whistle. The wires 9 and 10 extend from the electro-magnet in the box 8 to the fixed terminals 11 and 12 upon the rear end of the tender.

Each car 13 14 is fitted up with a circuit-breaker 15 16 and is provided with a pair of metal terminals 17 18 upon each end, and, further, with a conducting-cord 23 or 24, adapted to be secured between terminals occupying opposite positions, one on the end of one of the coaches and the other terminal being opposite it on the end of the other adjoining car. If, as is the case at the rear end of the train, the terminals 17 and 18 were in each instance connected by a loop similar to the loop shown at the rear end of the train a complete circuit would be formed in each coach.

I provide a storage-battery 23' in the forward baggage-car 13 and in circuit with the circuit-breaker 15 and other parts of the system. The opposite terminals upon the tender and upon the coaches are connected by strands of insulated wire 23 and 24, as shown, thus completing the circuit from the engine through the coaches and back to the engine. As shown, the storage-battery, which, though here shown to consist of three cells, really consists of but one, is connected directly in circuit, and, as the contacts in the circuit-breakers are complete, a constant current of electricity flows over the circuit upon the train. A strong cord 25, similar to the common signal-cord, is provided in each car and extends from the end thereof to the switch-lever of the circuit-breaker in the box 16 or 15, as the case may be. It will be seen that by pulling on the cord in either car the contact between the parts of the circuit-breaker belonging to said car will be separated, whereupon the electric valve in the box 8 upon the locomotive-cab operates, as will hereinafter be described, to open said valve and allow the compressed air from the chamber 6 to escape through the whistle 2 to notify the engineer. As soon as the cord 25 is released the contacts of the circuit-breaker connected therewith will be immediately restored, whereupon the electric valve upon the engine will operate to shut off the supply of compressed air to the whistle. The signal may now be repeated any number of times, and it is seen that any code of signals may be maintained between the person in charge of the train and the engineer. If, again, any of the wires forming the circuit should be cut or the connection between the cars broken in any way, as by uncoupling one of the cars from another, the engineer would be immediately notified thereof by the action of the valve and the consequent blowing of the whistle. The positions of the terminals 17 18 and 11 12 are properly shown in Fig. 2 to lie in the same plane, but separated by several inches from one another across the end of the car.

The flexible-cord connections 23 and 24 and

the cord-loop at the rear end of the train are shown in detail in Figs. 7 and 8. The blocks in which the terminals are secured are preferably placed beneath the eaves 26 and 27 of the cars, as shown, the idea in so placing them being to remove them as far as possible from the damaging effects of the weather. The socket-terminal 18 is arranged in one block 32 and is adapted to receive the split plug 29, having the insulating-handle 30. This plug is connected with the terminal 17 on the other car by the heavy water-proof insulated conductor or wire 23, secured firmly in the nipple-terminal 17, provided in the insulating-block 33.

The relative positions of the connectors are shown in Fig. 8. These connectors or couplings, as shown, each represent a branch of the metallic circuit and each contain but one single conductor. The two couplings are placed some distance apart side by side and practically in the same horizontal plane. The flexible wires 23 and 24 are of such length as to give plenty of slack for the cars to round a curve or to rock from side to side without pulling the plugs out of the sockets. These pairs of electrical couplers occupy reversed positions, so that in passing to the right hand around the circuit the plugs always extend forward. Thus the plugs and sockets upon abutting ends of the tender or the coaches will always come in the proper position for coupling, and all that the attendant has to do is to place each plug in the socket directly opposite the same, when the circuit will be correctly completed. With this arrangement there will always be one plug and one socket on each end of a coach, and the circuit may be closed across the rear end of the last coach by simply forming the plug thereon into the socket adjacent to the same, as shown by the dotted lines in Fig. 8. The advantages of this arrangement of the couplers and terminals are, first, absence of any liability of short-circuiting the several parts of the system, and, second, the automatic uncoupling and breaking of the electric connections when the cars are separated and pulled apart, thereby doing away with the necessity of attention from the train-hands.

No attempt has been made to properly illustrate the manner of carrying the wires through the various parts of the train—as, for instance, from the rear end of the tender 35 to the valve-box upon the locomotive-cab. These wires must of course in practice be protected from wear. It is possible that an additional terminal standard might be required upon the forward end of the tender to raise the wires to a height convenient for carrying the same across upon the cab by suitable couplers described.

In Fig. 4 I have shown an electrically-operated valve of novel design which I preferably use in connection with my apparatus. The wires 9 and 10 are connected directly through the electro-magnet 36. This electro-magnet

is preferably wound with comparatively fine wire, so as to interpose considerable resistance in the circuit, to the end that the device may be operated by as little current from the storage-battery as possible, so that the action of the same will continue as long a time as possible, thereby avoiding the necessity of frequently recharging the battery. The armature 37 is provided upon the lever 38 before the poles of the electro-magnet 36. The lever 38 is pivoted, as shown, at 39 and engages the slide-valve 40, adapted to close the port 41, leading into the whistle-pipe 42. The compressed air enters the valve-chamber through the pipe 7, extending from the low-pressure reservoir 6. As current is continually flowing through the electro-magnet 36 from the storage-battery in the baggage-car, the armature and the lever 38 will normally be held up against the ends of the magnet pole-pieces or cores, thus holding the slide-valve in a closed position over the whistle-port 41. Now if the circuit of the battery is by any cause broken the electro-magnet will be instantly de-energized, whereupon the lever 38 will immediately drop down at its outer end, owing to its own weight and the weight of the armature, thus throwing up the slide-valve 40 and opening the whistle-port to allow the compressed air to escape therethrough and blow the whistle 2. The vertical throw of the slide-valve is limited by the adjustable stops 45 and 46, provided in position to engage the outer end of the valve-lever 38. Several openings 47 are provided in the slide-valve, as shown, so that the pressure of the compressed air within the valve-chamber 60 will be exerted beneath the slide-valve to in a measure balance the same and decrease the friction between the bearing-surfaces. The spring 48 is provided to at all times hold the valve in position—as, for instance, when there is no pressure in the pipe. As shown, the parts of the slide-valve 40 are made very large to clearly represent the same; but in actual practice the bearing-surface of the valve is only about an eighth of a square inch, and the movement of the same seldom exceeds one thirty-second of an inch to open the port. It is obvious that the high pressure ordinarily maintained in the main reservoir 4 would be much too great to allow the free movement of the whistle-valve. For this reason it is necessary to provide a reducing-valve and a low-pressure reservoir between the main reservoir and the whistle 2. I preferably make use of the novel pressure-reducing valve shown in Fig. 3 in connection with the main and low-pressure reservoirs. The air enters the reducing-valve 5 from the main reservoir 4 at a pressure of about ninety pounds to the square inch. We will say that the low-pressure reservoir 6 at this time is practically empty, in which case the piston 49 in the large cylinder 50 of the reducing-valve 5 will stand in the lower part of the same and the pin-valve 51 will stand away from its seat in the lower end of the pipe

52, thus allowing the compressed air to enter the upper cylinder 53 and to flow directly into the low-pressure reservoir through the pipe 7. As shown, the pin-valve is connected with the large piston 49 by the piston-rod 55, extending through the air-tight bearing 56. Now as the compressed air flows into the reservoir 6 a back-pressure is exerted through the pipe 57 upon the under side of the piston 49, thus tending to raise the same and close the pin 51 against its seat 52 to cut off the supply of air from the main reservoir. The weight of the large piston is so adjusted as to resist the pressure beneath the same until the desired pressure per square inch has been attained in the reservoir 6. This pressure in the reservoir 6 is in practice about five pounds, although the apparatus may be used with a pressure of as high as twenty pounds. Suitable piston-packing 58 is provided on the piston within the cylinder 50. An opening 59 is made in the upper part of the cylinder 50 to allow a free ingress or egress of outside air, and thereby prevent the accumulation of any back-pressure upon the piston 49. As shown, the pin-valve 51 is provided with a ball-bearing 68, held in position by the adjustable nut 61, thus insuring the effectual shutting off of the air from the main reservoir. I preferably employ a circuit-breaker similar to that shown in Figs. 5 and 6, consisting in the double-strap lever 62, adapted to be drawn off of the contact-tongue 63 upon the binding-post 64 by pulling on the signal-cord 25. The strap is normally held closed upon the tongue and against the binding-post by the spiral spring 65. The pivot 66, upon which the strap 62 swings, serves as the second binding-post. The wires 21 are those shown in Figs. 1 and 2, extending through the circuit-breaker.

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 electrically-operated compressed-air signal, with the electric circuit extending therefrom through all of the parts of the train and through a suitable battery provided thereon, circuit-breakers included in said circuit and adapted to be operated by signal-cords provided in the coaches, the main compressed-air reservoir 4, the low-pressure reservoir 6, the reducing-valve 5, consisting in the piston 49, adapted to operate in the cylinder 50, the upper chamber 53, containing the pin-valve adapted to be closed against the seat provided therefor in the end of the pipe, extending from the main reservoir, the pipe 7, leading to the chamber 6, and the pipe 57, communicating therefrom with the cylinder 50 beneath the piston 49, whereby a constant and comparatively low pressure is maintained in the reservoir 6 for use in sounding the whistle.

2. The combination, in a reducing-valve, of the large cylinder 50, provided with an open-

ing 59, with the upper chamber 53, the piston 49, the piston-rod 55, the pin-valve 51, having the ball-bearing 60 and secured in position by the adjustable nut 61, the leading-in
5 pipe extending from the main compressed-air reservoir, the seat for the pin-valve provided in the lower end of said pipe, the pipe 7, leading from the chamber 53 to the low-pressure reservoir, and the pipe 57, communicating

with the part of the cylinder 50 lying beneath the piston 49 and with the pipe 7, or the low-pressure reservoir, substantially as described.

In testimony whereof I have hereunto set my hand this 2d day of October, 1890.

PAUL SYNNESTVEDT.

In presence of—

JOHN B. SYNNESTVEDT,

OSCAR T. LINDROOTH.