(No Model.)

2 Sheets—Sheet 1.

E. E. GOLD.

TRAP FOR CAR HEATING SYSTEMS.

No. 508,569. Patented Nov. 14, 1893.

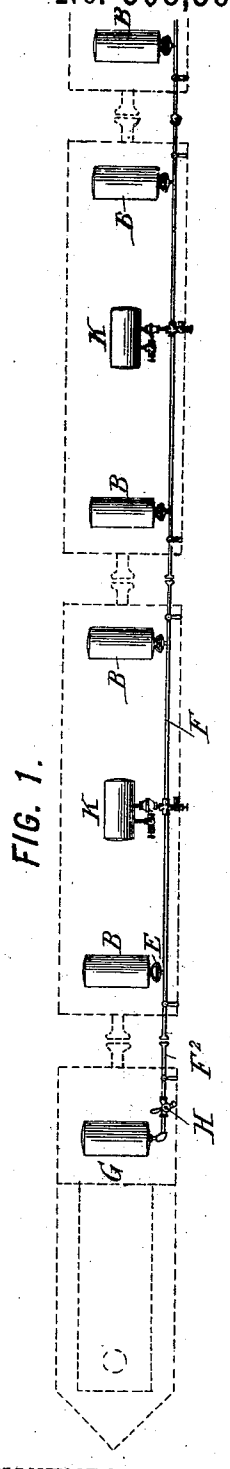

FIG. 1.

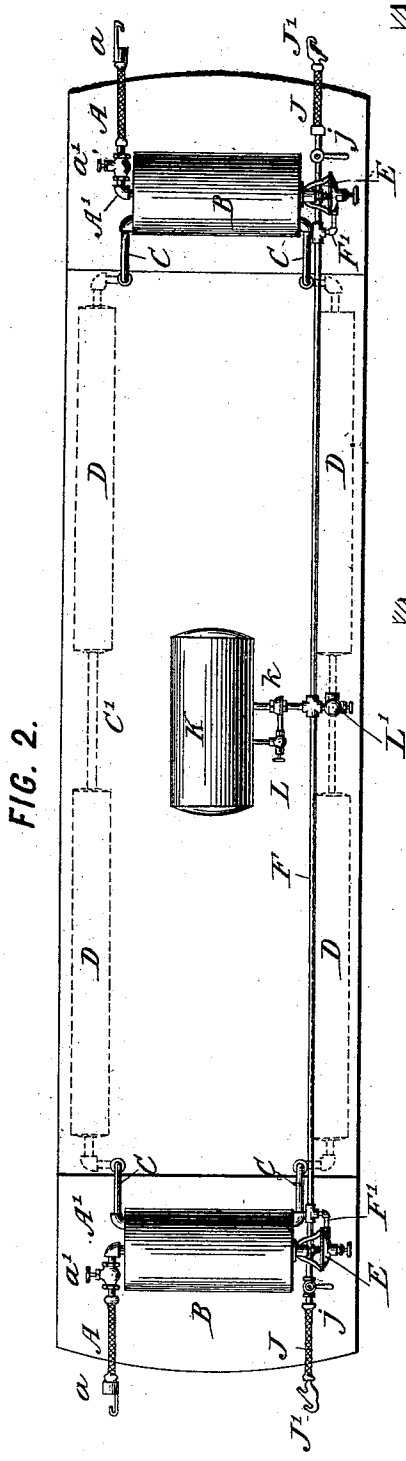

FIG. 2.

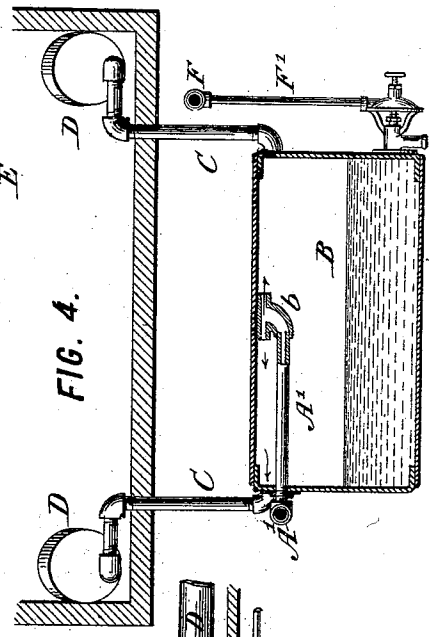

FIG. 4.

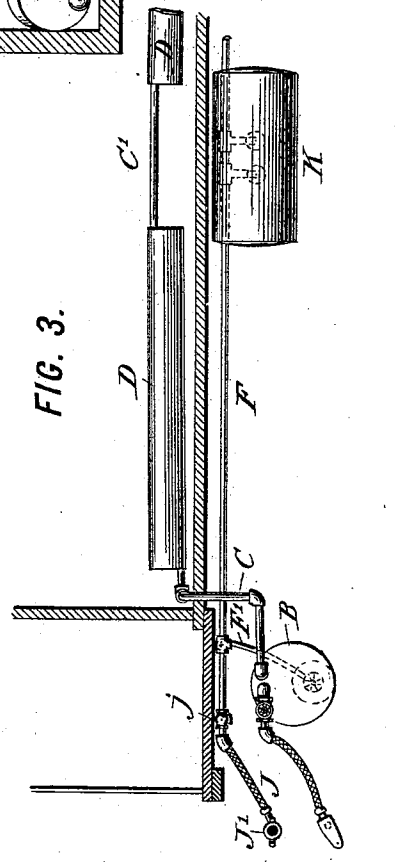

FIG. 3.

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(No Model.) 2 Sheets—Sheet 2.

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FIG. 6.

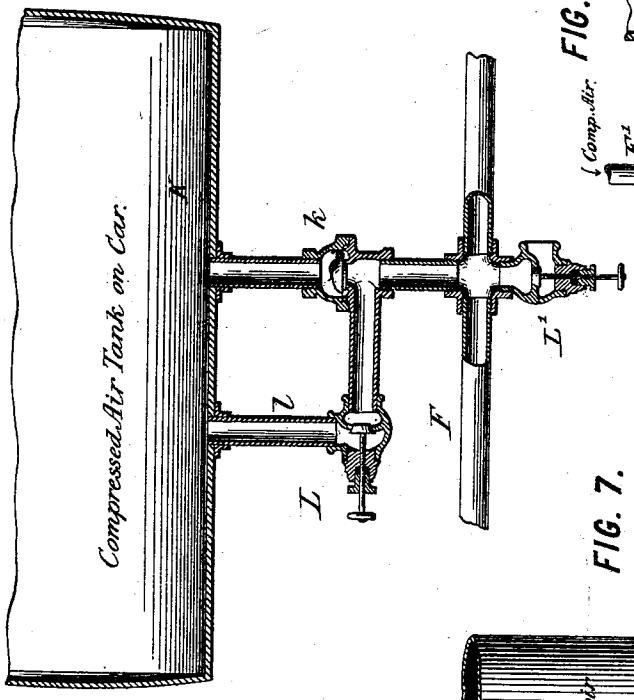


FIG. 9.

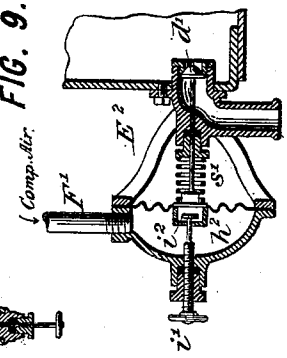


FIG. 7.

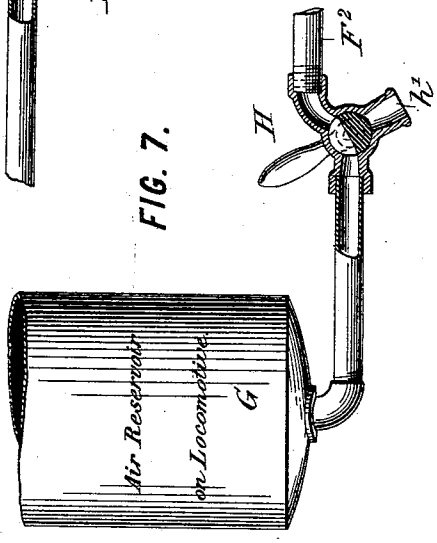


FIG. 5.

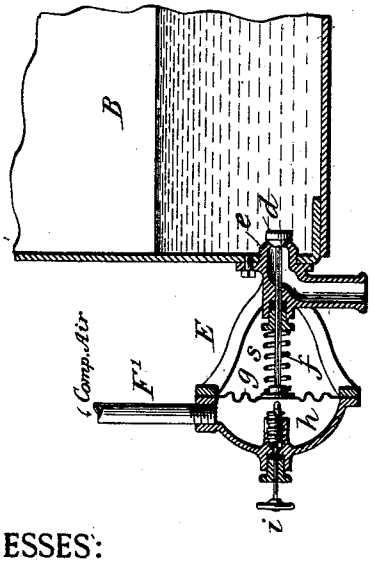
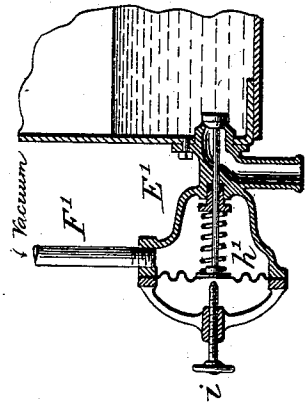


FIG. 8.



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UNITED STATES PATENT OFFICE.

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TRAP FOR CAR-HEATING SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 508,569, dated November 14, 1893.

Application filed March 28, 1893. Serial No. 468,081. (No model.)

To all whom it may concern:

Be it known that I, EDWARD E. GOLD, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Traps for Car-Heating Systems, of which the following is a specification.

In steam heating systems it is necessary to provide some means for disposing of the water of condensation that accumulates in the radiators or pipes. In steam heating systems for railway cars it is customary to dispose of the water of condensation in three ways, first, by blowing it off continuously at the end of the train through a small leak orifice; second, by discharging it intermittently through a thermostatic trap or automatic drainage valve which opens whenever the accumulated condensed water cools to a certain temperature; and third, by discharging it into a tank or reservoir wherein it is permitted to accumulate and from which it is discharged at convenient intervals by opening a valve by hand. The latter method, although more troublesome, is preferred in some cases, as for example on elevated railways, where it is undesirable to discharge the water of condensation either continuously or from time to time because it falls into the streets below.

My present invention provides certain improvements in steam car-heating systems wherein drainage tanks are provided for receiving the water of condensation. One object of my invention is to enable all the tanks on a train to be drained of their accumulated water simultaneously and by one operation, and controlled preferably by the engineer, in order that upon reaching the end of the route the engineer or other attendant may by operating a valve cause all the accumulated water to run out from the drainage tanks into drip tanks or basins provided on the track to receive it.

My invention also aims to improve the piping of cars whereon drainage tanks are employed.

According to my invention each drainage tank is provided with a pneumatically operated valve at its bottom, which normally remains closed but which is opened by increasing or decreasing the pressure of air in the controlling chamber of the valve above or below the normal pressure. On each car an air pipe is provided, couplings being provided for connecting the several pipes together, and each such pneumatic valve is connected by a branch with the air-pipe, while the continuous series of pipes is connected through the medium of any suitable controlling valve with a source of compressed air, or of rarefied air, such as a compressed air reservoir, or a pump for compressing air, or a suction device for rarefying air. Upon the air pipes of the several cars of a train being connected, the operation of this controlling valve serves to increase or decrease the air pressure above or below the normal in such a way as to operate the drainage valves on the several tanks and open them to discharge the accumulated water. To provide for the operation of these valves when the locomotive is disconnected, each car is preferably provided with an auxiliary air-tank containing compressed or rarefied air, connected by a valve with the air-pipe, so that the system of drainage valves on the tanks of all the cars that are connected together can be operated from one of the cars by manipulating the valve connected with the tank thereof.

Figure 1 of the accompanying drawings is a plan view showing in dotted lines the locomotive and cars of a train, and in full lines the several drainage and air tanks and the connecting air-pipes. Fig. 2 is an under side plan of a car showing its steam heating equipment and the pneumatic device for discharging the drainage tanks. Fig. 3 is a partial longitudinal section of the car. Fig. 4 is a transverse section thereof cut in a vertical plane intersecting the drainage tank. Fig. 5 is a fragmentary vertical section showing the preferred form of pneumatically operated drainage valve. Fig. 6 is a horizontal section of the compressed air tank on the car and its pipe connections and valves. Fig. 7 is a plan showing the air reservoir on the locomotive with the air-pipe and operating valve. Figs. 8 and 9 are sectional views corresponding to Fig. 5 and showing modifications of the pneumatically controlled valve.

I will first describe the steam heating system applied to the cars with reference to Figs. 2, 3 and 4. The steam, which is taken as usual from the locomotive boiler or other corre-

sponding source, enters the car through any usual form of coupling *a* and hose A, or other equivalent means for connecting the steam pipes on one car with those on the next or on the locomotive. From the hose A leads a pipe A′ having a valve or stop-cock *a′* for shutting it off when it is at the end of the train. The pipe A′ leads to and enters a drainage tank B placed at the end of the car, and preferably under the platform. The pipe A′ terminates about in the middle of the tank at its upper side in a double nozzle *b* (Fig. 4) by which the steam is divided and discharged both ways into the upper part or space of the tank. The steam thus divides and flows in opposite directions through the tank, and passes out therefrom through pipes C C which extend into the car and connect with radiators D D, or the pipe itself is carried through the car in one or more lengths or bends to constitute a radiator. In the construction shown the radiators D D are the Gold storage heaters, which are well understood in the art, of which as shown four are employed, two being connected to each pipe C, so that the steam passes through them serially, passing from the first radiator into the second through a pipe C′. As the construction of both ends of the car is alike, the tank B and pipes C and A′, and hose A and coupling *a* being duplicated, the steam which is admitted at one end and divides in one tank, flows in two branches through the radiators on opposite sides of the car and reunites in the other tank, passing out by the other pipe A and on through the hose and coupling to the next car.

The radiators D D, or lengths of pipe corresponding to them, are sloped or inclined so that the condensed water forming in them drains back through the pipes C C toward the opposite ends of the car, and flows into the tanks B B. These tanks consequently gradually fill with condensed water and require to be emptied or drained off at intervals, say for example on an elevated road at the end of each trip in severe weather, or once or twice a day in mild weather.

For draining the tanks B, each tank is provided with a pneumatically-controlled drainage-valve E, one suitable form of which is shown in Fig. 5. The particular form of valve here shown is so constructed that it closes itself and remains closed normally, but is opened to drain off the accumulated water by admitting compressed air to act against a diaphragm or other mobile part operating upon the valve stem. As long as the compressed air acts upon the diaphragm, the valve is held open and the water of condensation runs out. Referring to Fig. 5, a valve-disk *d* closes outwardly or with the flow of water against the seat *e* formed on the valve shell, and is fixed on the valve-stem *f* which passes through a stuffing box and extends to and terminates against the diaphragm *g* which constitutes one side of a chamber *h* into which compressed air is admitted through a pipe F′. The valve-disk *d* is held closed against its seat both by the pressure of the water seeking to escape and by the tension of a spring *s*, but upon admitting compressed air through the pipe F′ the diaphragm is forced against the valve stem, and by overcoming the pressure of the spring it forces the valve-disk from its seat. In case it should be necessary to open the valve by hand, a screw-stem *i* is provided which may be turned to press against the diaphragm and force the valve-disk off from its seat to the same effect as when compressed air is admitted.

Each car is equipped with an air-pipe F extending from end to end thereof, and provided at its ends with a flexible hose J and coupling J′, or any other equivalent means for connecting the pipe F of one car with the similar pipe of the next, or with a pipe F^2 on the locomotive. The locomotive is provided with a compressed air tank, G, which may be the usual compressed air tank employed in connection with the Westinghouse system of air brakes, and from which leads the pipe F^2, which pipe, however, is not to be confounded with the air-brake pipe, being necessarily a distinct pipe therefrom. On each car the pipe F has at each end a stop-cock *j* for closing it off at the end of the train or when the locomotive is disconnected. On each car the pipe F has branch pipes F′ leading from it to the drainage valves E of the tanks B. On the locomotive is provided any suitable sort of operating valve H adapted for establishing communication between the air reservoir G and the air-pipes F, and also adapted preferably to empty the pipes F of compressed air by opening them to the atmosphere. For this purpose I have shown in Fig. 7 a three-way cock which in the position shown admits compressed air to flow from the reservoir G to the pipe F^2 and train air-pipes F, while in another position it is closed, and in a third position it will establish communication between the train air-pipes and the nozzle *h′* communicating with the atmosphere, this being in substance the well known three-way cock used in the Westinghouse air-brake system.

When it is desired to discharge the accumulated water of condensation, say for example at the end of a trip, the engineer simply turns the valve H to the position for admitting compressed air into the train pipes F F, whereupon compressed air flows through the branch pipes F′ into the chambers *h* of the pneumatically operated valves E E, thereby opening these valves and holding them open to permit the water of condensation to run out. When the drainage from the several tanks ceases, the engineer will turn the valve H to the opposite position and let the compressed air escape, thereby permitting the several valves E E to close again ready for the next trip.

It sometimes occurs that it is not desirable to operate the drainage valves until the loco-

motive has been uncoupled from the train, as for example in case the locomotive is disconnected and switched to the other end of the train, so that the tanks may be drained while this is taking place and without waste of time. To provide for this, I place on each car a compressed air tank K, which is supplied with compressed air from any suitable source, and which is connected through any suitable branch pipes or ducts with the air-pipe F. In the construction shown a check-valve *k* is introduced in order that when compressed air is admitted to the pipe F at higher pressure than that existing in the tank K, a flow will take place into the latter to replenish its supply and restore it to the maximum pressure, while preventing a return flow; but to permit the compressed air to be turned at will from the tank K into the train-pipe F, I provide a by-pass pipe *l*, or any other branch duct or passage, and in it a valve L which is normally closed, but by opening which the compressed air may be admitted into the pipe F to operate the drainage-valves E E. The valve L is immediately closed after sufficient compressed air has been admitted into the pipes to operate the drainage valves, and when the flow has ceased from the several tanks the valves are closed by permitting the air to escape, which may be done by opening the cock *j* at either end of the train, or preferably by the provision of a valve L′ controlling a branch from the pipe F; or a single three-way cock might be used in place of the two valves L L′. By the described construction the air pressure in the tank K is resupplied every time that the drainage valves are operated by compressed air from the locomotive; or in case these valves are habitually operated from the tank K, this tank may be replenished at intervals by admitting compressed air into the pipes F from the locomotive at any time shortly after the condensation tanks have been drained. It will be understood that where several cars are connected on a train, the admission of compressed air from any of the tanks K will simultaneously operate all the drainage valves on the train. It will be consequently sufficient to have only one auxiliary tank K on the entire train, but in practice it is preferable to have one such tank on each car, so that when one tank has been exhausted another can be used, and so that if any car be disconnected from the train, its drainage valves can be conveniently operated simultaneously from its own tank.

My invention may be considerably modified without departing from its essential features. Thus instead of maintaining the air in the pipes F F′ and chambers *h* normally at atmospheric pressure while the valves E are closed, and introducing compressed air to force the valves open, some other and equivalent system may be substituted to the same end. All that is strictly essential is, that means be provided for varying the pressure of air from any determined normal pressure to a pressure above or below that in order to operate the valves. For example I have shown in Fig. 8 a construction in which normally the valves remain closed under atmospheric pressure, but to open them the air in the confined chamber of the valves is reduced below this pressure by drawing or sucking the air from the pipes F F′, or in other words, by applying a vacuum. In this case the valve chamber, here lettered *h′* is arranged on the opposite side of the diaphragm to that in the construction first described, the valve being in other respects the same as that shown in Fig. 5. Another modification is shown in Fig. 9, the valve, here lettered E^2, being constructed with a chamber h^2 the same as in Fig. 5, but differing therefrom in that its valve-disk *d′* is arranged outside of its seat, so that the action of a spring *s′* is to press the valve off from its seat so that the valve constantly tends to open. Normally the valve is held closed by compressed air admitted into the chamber h^2 through the pipe F′, the pressure being sufficient to overcome the tension of the spring *s′*. With this system, in order to drain the tanks of the cars it is only necessary to open a relief valve such as that shown at L′ in Fig. 6, to permit the compressed air confined in the pipes F F′ to escape. For operating the valve by hand, a screw *i′* is provided having at its end a head i^2 for engaging a flange projecting from the diaphragm, so that the diaphragm and valve stem may be pulled outward against the pressure of air in the chamber h^2.

The arrangement of steam piping shown is advantageous in that the condensation water tanks B B are kept hot, so that there is no possibility of their freezing as long as steam is turned on. The radiators of the different cars of the train are connected in series, those on each car being in two branches, so that if either should be stopped, free communication would remain through the other. By this system less pipe is required than by any previous system of piping. It is practically advantageous to jacket the tanks B B and the portions of the pipes C C exposed beneath the car floor, with some non-heat-conducting covering.

I claim as my invention the following-defined novel features or improvements, substantially as hereinbefore specified, namely:

1. The combination with a locomotive and the car or cars of its train, the latter having steam-heating pipes, and a drainage tank for receiving the condensed water on each car, of means for draining the accumulated water out of said tanks on the car or cars of the train, consisting of a pneumatically-operated drainage valve applied to each tank, an air-pipe on each car connected with said valve, and having couplings for connecting it with the like pipes on adjoining cars, to form a continuous air-pipe through the train, a source of compressed or rarefied air, and a valve communicating between such source and said con-

tinuous air-pipe whereby by operating said valve the pressure of air in said pipe may be varied to open said pneumatic valves and discharge the condensed water from the several tanks simultaneously by one controlling manipulation.

2. The combination with a locomotive and the car or cars of its train, the latter having steam-heating pipes, and a drainage tank for receiving the condensed water on each car, of means for draining the accumulated water out of said tanks on the car or cars of the train, consisting of a pneumatically-operated drainage valve applied to each tank, an air-pipe on each car connected with said valve, and having couplings for connecting it with the like pipes on adjoining cars to form a continuous air-pipe through the train, a reservoir of compressed or rarefied air on the locomotive, a pipe communicating between said reservoir and continuous air-pipe, and a valve on the locomotive for controlling such communication, whereby by operating said valve the emptying of all the drainage tanks on the train may be simultaneously effected from the locomotive.

3. The combination with a locomotive and the car or cars of its train, the latter having steam-heating pipes, and a drainage tank for receiving the condensed water on each car, of means for draining the accumulated water out of said tanks on the car or cars of the train, consisting of a pneumatically-operated drainage valve applied to each tank, an air-pipe on each car connected with said valve, and having couplings for connecting it with the like pipes on adjoining cars, to form a continuous air-pipe through the train, a source of compressed or rarefied air, an auxiliary air-tank on one or more cars, for storing compressed or rarefied air, communicating with said pipe, and a valve for manually controlling the communication between said tank and pipe, whereby the operation of said valve is effective, when the car or cars are disconnected from said source of compressed or rarefied air, to effect the simultaneous discharge of condensed water from the several tanks of the train.

4. The combination on a railway car of steam-heating pipes, a drainage tank for receiving the condensed water, a pneumatically-operated drainage valve applied to such tank, an air-pipe having couplings for connecting it with like pipes on adjoining cars, an auxiliary air-tank communicating with said pipe, and a valve for manually controlling the communication between said tank and pipe.

5. The combination on a railway car of steam-heating pipes, a drainage tank for receiving the condensed water therefrom, a pneumatically-operated drainage valve applied to such tank, an air-pipe connected with said valve and having couplings for connecting it with like pipes on adjoining cars, an auxiliary air-tank for storing compressed air communicating with said pipe, a check-valve for admitting a flow of compressed air from said pipe into said auxiliary tank and preventing its back flow, and a controlling valve adapted to be manually operated for permitting the escape of compressed air from said auxiliary tank into said air-pipe for operating said drainage valve.

6. The combination on a railway car of drainage tanks for receiving condensed water placed at opposite ends of the car, steam-pipes terminating in couplings and extending thence and opening into the upper parts of said tanks, and two branch steam-pipes extending from the upper part of one of said tanks, entering and passing through the car and terminating in communication with the upper part of the other tank, said pipes being inclined to drain condensed water into said tanks, whereby steam circulates in the upper part of each tank and keeps the accumulated water hot, a pneumatically-operated drainage-valve applied to each tank, an air-pipe leading from a source of compressed air and communicating with both said valves, and a valve for controlling the pressure of air in said pipe, for simultaneously operating said drainage valves.

7. The combination on a railway car of steam-heating pipes, a drainage tank for receiving the condensed water therefrom, a pneumatically-operated drainage valve applied to such tank, an air-pipe connected with said valve, an air-tank on the car, connected to said air-pipe, and a valve to be operated by hand for admitting air from said tank into said air-pipe to operate said drainage valve.

8. The combination on a railway car of steam-heating pipes, two drainage tanks for receiving the condensed water therefrom, pneumatically-operated drainage valves applied to said tanks, a compressed air-tank, an air-pipe leading from said tank to both said valves, and a valve to be operated by hand for admitting air from said air-tank to said air-pipe for simultaneously operating both said drainage valves.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

EDWARD E. GOLD.

Witnesses:
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FRED WHITE.