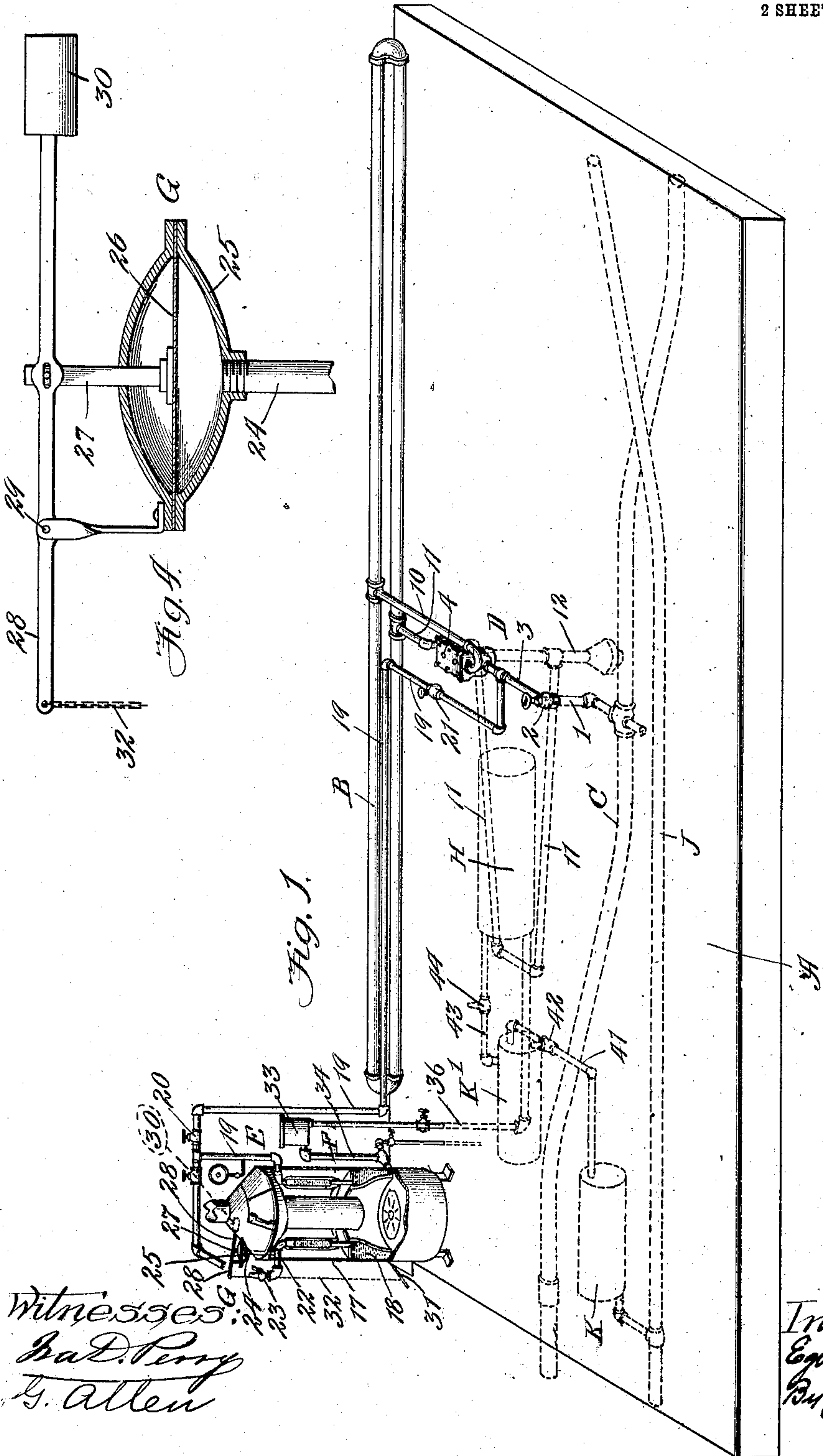


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 DUPLEX HEATING SYSTEM.  
 APPLICATION FILED JULY 20, 1907.

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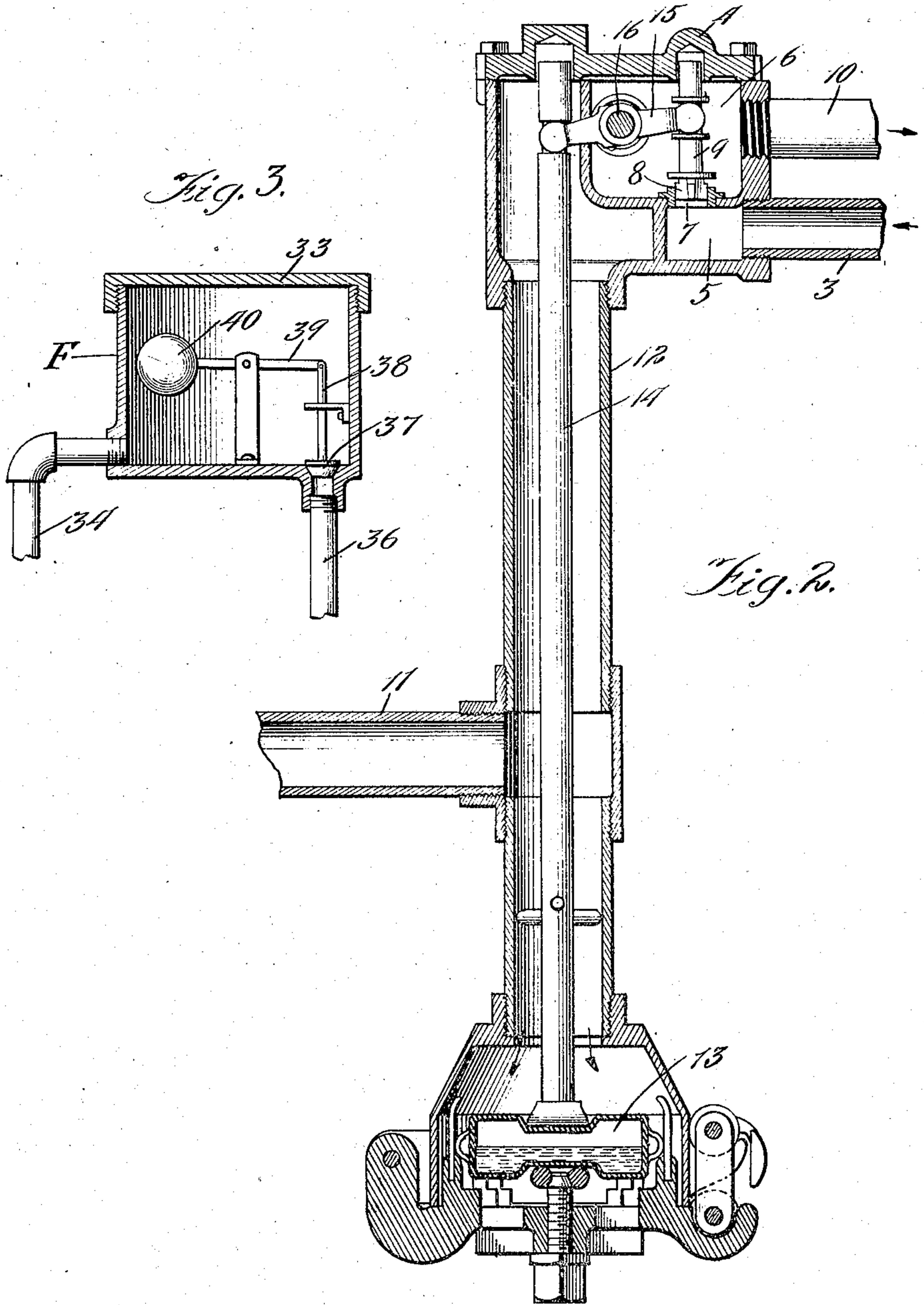
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# UNITED STATES PATENT OFFICE.

EGBERT H. GOLD, OF CHICAGO, ILLINOIS.

## DUPLEX HEATING SYSTEM.

No. 923,968.

Specification of Letters Patent.

Patented June 8, 1909.

Application filed July 20, 1907. Serial No. 384,804.

*To all whom it may concern:*

Be it known that I, EGBERT H. GOLD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Duplex Heating Systems, of which the following is a specification.

My invention relates primarily to heating systems which are ordinarily supplied with a heating medium from a source of supply which is common to two or more systems and which are also supplied with auxiliary heaters for use in case of the total or partial failure of the primary source of supply.

More particularly, my invention is intended for use in the heating of railroad cars where all of the cars of a train will be normally supplied with a heating medium, such as steam, from a train pipe leading from a primary generator, such as the locomotive boiler, while individual cars will be provided with auxiliary generators which will ordinarily be used either when, for some reason, the primary generator cannot be relied upon or when the car is detached from the locomotive or other primary generator, and my invention is still further especially useful in connection with that type of car heating systems in which the cars are normally supplied with high-pressure steam from the train pipe and are provided with a thermostatically operated device whereby the steam in the radiating pipes in the car is automatically maintained at a low pressure, usually about atmospheric pressure, or what is commonly known as the vapor system of car heating.

Broadly, the object of my invention is to provide any such systems with a simply constructed and a readily and reliably operated auxiliary heater which shall automatically supply the radiating system with a heating medium, preferably steam, at low pressure.

Especially is it my plan to provide individual cars with a radiating system normally supplied with the heating medium from the train pipe and provided with an auxiliary generator on each car which may be readily connected with the radiating system so as to supply a heating medium thereto at low pressure and which shall be automatically controlled and operated.

More particularly, it is the purpose of my

invention to provide such an auxiliary heater for the vapor system of heating so that it shall be possible to eliminate the system of water pipes filled with water and used with emergency heaters of the so-called Baker heater type, which are so commonly in use as auxiliary heaters, and to make it possible to obviate all the difficulties, dangers, expense and discomforts which are attendant upon such water heating systems, such, for example, as the danger of freezing, the danger of explosions, the necessity for an intensely hot fire, the expense of heavy piping and fittings, the slow operation in heating, the equally slow operation in cooling after the water in the pipes has become thoroughly heated, etc., and to substitute therefor a low pressure generator which may be quickly set in operation with a low fire, which will rapidly fill the radiating pipes with steam at low pressure, which will only require light and inexpensive fittings and pipes, which will be automatically maintained at low pressure, insuring a minimum consumption of fuel and a maximum of comfort, and which will permit of the rapid cooling of the car, etc.

Another object of my invention is to provide means for automatically supplying such auxiliary generator with water.

It is a subsidiary purpose of my invention to make the installation of such a system relatively easy and inexpensive. I, therefore, aim to utilize, so far as possible, the ordinary heater, when one is already installed, and also the air and water supplies which ordinarily are found in cars of this sort.

I shall illustrate the present invention in connection with and as a modification and improvement upon my low-pressure system of heating railway cars which is set out in my Patent No. 758,436 of April 26, 1904 and in subsequent patents embodying improvements and modifications upon my original system. In a heating system of that character steam is conveyed at high pressure through a steam train pipe running the length of the train and introduced into the several radiating systems in the cars at reduced pressure, the pressure and temperature in the radiating pipes being maintained by automatic means.

The invention has for further objects the



other new and improved constructions and arrangements set out in the accompanying specification.

These and such other objects as may hereafter appear are accomplished by my invention, a convenient embodiment of which is shown in the accompanying drawings, in which—

Figure 1 is a diagrammatic view in perspective of a heating system as applied to a car. Fig. 2 is a vertical section through the controller or vapor regulator. Fig. 3 is a sectional elevation of the water feed regulator, and Fig. 4 is a similar view of the damper regulator.

Like characters of reference indicate like parts in the several figures of the drawings.

A represents the flooring of a car, B a system of radiating pipes, C a steam train pipe, D the automatic controller, by means of which high pressure steam is taken from the train pipe and introduced into the radiating system, E the auxiliary generator, F an automatic water feed for the same, G automatic means for controlling the damper of the generator, H the water tank commonly carried upon a Pullman car, which I utilize for feeding the generator, J the compressed air train pipe, K the air tank and K' the auxiliary air tank which supplies pressure to the water tank in the customary manner.

The steam from the primary source of supply, or from the train pipe C passes up through a pipe 1 and valve 2 and into a pipe 3 which leads to a casing 4 in which is formed an inlet chamber 5 and an outlet chamber 6 connected by a port 7 closed by valve 8 on a spindle 9.

10 is a pipe leading from the outlet chamber to the system of radiating pipes B. When the valve 8 is raised the steam will pass freely from pipe 3 into pipe 10 and into the radiating system.

11 is a return pipe from the radiating system which is preferably made to extend around the water tank H so as to keep the water from freezing and which terminates at the drip pipe 12, in which is a thermostat 13 of any desired construction, here shown as a diaphragm inclosing a volatile fluid. From this diaphragm extends a rod 14 to which is connected a lever 15 pivoted at 16 and connected at the other end with valve stem 9. The steam in passing through the radiating pipes forces the cold air and water of condensation out through pipe 11 and past the thermostat in drip pipe 12. When the system is filled with steam at sufficiently high temperature, the steam coming into contact with the thermostat causes the same to rock the lever 15 and close valve 8, shutting off the supply of steam to the radiating pipes, the valve 8 remaining closed until there has been sufficient con-

densation in the radiating pipes to cause the cooling and contraction of the thermostat 13, when valve 8 will again be opened. In practice, however, it is found that valve 8 remains open most of the time sufficient to admit enough steam to keep up a proper pressure and temperature in the radiating pipes.

I have described in the above paragraph one form of controlling means whereby steam at high pressure is introduced into and maintained in the radiating system at relatively low pressure, but it will be apparent that other apparatus to accomplish the same end or other methods of low-pressure heating might be utilized in connection with the other elements of my present invention.

When steam from the locomotive is not available, I utilize steam generator E for supplying the heating medium. I have shown this generator as consisting of the shell 17 of an ordinary Pullman car style of heater, in the fire-box of which I arrange a boiler 18 which is in effect a water jacket. The steam generated in the boiler passes out through a pipe 19 which is provided with a valve 20 and which connects with pipe 3 leading into the casing 4. The pipe 19 is preferably provided near its connection with pipe 3 with a valve 21. The steam from the generator will, therefore, follow the same course as steam from the train pipe through the inlet and outlet chambers of the casing and into the radiating pipes, whence it will pass through return pipe 11 and expand thermostat 13 so as to close the admission valve when the temperature in the radiating pipes has reached the proper point. When valve 8 is closed or partially closed, pressure will begin to accumulate in pipe 19 and, in order to safeguard the generator and make it automatic in its operation, this pressure is utilized to close a damper and slow down the fire in the generator. So, also, the accumulation of pressure between the controlling device 4 and the generator would tend if unchecked to force back the water in the generator and raise the level of the water in the float tank 33, thereby closing the valve in said tank, as hereinafter explained.

22 is a pipe on which is the safety valve 23. Pipe 24 leads from the safety valve pipe 22 and connects with the diaphragm casing 25, in which is a diaphragm 26 carrying a rod 27 connecting with a lever 28 pivoted at 29 and carrying a weight 30. The damper 31 is connected to the other end of lever 28 by a chain or cord 32.

When pressure rises in the generator, diaphragm 26 is expanded and rocks lever 28, closing the damper. Another form of automatic controlling means for the damper might be used, this particular form of ap-



paratus being shown simply for purposes of illustration.

To make the operation of my system perfectly self-regulating, I prefer to provide an automatic water feed, and to that end I make use of the water and air supplies ordinarily carried by Pullman coaches. 33 is a float tank connected with the boiler by pipe 34 and with the water tank H by pipe 36, the entrance of which is closed by a valve 37. This valve has a stem 38 connected with a lever 39 pivoted within the tank, the other end of the lever carrying a float 40. The auxiliary air tank K' is kept supplied with air from the air tank K used for the air brakes, these tanks being connected by pipe 41, in which is the check valve 42. Auxiliary tank K' is connected with the water tank by a pipe 43 having a pressure reducing valve 44. The water in tank H will, therefore, be forced into the boiler of the generator whenever valve 37 is raised. The position of valve 37 will depend, of course, upon the level of water in the float chamber. Any form of automatic means for opening valve 37 might be utilized.

It will be seen that so long as the car is connected with the train it will be heated by steam taken from the locomotive or other source of supply common to the other cars of the train, the temperature and pressure in the radiating pipes being automatically regulated. For the greater part of the time the car will be so heated. But in case it becomes necessary to cut the car out of the train, the auxiliary steam generator may be connected with the system by opening valve 21, valve 2 being closed to prevent escape of steam through the train pipe. When so connected the same system of automatically regulated low-pressure heating will be continued which prevails under normal conditions.

I do not here claim means for feeding water from the water tank to the generator through the agency of compressed air, either broadly or substantially as here shown, but reserve the right to claim such subject matter, or so much thereof as may be patentable, in my co-pending application Serial No. 387,550, filed August 7, 1907, restricting the present application in this regard to the devices for feeding water to the generator in combination with the means herein shown for controlling the operations of the generator in accordance with pressure conditions in the radiating pipes and connecting pipes.

I claim:

1. The combination with a radiating system, of means for supplying a heating medium thereto, thermostatically operated means for controlling the flow of said heating medium through said system, an auxiliary device for supplying a heating me-

dium to said system, and means adapted to be set in operation by the condition of the heating medium in said system to control the operation of said auxiliary device.

2. The combination with a radiating system, of a primary source of supply for supplying a heating medium thereto, a thermostatically operated device for controlling the flow of a heating medium through said system, means for disconnecting said primary source of supply from said radiating system, an auxiliary generator for generating a heating medium and supplying the same to said radiating system when said primary source of supply is disconnected, and means for controlling the operation of said generator, said means being arranged to be set in operation when said auxiliary generator is in communication with said radiating system by the condition of the heating medium in the radiating system whenever the operation of said thermostatic device has served to wholly or partially check the flow of the heating medium through said system.

3. The combination with a radiating system, of a source of supply of a heating medium normally connected with said system, thermostatic means for controlling the admission of a heating medium from said source into the system, an auxiliary generator adapted to be connected with said system, and means coöperating with said controlling means for controlling the operation of said auxiliary generator.

4. The combination with a radiating system, of a source of supply of a heating medium normally connected with said radiating system, a valve in the connection between said source and said system, a thermostatic device to operate said valve, an auxiliary generator adapted to be connected with said system, and means, coöperating with said valve, for automatically controlling the operation of the auxiliary generator.

5. The combination with a radiating system, of a source of supply of a heating medium normally connected with said system, a valve in the connection between said source and said system, a device operated by thermostatic conditions at the outlet of said system to control the valve, an auxiliary generator adapted to be connected with said system, and means coöperating with said valve for controlling the operation of the generator.

6. The combination with a radiating system having an inlet valve and a thermostatic device to control the same, of a source of supply of steam and a steam generator adapted to be connected alternately with the radiating system so that the flow of steam from either of the same is controlled by the inlet valve, and means set in operation by



the condition of the heating medium in said system for controlling the operation of the generator.

7. The combination with a radiating system, of a source of supply of steam normally connected with said system, a controlling device operated by thermostatic means to control the admission of steam from said source into the radiating system, an auxiliary steam generator adapted to be connected with said system through said controlling device, and means operated by changes of pressure in the heating system for controlling the operation of said generator.

8. The combination with a radiating system, of a source of supply of steam at high pressure normally connected with said system, thermostatically operated controlling means adapted to admit steam from said source and maintain steam in said system at lower pressures, an auxiliary steam generator adapted to be connected with said system, and means cooperating with said controlling means for controlling the operation of the generator.

9. The combination with a radiating system, of a source of supply of steam at high pressure normally connected with said system, thermostatically operated controlling means adapted to admit steam from said source and maintain steam in said system at lower pressure, an auxiliary steam generator adapted to be connected with said system and to generate steam at relatively low pressure, and means cooperating with said controlling means for controlling the operation of the generator.

10. The combination with a radiating system, of a steam train pipe, a connection between the train pipe and said system, a controlling device interposed in said connection thermostatic means for operating the same, a steam generator adapted to be connected with said system through said controlling device, and means for automatically controlling the operation of the steam generator in conformity with thermostatic conditions in said system.

11. The combination with a radiating system, of a steam train pipe, a connection between the train pipe and said system, a controlling device interposed in said connection thermostatic means for operating the same, a steam generator adapted to be connected with said system through said controlling device, a controlling damper for the steam generator, and means set in operation by changes of pressure in said system for opening and closing the damper.

12. The combination with a radiating system, of a steam train pipe, a connection from the train pipe to said system, a controlling device interposed in said connection thermostatic means for operating the same, a

steam generator adapted to be connected with said system through said controlling device, automatic means for controlling the operation of the generator, and automatic means for supplying the generator with water.

13. The combination with a radiating system, of a source of supply of a heating medium normally connected with said system, thermostatic means for controlling the admission of a heating medium from said source into the system, an auxiliary generator adapted to be connected with said radiating system, and means arranged to be set in operation by the condition of the heating medium in said system, for controlling the operation of the auxiliary generator.

14. The combination with a radiating system, of a source of supply of a heating medium normally connected with said system, a controlling device operated by thermostatic means for controlling the admission of a heating medium from said source into the system, an auxiliary generator adapted to be connected with the system through said controlling device, and means set in operation by the condition of the heating medium in said system for controlling the operation of the auxiliary steam generator.

15. The combination with a car, of a steam radiator located therein, a steam generator located in said car and arranged to supply steam to said radiator, a water tank in communication with said generator so as to supply water thereto, an air tank arranged to contain air under pressure and communicating with said water tank so as to force water from said water tank to said generator, a supply valve arranged to control the flow of water from the water tank to the generator, and means automatically actuated by thermostatic conditions in said radiating system for determining the maximum pressure in the generator.

16. The combination with a radiating system, of means for supplying a heating medium thereto, automatic means for controlling the flow of the heating medium through said system, an auxiliary device for supplying a heating medium to said system, so that the same is controlled by said automatic means, and means adapted to be set in operation by the condition of the heating medium in said system to control the operation of said auxiliary device.

17. The combination with a radiating system, of means for supplying a heating medium thereto, automatic means for controlling the flow of said heating medium through said system, an auxiliary heater for supplying a heating medium to said system, so as to be controlled by said automatic means, means adapted to be set in operation by the condition of the heating medium in said system to control the operation of said auxil-



ary device, and an automatic device for supplying said auxiliary heater with and maintaining water therein at a given level.

5 18. The combination with a radiating system, of a heater for supplying a heating medium to said system, automatic means for controlling the flow of said heating medium through said system, means adapted to be set in operation by the condition of the heating

medium in said system to control the operation of said heater, and an automatic device for supplying said heater with and maintaining water therein at a given level. 10

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