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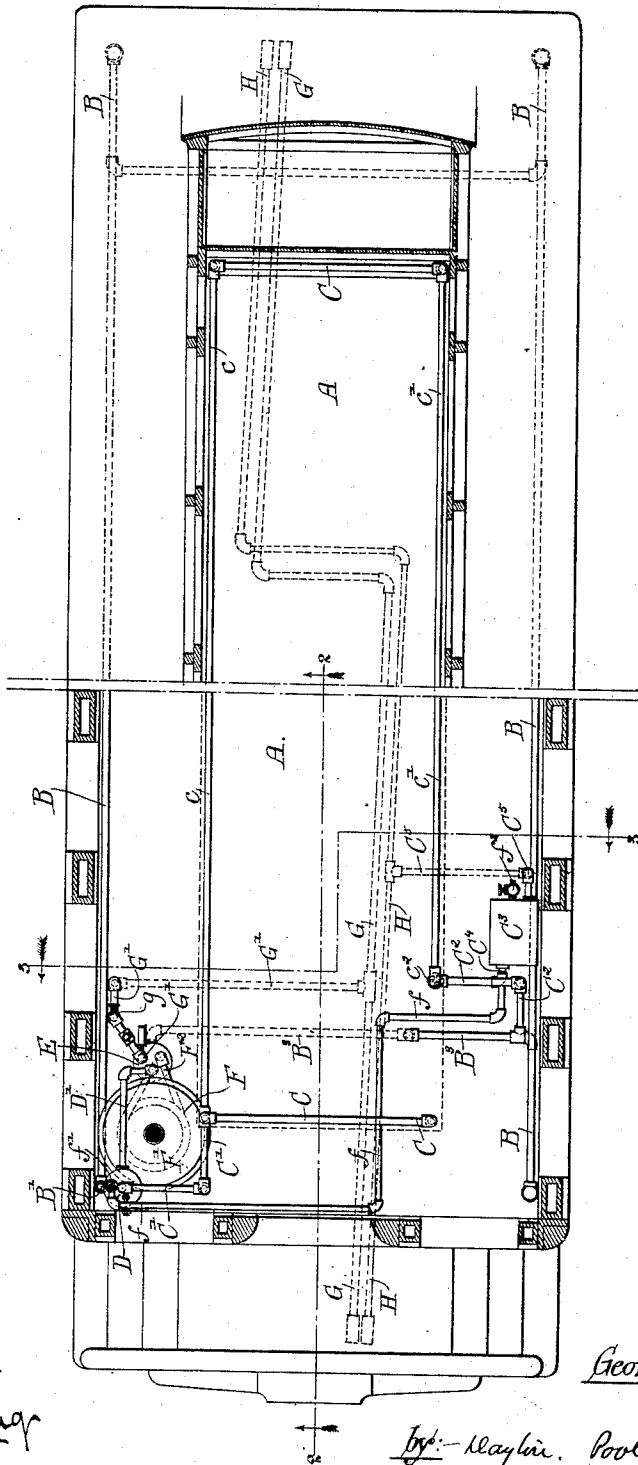
4 Sheets—Sheet 1.

G. A. PRESCOTT.
CAR HEATING APPARATUS.

No. 474,404.

Patented May 10, 1892.

Fig. 1.



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Inventor:
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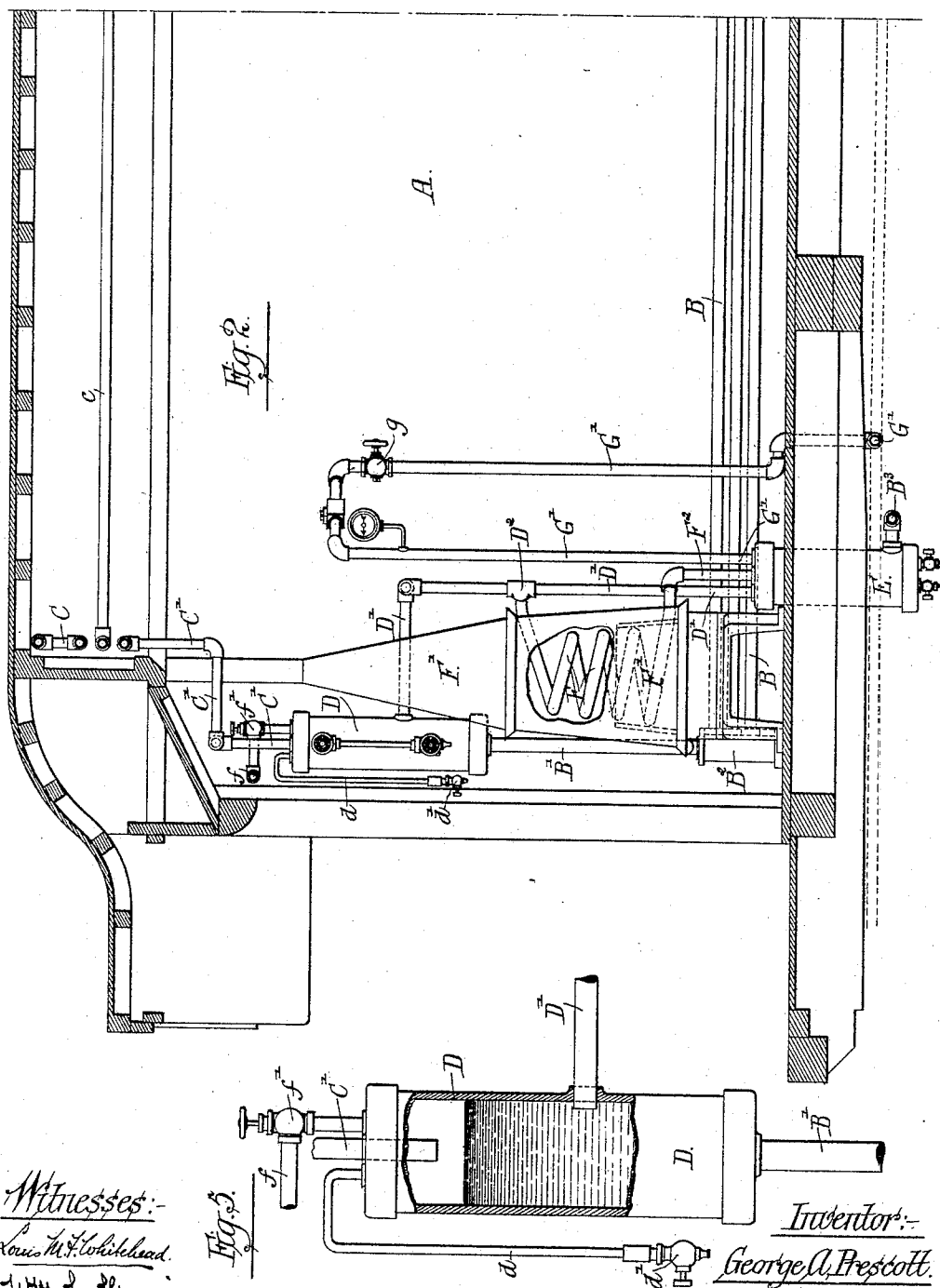
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Fig. 5.

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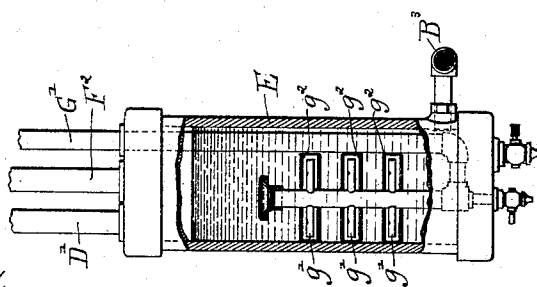
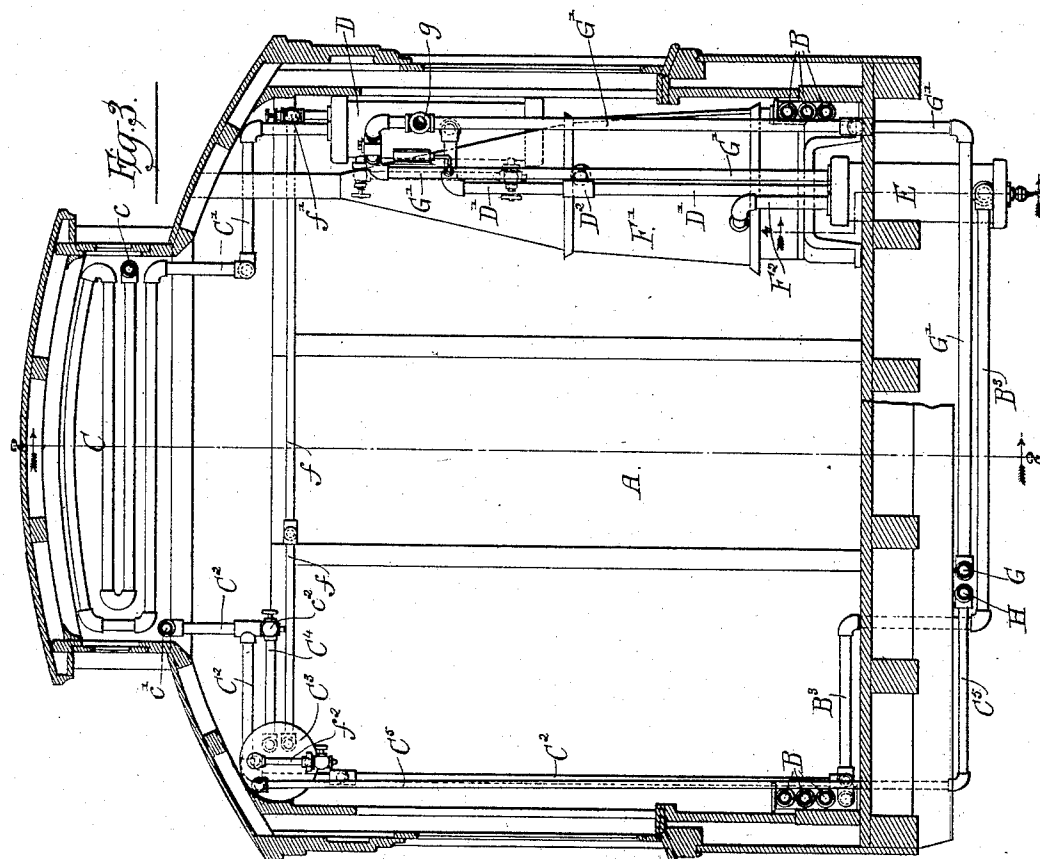
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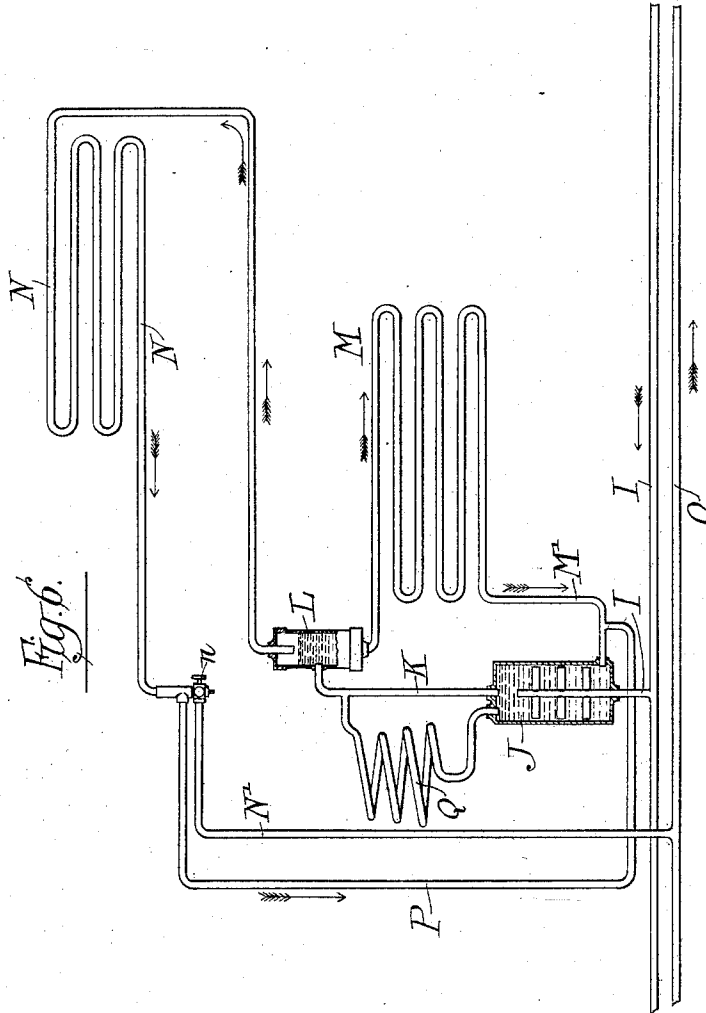
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CAR HEATING APPARATUS.

No. 474,404.

Patented May 10, 1892.



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UNITED STATES PATENT OFFICE.

GEORGE A. PRESCOTT, OF TOPEKA, KANSAS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF THREE-FOURTHS TO WILLIAM M. ABERNATHY AND WILLIAM WADSWORTH, OF SAME PLACE.

CAR-HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 474,404, dated May 10, 1892.

Application filed September 23, 1890. Serial No. 365,888. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. PRESCOTT, of Topeka, in the county of Shawnee and State of Kansas, have invented certain new and useful Improvements in Car-Heating Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in car-heating apparatus of that class in which the heat for warming the car may be derived at will either by means of steam taken from the locomotive-boiler or from a boiler especially designed for supplying steam to the several cars of the train or by means of an auxiliary heater located in the car, so that when the car is attached to a train provided with means for supplying steam to all of the cars it may be heated by steam, and when it is detached from the train or when attached to a train having no means of steam-supply the auxiliary heater may be used.

The invention consists in the matters hereinafter described, and pointed out in the appended claims.

In the accompanying drawings, illustrating my invention, Figure 1 is a sectional plan view of a car containing a heating apparatus embodying my invention; Fig. 2, a longitudinal vertical section of one end of the car, taken on line 2 2 of Fig. 1; Fig. 3, a vertical cross-section of the car, taken upon line 3 3 of Fig. 1. Figs. 4 and 5 are enlarged detail views of parts of the heating apparatus. Fig. 6 is a diagrammatic view illustrating more clearly the system of steam and hot-water circulation.

In said drawings, A indicates the car-body; B, a series of connected hot-water-circulating pipes located within the lower part of the car, and C a series of connected steam circulating or condensing pipes located in the upper part of the car, preferably above the level of the pipes B.

D indicates a separating-chamber to which the water-circulating pipes are connected in

such manner that water circulating in the pipes passes through the chamber, and to the top of which the steam-pipes are connected, said chamber being located above the level of the water-pipes, which are filled with water to a point which will bring the water-line within said separating-chamber.

E indicates a water-heating chamber located in the lower part of the car and connected in circuit with the water-pipes B.

D' indicates a pipe leading from the heating-chamber E to the separating-chamber D and entering the latter at a point below the water-level therein.

F indicates a heating-coil of pipe of any desired form, the same being located within a heating stove or furnace F', located therein form a water-heater of familiar construction. The heating-coil F is connected at its lower end through a pipe F² with the heating-chamber E, and is connected at its upper end with the pipe D' by an ordinary T-coupling D². The pipe composing the said heating-coil F may, however, if preferred, be extended to the separating-chamber D.

B' indicates a pipe leading from the lower part of the separating-chamber D to a "header" B², connected with the series of water-circulating pipes B at the lower part of the car.

C' indicates a pipe leading from the upper part of the separating-chamber D to the steam-circulating pipes C at the top of the car.

G indicates a steam-supply pipe extending from end to end of the car, preferably beneath the floor, and provided with suitable couplings or fittings to adapt it to be readily connected with similar pipes on adjacent cars of the train, the several connected pipes serving to convey steam from the boiler to the several cars.

G' indicates a branch steam-supply pipe rising from the main steam-supply pipe to a point above the water-level in the water-circulating pipes and then extending downwardly to the water-heating chamber. Said pipe G' is provided with a valve g, adapted

to shut off the supply of steam from the boiler when desired or to close communication between said pipe G' and the pipe G when the car is disconnected from the locomotive or the rest of the train or when it is desired to heat the car by means of the auxiliary heater. The branch steam-supply pipe extends at its lower end to the bottom of the heating-chamber E and is adapted to discharge steam into said chamber for heating the water therein, as hereinafter more fully pointed out.

B³ indicates a water-return pipe leading from the hot-water-circulating pipes B at the bottom of the car to the lower part of the water-heating chamber E and adapted to convey the water back to the heating-chamber after it has passed through the several pipes B. The steam-circulating pipes C at the top of the car embrace longitudinal pipes *c c'*, which extend from end to end of the car and connect with each other by flat vertical coils, which in the instance illustrated are located at each end of the car, near the top thereof. The end of the pipe *c'* is bent or carried downwardly, and with the same, above its lower end, is connected an open local water-return pipe C², as shown more particularly in Figs. 1 and 3, which extends downwardly and is connected with the water-pipe B³, which connects the water-circulating pipes with the bottom of the heating-chamber.

C³ indicates a water tank or receptacle below the level of the steam-circulating pipes and above the water-line of the water-pipes B, and C⁴ a pipe connecting the steam-pipe *c'* with said tank, said pipe C⁴ being connected with the lower end of the steam-pipe below the point at which the return-pipe C² is connected therewith. A valve *c²* in said pipe C⁴ is adapted to close the same to prevent the passage of water from the steam-pipe *c'* to the tank or receptacle C³ when the auxiliary heater is in use. C⁵ indicates a pipe leading from said tank or receptacle C³ downwardly through the bottom of the car and opening into the main water-return pipe H, which leads back to the locomotive or to the vicinity of the steam-generator in case a separate boiler is carried on the train. The pipes C⁴ and C⁵ constitute in effect a single return-pipe for water of condensation from the steam-circulating pipes, inasmuch as the tank C³ does not affect the action of said return-pipe, except to accumulate water of condensation for use, in the manner hereinafter set forth.

The operation of my improved heating apparatus is as follows: When it is desired to heat the car by steam taken from the locomotive-boiler, the other cars in the train being all equipped with similar apparatus and the steam and return pipes connected together from car to car so as to establish communication with the boiler, the valves *g* and *c²* are opened and steam then enters through the main steam-supply pipe G and the branch pipe G' into the heating-chamber E, the con-

struction being such that the steam is permitted to escape from the pipe G' into the water. It is obvious that the steam entering the heating-chamber will heat the water therein and will produce an upward current or circulation of water through the said chamber and through the pipe D', colder water from the above meanwhile entering said chamber through the return-pipe B³. The water rising in the pipe D' passes into the separating-chamber D and flows downwardly therein, while steam liberated from the water in the chamber rises through the pipe C' and passes into the circulating-pipes C. The heated water passes from the chamber D downwardly through pipe B' and enters the circulating-pipes B at the lower part of the car, from which, after it has passed through said pipes and by its circulation therein imparted a greater portion of its heat to the air within the car, it returns through the pipe B³ into the bottom of the water-heating chamber E. The steam passing through pipes C loses a greater part of its heat and is condensed. The water of condensation as it passes downwardly through the depending part of the pipe *c'* flows past the end of the local return-pipe C² and passes through said pipe C⁴ into the tank or receptacle C³. The overflow from said tank passes downwardly through the pipe C⁵ to the main return-pipe H below the car, and thence back to the vicinity of the boiler, where it is preferably used for feeding the same.

If the car is detached from the locomotive or if the train is not equipped with the necessary steam-supply apparatus, it becomes necessary to heat the car by means of the heater located within the same. In this case the valves *g* and *c²* are closed, thus shutting off all communication between the circulating-pipes and the steam-supply and water-return pipes G and H.

Fire being made in the heater F', the coil F therein will become heated, and the heated water and steam generated in said coil will rise through said coil, passing through the connection D² into the pipe D', and thence into the separating-chamber D, when the water will pass downwardly through pipe B³ to the pipes B, as before, and the steam will ascend through pipe C' and pass into the steam-pipes C. Water returns, as before, through the pipe B³ into the bottom of the chamber E, flowing through the latter into the pipe F², and thence back into the bottom of the heating-coil F. The steam meanwhile passes through the circulating or condensing pipes at the top of the car and, parting with its heat, becomes condensed and the water of condensation returns through pipe *c'*, passes down through the open local return-pipe C² to return-pipe B³, where it mingles with the returning water and passes into the bottom of the chamber E. It is thus seen that by my improved construction both a steam-circulation and a hot-water-circulation system are

provided, each operating independently of the other, so far as the circulation of the steam and water is concerned, and each deriving its heat from the same source.

5 The diagram Fig. 6 illustrates more clearly the construction and operation of my improved apparatus for heating the car. In said figure I indicates the steam-supply pipe, which is arranged to discharge into the water-heating chamber J. K is the pipe leading from the water-heating chamber to the separating-chamber L. M indicates a water-circulating pipe, which is connected with the separating-chamber L and with the bottom of the water-heating chamber by a pipe M', and N is a steam circulating or condensing pipe, which is connected with the return-pipe O by means of the escape or return pipe N', provided with a valve *n*, and with the heating-chamber by the open local return-pipe P. Q is a local heating-coil, which is connected at its lower end with the water-heating chamber and at its upper end with the pipe K.

When the car is heated by steam from the steam-supply pipe, the water and steam rise through the pipe K and pass into the separating-chamber, from which the water passes to the circulating-pipes M, and thence through the pipe M' back to the heating-chamber J. Steam meanwhile passes from the separating-chamber into the pipe N and is there condensed, the water of condensation returning to the steam-generator through the pipe N', the valve *n* being at this time open and the steam which condenses in the pipe P returning to the water-heating chamber J. When the car is heated by the local heater, the valve *n* is closed and the hot water and steam from the coil Q rise and pass into the separating-chamber, from whence the hot water circulates through the pipe M and returns through the heating-chamber J to the lower end of the coil, while steam passes into the pipe N, and, being there condensed, the water of condensation returns to the heating-chamber J through the open pipe P. The said open or local return-pipe P is connected with the steam or condensing pipe N at a point above that at which the pipe N' is connected therewith, so that when the valve *n* is open and the car is being heated by steam from the supply-pipe water of condensation flowing from the steam-pipes M will not enter the said local return-pipe P, but will pass out through the return-pipe N', and will thus prevent the system of pipes being filled above the water-line therein, as would occur by condensation of steam if the pipe N', arranged and connected as described, were absent. By the connection of the valved return-pipe N' with the steam circulating or condensing pipes at a point below that at which the local return-pipe connects therewith, the heating system on the car is adapted for use in connection with either a steam-supply or local heater by the employment of one valve only in addition to that in the steam-

supply pipe, while at the same time a construction is obtained which is simple, convenient, and safe.

The construction shown in Fig. 7 is not in itself new and is illustrated merely for the purpose of making clear the operation of the apparatus as a whole.

As a further and separate improvement for the purpose of preventing noise in the escape of steam from the supply-pipe into the heating-chamber, and to facilitate the heating of the water by the steam, I extend the said steam-pipe into the said chamber and provide the same with a series of branch pipes *g' g'*, each of which is perforated or provided with small apertures for the escape of the steam into the water within the chamber. These perforated or apertured branch pipes are each surrounded by a jacket or short tube *g*², as illustrated in the drawings. By this construction the steam is broken up into small jets as it escapes from the supply-pipe, and these jets after entering the water are further broken up by striking the jackets or tubes *g*². A rapid heating of the water is obtained by this construction, inasmuch as the steam and water are thoroughly mixed and the heat thus quickly imparted to and distributed through the water in the heating-chamber.

I find that by the employment of means such as herein shown for breaking up the steam into small jets as it mingles with the water the objectionable noise commonly caused by the discharge of steam into the water is entirely done away with. Pipes or passages arranged to discharge the steam into the water through a plurality of perforations or apertures may be arranged in a great variety of different ways, and the particular construction shown, in which the main pipe is provided with a plurality of apertured branches, is not therefore essential.

As a still further and separate improvement I provide a pipe *f*, leading from the tank or receptacle C³ to the separating-chamber D and provided with a shut-off valve *f'*. By reference to Fig. 3 of the drawings it will be observed that the pipe C³ opens into said tank C³ at a point considerably above the bottom thereof, and that therefore condense-water from the steam-circulating pipes will accumulate and remain in said tank or chamber C³. By means of the pipe *f* and valve *f'* this condense-water may be drawn off and passed back into the water-circulating pipes in case the water-supply therein becomes low. It will be observed that the valve *c*² in the return-pipe leading from the steam-circulating pipes is shown as placed in said pipe between the tank C³ and the steam-circulating pipes. This arrangement of said valve is preferable, inasmuch as it serves to prevent an accumulation of water of condensation in said tank when the auxiliary heater is in use and a consequent diminution in the supply of water in the pipes, and therefore obviates the necessity of replenishing the water in said pipes, as

would be necessary in case the condense-water were permitted to accumulate in said tank. On the other hand, when steam from the locomotive is used there will be a constant accession of water of condensation within the steam-pipes, and by opening the valve c^2 this water is permitted to pass into the tank C^3 , where it will accumulate until it reaches the level of the overflow-pipe C^3 , when the surplus of said water of condensation will pass off through said pipe to the main return-pipe H. I also provide any suitable and convenient form of connection or valve, as f^2 , located at the under side of the tank C^3 , whereby surplus hot water in said tank may be drawn off for use in the car, if desired.

In order to draw off water from the water-pipes in case the accumulation of water of condensation in the steam-circulating pipes brings the water-level considerably above the top of the separating-chamber, I provide a drain-pipe d , communicating with the top of said chamber and provided with a valve d' .

In a steam-heating apparatus of the general character above set forth means may be employed different from those shown for heating water by steam, it being obvious that the general advantages gained by the use of steam and water circulating pipes arranged in connection with main and local return-pipes for water of condensation in the manner described is obtained whether the water is heated in the particular manner herein shown or otherwise. One of these advantages is that of economy in fuel consumption, arising from the fact that all of the heat in the steam is utilized in heating the car, inasmuch as the steam is entirely or to a great extent condensed in said steam-circulating pipes, and is thus caused to part with most of its heat.

Another important advantage gained by the use of the steam-circulating pipes is that when the auxiliary heater is being used and the circulating-pipes are closed entirely from communication with the outside air liability of a dangerous pressure in the system is obviated, from the fact that the steam is being constantly condensed within the steam-circulating pipes, the condensation commonly being so rapid as to prevent any great increase of pressure under conditions that commonly obtain in such heating apparatus.

A great disadvantage arising from heating devices using hot water only, as heretofore made, is that in such devices there is practically no steam-space or condensing-surface, so that any considerable increase in temperature rapidly produces a high degree of pressure within the closed pipes of the apparatus. In the construction herein shown, on the contrary, the steam-circulating pipes contain such a large area of condensing-surface that the hottest fire which can be made in the heater will fail to make steam fast enough to produce a dangerous pressure.

I claim as my invention—

1. A car-heating apparatus comprising a

live-steam-supply pipe, a water-heating chamber into which said supply-pipe discharges, a separating-chamber, a pipe leading upwardly from the heating-chamber to the separating-chamber, an auxiliary water-heater provided with a coil in communication at its opposite ends with the water-heating chamber and separating-chamber, water-circulating pipes communicating with the separating-chamber and with the water-heating chamber, a steam-condensing pipe leading from the top of the separating-chamber, an open local return-pipe for water of condensation, connected with said condensing-pipe and leading back to the water-heating chamber, and a valved return or discharge pipe for water of condensation, also connected with the said steam-condensing pipe, substantially as described.

2. A car-heating apparatus comprising a live-steam-supply pipe, a water-heating chamber into which said supply-pipe discharges, a separating-chamber, a pipe leading upwardly from the heating-chamber to the separating-chamber, an auxiliary water-heater provided with a coil in communication at its opposite ends with the water-heating chamber and separating-chamber, water-circulating pipes communicating with the separating-chamber and with the bottom of the water-heating chamber, a steam-condensing pipe leading from the top of the separating-chamber, an open return-pipe for water of condensation, connected with said condensing-pipe and leading back to the water-heating chamber, and a return or discharge pipe connected with said steam-condensing pipe at a point below that at which the local return-pipe is connected therewith and provided with a valve, substantially as described.

3. A car-heating apparatus comprising a live-steam-supply pipe, a water-heating chamber into which said supply-pipe discharges, a separating-chamber, a pipe leading from the heating-chamber to the separating-chamber, an auxiliary water-heater provided with a coil in communication at its opposite ends with the heating-chamber and separating-chamber, water-circulating pipes communicating with the separating-chamber and with the water-heating chamber, a steam-condensing pipe leading from the top of the chamber, an open local return-pipe for water of condensation, connected with said condensing-pipe and leading back to the water-heating chamber, a tank for water of condensation, located above the level of the water-circulating pipes, a valved return or discharge pipe leading from the condensing-pipe to the said tank, and a return or discharge pipe for water of condensation, opening into the upper part of said tank and leading downwardly from the latter, substantially as described.

4. A car-heating apparatus comprising a live-steam-supply pipe, a water-heating chamber into which said supply-pipe discharges, a vertical pipe leading into said chamber, connected with said steam-supply pipe and pro-

vided within the chamber with a plurality of horizontal branches provided with steam-exit apertures or perforations, tubes within the chamber surrounding the apertured or perforated branch pipes, and water-circulating pipes in communication with said water-heating chamber, substantially as and for the purpose specified.

5. A car-heating apparatus comprising a live-steam-supply pipe, a water-heating chamber into which said supply-pipe discharges, a separating-chamber, a pipe leading upwardly from the heating-chamber to the separating-chamber, an auxiliary water-heater provided with a coil in communication at its opposite ends with the water-heating chamber and separating-chamber, water-circulating pipes communicating with the separating-chamber and with the water-heating chamber, a steam-condensing pipe leading from the top of the separating-chamber, a water-tank located above the level of the water-circulating pipes, an open local return-pipe for water of condensation, connected with said condensing-pipe and leading back to the water-heating chamber, a valved return or discharge pipe also communicating with the said steam-condensing pipe and leading to the said tank, a water return or discharge pipe connected with the upper part of the tank and leading downwardly therefrom, and a valved outlet upon the tank, substantially as described.

6. A car-heating apparatus comprising a

live-steam-supply pipe, a water-heating chamber into which said supply-pipe discharges, a separating-chamber, a pipe leading upwardly from the heating-chamber to the separating-chamber, an auxiliary water-heater provided with a coil in communication at its opposite ends with the water-heating chamber and separating-chamber, water-circulating pipes communicating with the separating-chamber and with the water-heating chamber, a steam-condensing pipe leading from the top of the separating-chamber, an open local return-pipe for water of condensation, connected with said condensing-pipe and leading back to the water-heating chamber, a water-tank located above the level of the water-pipes, a valved return-pipe, also connected with said condensing-pipe and leading to the tank, a return or discharge pipe connected with the upper part of the tank and leading downwardly therefrom, and a pipe extending from the bottom of said tank to the water-circulating pipes and provided with a valve by which water may be allowed to flow from said tank to the circulating-pipes for replenishing the latter, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

GEORGE A. PRESCOTT.

Witnesses:

E. M. COCKRELL,
J. R. McNARY.