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C. J. COLEMAN.

RAILWAY SIGNAL.

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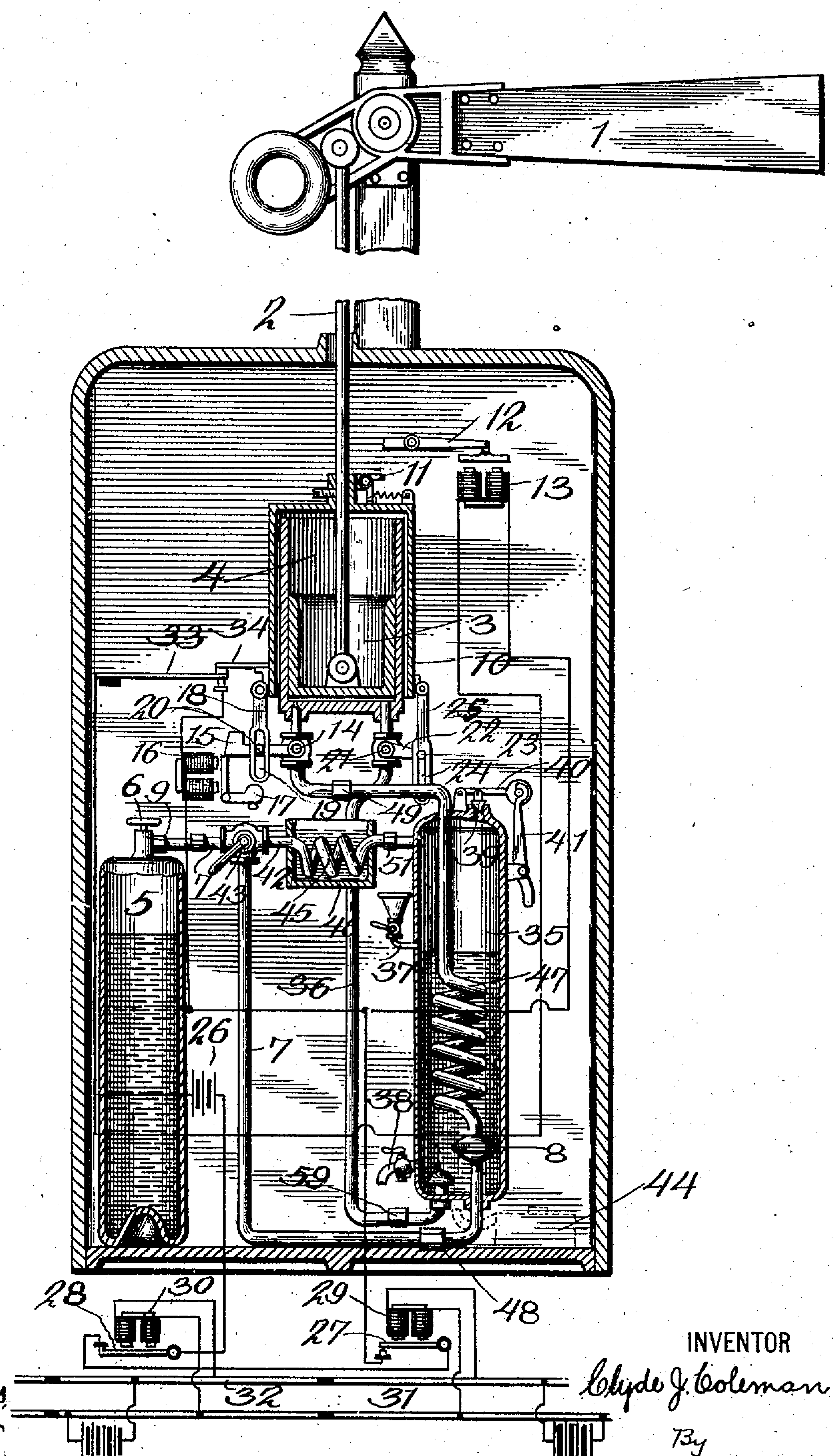

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RAILWAY-SIGNAL.

No. 842,300. Specification of Letters Patent. Patented Jan. 29, 1907.

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To all whom it may concern:

Be it known that I, CLYDE JAY COLEMAN, a citizen of the United States, and a resident of New York city, in the county and State of New York, have invented certain new and useful Improvements in Railway-Signals, of which the following is a specification.

This invention relates to railway-signal apparatus, and more particularly to such as is operated by liquefied gas—such, for example, as carbonic-acid gas or ammonia-gas.

The invention is more particularly addressed to means including a receiving-chamber associated with the signal whereby the gas after having been utilized—that is, the exhaust-gas—may be accumulated in the receiving-chamber and recovered for a subsequent use instead of being permitted to escape into the open air, and thus become lost. The receiving-chamber contains a suitable absorbent medium for the exhaust-gas. In some cases it will be found convenient to treat the absorbed exhaust-gas in the receiver and without detaching the latter from its operating position. In other cases it will be found more convenient to detach the receiver from its operating position and transport it to the factory for the recovery of the absorbed gas. Provision is therefore made for detaching and replacing the receiving-chamber—that is to say, it is deportable and replaceable. In the preferred arrangement the liquefied gas would be stored in a supply-tank local to the signal with which it is connected, and the receiving-chamber associated with this signal will also be local thereto. The gas from the supply-tank is conducted through suitable connections to a pressure-applying device, which preferably is in the form of a piston-chamber which is in operative connection with the signal. After this gas has accomplished its work it is conducted to the receiving-chamber, where it is absorbed by the absorbent medium and from which it is thereafter recovered. If ammonia-gas is the gas employed, then the absorbent medium may be water, or preferably a solution of sulfate of ammonia or strong brine, these last two mediums not being liable to freeze. In this case the gas may be recovered by applying heat, as from a lamp, to the receiving-chamber and conducting the recovered gas directly to the supply-tank for liquefied gas. This may be done, of course, without detaching the receiving-chamber from its place. If the gas employed is carbonic-acid gas, then the absorbent medium may be a strong solution of caustic soda or caustic potash. In this case it would be more convenient to deport the receiving-chamber to the factory, for the recovery of the gas.

In the accompanying drawing, forming part of this specification, I have shown a side elevation, partly in section, of a signal apparatus embodying one of the various embodiments of the invention.

Referring now more particularly to the specific apparatus, as shown in the drawing, the signal 1 is provided with an operating rod 2, having a piston 3 working in the piston-chamber 4, which constitutes the pressure-applying device. The supply-tank 5 contains a suitable liquefied gas and is provided with a valve 6, which is permanently opened after the tank is coupled with the pipe 7, which leads to the piston-chamber 4. The pipe 7 is preferably provided with an automatic reducing-valve 8 and has a connection 9, by means of which the tank 6 may be detached and replaceably connected in place. Thus the tank 5 is deportable, so that when it has become exhausted another charged tank or the same tank recharged may be substituted for the one removed. The signal, as shown in the drawing, is arranged to stand normally at "danger" and is counterweighted, so as to be biased to danger position. These features of the signal, while preferred because of their advantages, are not essential in all cases.

10 is a hood surrounding the piston-chamber and carried by the rod 2.

Control of the gas supplied to the piston-chamber is provided for by means of suitable valve devices, and in the form shown in the drawing these valve devices are arranged to be controlled from a distance and by means of electric circuits operated by a passing train.

In the form of the signal as shown in the drawing the expansive power of the gas is applied to lower the signal to "safety," in which position it is held by a retaining device controlled by a passing train. When the retaining device is released, the signal moves up to "danger." Referring to the retaining device, a spring-catch 11, carried by the boss of the hood 10, is arranged to snap past the projecting end of the armature 12 of the magnet 13 when the rod is elevated to lower the signal. The catch 11 then settles upon and is supported by the armature to hold the signal at "safety," the magnet 13 being at this time energized, as will be presently shown. This projecting end of the armature constitutes a retaining device to hold the signal against return movement, due to its normal bias. The gas in the piston-chamber 4, which elevated the piston and rod, escapes after the catch 11 passes the armature 12, as will be now shown. The pipe 7 has a valve 14 for the inlet of gas to the piston-chamber. This valve is operated by the weighted arm 15, which is normally held in horizontal position, as shown, by the weighted armature 17 of the magnet 16, which closes the valve. When the magnet 16 is energized, the armature is attracted and permits the arm 15 to drop and open the valve 14. 18 is an arm having a slot 19, into which projects a pin 20, carried by the arm 15. The arm 18 is carried by the hood 10, and when the rod 2 rises the arm 18 lifts the fallen arm 15 above the end of the armature 17, which closes the valve, and so that the armature 17 when released from the magnet may move under and again support the arm 15.

21 is an exhaust or outlet valve operated by the arm 22, having a pin 23, which enters the slot 24 of the arm 25, carried by the hood 10. This valve is normally closed and is opened just after the catch 11 passes the armature 12, this being accomplished by the slotted arm 25. When the rod 2 returns to its lower position, the arm 15 is not affected, but the arm 25 lowers the valve-arm 22, and so closes the valve. The magnets 13 and 16 are arranged in multiple in the signal-circuit, which includes the battery 26 and circuit-controllers 27 and 28, operated, respectively, by the track-magnets 29 and 30. The magnets 29 and 30 are connected, respectively, in the rail-circuits of track-sections 31 and 32. In the branch with the magnet 16 is a circuit-controller 33, mechanically closed when the signal is at "danger" by an arm 34, carried on the hood 10. When the signal goes to "safety," the circuit through the magnet 16 is broken at 33. This effects a saving of battery-power.

The operation of the apparatus as above described is as follows: A train on track-section 31 closes at 27 the signal-circuit of battery 26, energizing magnets 13 and 16, the latter of which shifts the arm 15, which thereupon opens the valve 14, allowing gas to enter the piston-chamber 4, and lowers the signal to "safety." As the rod 2 rises the branch circuit through magnet 16 is broken and the armature 17 is released. As the rod continues to rise the arm 15 is lifted, so that it again closes the inlet-valve 14 and comes to rest upon the armature 17. The catch 11 also snaps past the armature 12 and immediately thereafter the outlet-valve 21 is opened, allowing the rod to settle back slightly, so that the catch 11 rests upon the armature 12, which being held by its magnet supports the signal at "safety." When a train enters track-section 32, the signal-circuit of battery 26 is broken at 28, thereby deënergizing magnet 13, releasing catch 11, and permitting the signal to rise to "danger" behind the train. Sufficient gas remains within the piston-chamber to form a cushion for the return stroke of the piston. When the train passes beyond track-section 32, the signal-circuit will be restored to normal.

35 is the receiving-chamber containing an absorbent medium. The pipe 36, which includes the exhaust-valve 21, leads to the receiver 35 at its lower end.

37 is an inlet, and 38 is an outlet, whereby the liquid absorbent medium may be supplied to and withdrawn from the receiver.

39 is an escape-valve for the receiver and carried on a weighted arm 40, arranged to be locked by a catch 41, so as to close the valve 39 when required.

42 is a pipe leading from the upper end of the receiver to the pipe 7, the junction of these pipes being provided with a two-way valve 43, whereby either one of these pipes may be thrown into communication with the supply-tank 5.

44 is a lamp for heating the receiver 35 when it is desired to recover the absorbed exhaust-gas without detaching the receiver from position. The pipe 42 is preferably provided with a condensing-worm 45, passing through a cooling vessel 46, which may be filled with water.

In the preferred arrangement the pipe 7 leads through the receiver 35, and the automatic reducing-valve 8 is located in that part of the pipe 7 which would be within the absorbent medium in the receiving-chamber. By means of this arrangement the heat generated in the absorbent medium by the chemical action due to the absorption of the exhaust-gas prevents freezing of the reducing-valve 8.

It will be understood, of course, that the gas passing through the reducing-valve tends to lower the temperature of the valve, which in some cases might freeze up this valve if there were no means employed to prevent this result.

Another advantage of leading the pipe 7 through the receiving-chamber 35 is that the heat of the absorbent medium due to the chemical action above referred to tends to expand the gas, and thereby increase its efficiency in the piston-chamber. For this last-mentioned purpose the pipe 7 is provided with a coil 47, so as to increase the surface of the pipe exposed to the absorbent medium.

Of course the operation of recovering the exhaust-gas would not be resorted to until after the supply-tank has become sufficiently exhausted. If the recovery of the exhaust-gas is to be effected without removing the receiving-chamber from position, as would be the case if the gas used were ammonia, the operation would be as follows: The valve 43 would be turned so as to open communication between the pipe 42 and the tank 5, and the lamp 44 would be then applied to the receiving-chamber. The gas would then be driven off through the pipe 42 and into the tank 5, the gas being cooled as it passes through the worm 45 and accumulating in the tank 5 in the form of a liquid. During this operation the foreign or permanent gases—such as air, hydrogen, &c.—may escape through the valve 39, which of course at this time is not locked down by the catch 41.

If the receiver containing the absorbed gas is to be removed to the factory for the recovery of this gas, then the receiver will be detached from its connections and a fresh receiver substituted therefor. For this purpose the pipe 7 has couplings 48 and 49, the pipe 36 has a coupling 59, and the pipe 42 has a coupling 51, by means of which the receiving-chamber is deportable and replaceable. In deporting the receiving-chamber the valve 39 is locked down by means of the catch 41.

If desired, the liquid in the receiver containing the absorbed exhaust-gas may be run off through the outlet 38 and carried away to some place where the gas may be conveniently recovered. In this case a fresh supply of the absorbent medium will be supplied to the receiving-chamber through the inlet 37.

It will be understood that the means associated with the signal for the recovery of the exhaust-gas may be variously modified without departing from the scope of the invention. It will also be understood that the mechanism for operating the signal by means of liquefied gas may be variously modified.

I claim—

1. In a railway signal apparatus, the combination of a signal; a supply-tank for liquefied gas; a gas-pressure-applying device in operative connection with said signal and in controllable communication with said supply-tank; and a non-expansible low-pressure receiving-chamber connected with said pressure-applying device and adapted to receive therefrom the exhaust-gas.

2. In a railway signal apparatus, the combination of a signal; a deportable and replaceable supply-tank for liquefied gas; a gas-pressure-applying device in operative connection with said signal and in controllable communication with said supply-tank; and a non-expansible low-pressure receiving-chamber connected with said pressure-applying device and adapted to receive therefrom the exhaust-gas.

3. In a railway signal apparatus, the combination of a signal; a supply-tank for liquefied gas; a gas-pressure-applying device in operative connection with said signal and in controllable communication with said supply-tank; a receiving-chamber connected with said pressure-applying device and adapted to receive therefrom the exhaust-gas; and a valved connection between said receiving-chamber and said supply-tank.

4. In a railway signal apparatus, the combination of a signal; a supply-tank for liquefied gas; a gas-pressure-applying device in operative connection with said signal and in controllable communication with said supply-tank; a receiving-chamber connected with said pressure-applying device and adapted to receive therefrom the exhaust-gas; a valved connection between said receiving-chamber and said supply-tank; and a condenser in said connection.

5. In a railway signal apparatus, the combination of a signal; a supply-tank for liquefied gas; a gas-pressure-applying device in operative connection with said signal and in controllable communication with said supply-tank; and a deportable and replaceable non-expansible low-pressure receiving-chamber connected with said pressure-applying device and adapted to receive therefrom the exhaust-gas.

6. In a railway signal apparatus, the combination of a signal; a gas-pressure-applying device in operative connection with said signal; a receiving-chamber connected with said gas-pressure-applying device and adapted to receive therefrom the exhaust-gas and containing an absorbent medium for said gas; a supply-tank for liquefied gas; and a supply-pipe leading from said supply-tank to said gas-pressure-applying device and passing through said receiving-chamber.

7. In a railway signal apparatus, the combination of a signal; a gas-pressure-applying device in operative connection with said signal; a receiving-chamber connected with said gas-pressure-applying device and adapted to receive therefrom the exhaust-gas and containing an absorbent medium for said gas; a supply-tank for liquefied gas; and a supply-pipe leading from said supply-tank to said gas-pressure-applying device and passing through said receiving-chamber, said pipe including a reducing-valve located in the receiving-chamber.

8. In a railway signal apparatus, the combination of a signal; a gas-pressure-applying device in operative connection with said signal; a receiving-chamber connected with said gas-pressure-applying device and adapted to receive therefrom the exhaust-gas and containing an absorbent medium for said gas; a supply-tank for liquefied gas; a sup-

ply-pipe leading from said supply-tank to said gas-pressure-applying device and passing through said receiving-chamber; and a valved connection between said receiving-chamber and said supply-tank.

9. In a railway signal apparatus, the combination of a signal; a gas-pressure-applying device in operative connection with said signal; a receiving-chamber connected with said gas-pressure-applying device and adapted to receive therefrom the exhaust-gas and containing an absorbent medium for said gas; a supply-tank for liquefied gas; a supply-pipe leading from said supply-tank to said gas-pressure-applying device and passing through said receiving-chamber; a valved connection between said receiving-chamber and said supply-tank; and a condenser in said connection.

10. In a railway signal apparatus, the combination of a signal; a gas-pressure-applying device in operative connection with said signal; a receiving-chamber connected with said gas-pressure-applying device and adapted to receive therefrom the exhaust-gas and containing an absorbent medium for said gas; a supply-tank for liquefied gas; a supply-pipe leading from said supply-tank to said gas-pressure-applying device and passing through said receiving-chamber, said pipe including a reducing-valve located in the receiving-chamber; and a valved connection between said-receiving-chamber and said supply-tank.

11. In a railway signal apparatus, the combination of a signal; a supply-tank for liquefied gas; a gas-pressure-applying device in operative connection with said signal and in controllable communication with said supply-tank; supply and exhaust valves therefor; train-operated means for controlling said valves; and a non-expansible low-pressure receiving-chamber connected with said pressure-applying device and adapted to receive therefrom the exhaust-gas.

12. In a railway signal apparatus, the combination of a signal; a gas-pressure-applying device in operative connection with said signal; supply and exhaust valves therefor; train-operated means for controlling said valves; a receiving-chamber connected with said gas-pressure-applying device and adapted to receive therefrom the exhaust-gas and containing an absorbent medium for said gas; a supply-tank for liquefied gas; and a supply-pipe leading from said supply-tank to said gas-pressure-applying device and passing through said receiving-chamber.

13. In a signal apparatus, the combination of a signal; a supply source for liquefied gas; a gas-pressure-applying device in operative connection with the signal; and means for raising the temperature of the vapor-gas.

14. In a signal apparatus, the combination of a signal; a supply source for liquefied gas; a gas-pressure-applying device in operative connection with the signal; and means for raising the temperature of the vapor-gas before it is admitted to the pressure-applying device.

15. In a signal apparatus, the combination of a signal; a supply source for liquefied gas; a gas-pressure-applying device in operative connection with the signal; and means for raising the temperature of the vapor-gas, said means consisting of a chemical-heat generator.

16. In a signal apparatus, the combination of a signal; a supply source for liquefied gas; a gas-pressure-applying device in operative connection with the signal; an expansion-chamber interposed between said supply source and said pressure-applying device; and means for raising the temperature of the vapor-gas.

17. In a signal apparatus, the combination of a signal; a supply source for liquefied gas; a gas-pressure-applying device in operative connection with the signal; an expansion-chamber interposed between said supply source and said pressure-applying device; a reducing-valve between the expansion-chamber and supply source; and means for raising the temperature of the vapor-gas.

18. In a signal apparatus, the combination of a signal; a supply source for liquefied gas; a gas-pressure-applying device in operative connection with the signal; an expansion-chamber interposed between said supply source and said pressure-applying device; a reducing-valve between the expansion-chamber and supply source; and means for applying heat to said expansion-chamber and reducing-valve.

19. In a signal apparatus, the combination of a signal; a supply source for liquefied gas; a gas-pressure-applying device in operative connection with the signal; an expansion-chamber interposed between said supply source and said pressure-applying device; a reducing-valve between the expansion-chamber and supply source; and means for applying heat to said expansion-chamber and reducing-valve, said means consisting of a chemical-heat generator.

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

CLYDE J. COLEMAN.

Witnesses:

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