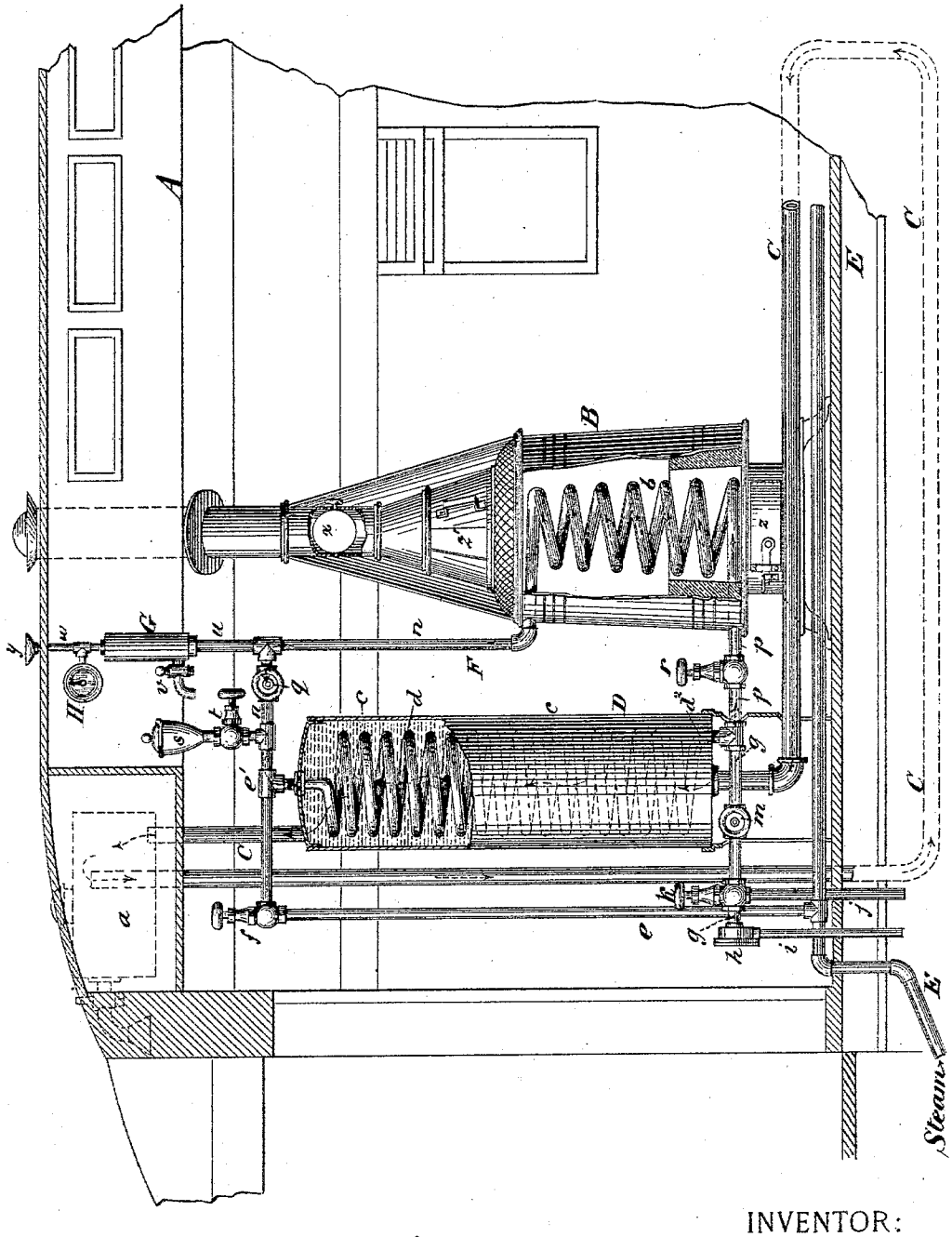
(No Model.)

E. E. GOLD.

HEATING APPARATUS FOR CARS, &c.

No. 569,637. Patented Oct. 20, 1896.



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HEATING APPARATUS FOR CARS, &c.

SPECIFICATION forming part of Letters Patent No. 569,637, dated October 20, 1896.

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To all whom it may concern:

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

This invention relates to apparatus for heating railway-cars or other apartments through the medium of a circuit of pipe, through which a heated liquid is caused to flow.

It relates especially to that type of circulatory heating apparatus wherein the liquid-circuit may be heated either by steam heat from an external source or by the more direct heat of a fire placed in or close to the apartment in order that when steam is available a fire in the car or other apartment is unnecessary, and when steam is not available the operation of the system may be continued by the use of a fire in or adjacent to the car or apartment as the source of heat.

According to my present invention the liquid-radiating circuit is not brought into direct contact with the fire, but when heated therefrom the heat is communicated to it through the medium of an intervening closed or sealed circuit, through which flows water, steam, or other fluid, which is heated by direct contact with the fire, and which in turn communicates the heat to the liquid-radiating circuit. I combine therewith means for bringing steam from a suitable source external to the car or apartment, as, for example, from the boiler of a locomotive, into operative contact with the radiating-circuit to heat the latter when it is not being heated from the fire or stove through the intermediate fluid-circuit. According to the preferred construction the said intermediate circuit becomes at one time a distinct closed fluid-circuit for communicating heat from the stove to the radiating-circuit and at another time by the operation of suitable valves a part of the steam-heating system. In such latter case the heater, by means of which the heat is communicated to the radiating-circuit, consists of two chambers or passages in heat-conducting contact with one another, through the one of which the liquid in the radiating-circuit flows, and the other of which forms at one time a part of the intermediate fluid-circuit and at another time a part of the steam-circulating system, so that whether the radiating-circuit is being heated by steam or by the stove it receives its heat by conduction within the steam-heater.

I will now proceed to describe my invention in its preferred embodiment, with reference to the accompanying drawing, wherein the figure is a side elevation of the heating apparatus in its preferred form, partly broken away in vertical section and shown as applied to a railway-car, which is represented in vertical longitudinal section.

Let A designate the railway-car as a whole; B, the stove or heater therein of any ordinary kind—such, for example, as that which is known as the "Baker" heater—and C the liquid-radiating circuit extending throughout the car. This circuit is completed diagrammatically in dotted lines in order that the flow of the liquid through it may be traced. The liquid contained in this circuit may be brine, glycerin, or any other liquid not liable to freeze, and which has good heat conducting and radiating properties. The circuit extends to the upper part of the car and the two pipes thereof open into an expansion-box *a*, as is common.

The stove B has a coil of pipe *b* within its fire-chamber after the manner well understood with reference to what is known as the "Baker" car-stove. This coil, however, does not, as heretofore, form part of the radiating-circuit C. Instead thereof the circuit C is entirely exterior to the stove B. The circuit C is heated by a heater D, preferably arranged vertically, and with the top and bottom of which the pipes of the circuit connect, so that the interior of the liquid chamber or passage in the heater forms a part of the radiating-circuit. The heater D is preferably constructed with a vertical cylindrical outer shell *c* and with a coil or drum *d* of pipe arranged therein. The pipes of the circuit C connect with the outer shell *c*, whereby the liquid in the radiating-circuit flows through the shell and around the coil of pipe *d*.

E is the main steam-pipe, which in the case of a railway-train will be coupled from car to car, so that it extends the entire length of the train, steam being admitted to it from the locomotive-boiler or other source of steam. In

each car a branch steam-pipe *e* leads from it to a suitable valve or cock *f*. From this valve the pipe *e'* leads to and joins the upper end of the coil *d*, which projects out through the top of the shell *c* of the heater D. The bottom end d^2 of this coil connects with a drainage-pipe *g* for leading off the water of condensation. This pipe *g* terminates in a trap *h*, from which a drip-pipe *i* leads downwardly and discharges beneath the floor of the car. The trap *h* is preferably a thermo-expansion trap operating automatically to discharge the accumulated water of condensation whenever the latter becomes sufficiently cool to open the trap. The pipe *g* is also provided with a blow-off cock *k*, from which a blow-off pipe *j* leads down and opens beneath the floor of the car. The arrangement and purpose of the parts *h i j k* are the same as those of the corresponding parts shown and described in my application, Serial No. 273,183, filed May 8, 1888. The pipe *g* is also provided with a valve or stop-cock *m*, by closing which the trap *h* is made inoperative, since the water of condensation is retained in the pipes without being permitted to reach the trap. The two coils *b* and *d* are connected together at their opposite ends and constitute with their intervening connecting-pipes a fluid-circuit F, which I shall refer to as the "intermediate fluid-circuit." The upper end of the coil *d* is connected by a pipe or pipes *n* with the upper end of the coil *b*, while the respective lower ends of the two coils are connected through the medium of a pipe or pipes *p*, which may or may not be in line with and constitute a continuation of the drainage-pipe *g*. The pipe *n* is provided with a valve *q* by which to close it off, and the pipe *p* is provided with a similar valve *r*.

The operation will now be understood. Let us suppose that it is desired to heat the car by heat derived from steam supplied through the pipe E. The attendant will open the valve *m* and the valve *f* and will close the blow-off cock *k*. The valves *q* and *r* may be left either both open or both closed. Steam from the pipe E will then flow through the branch pipe *e* and pipe *e'* into the coil *d*, thereby communicating its heat to the liquid flowing through the heater D, whereby a circulation is instituted through the liquid-radiating circuit C C, and the heat imparted to the liquid therein in the heater D is radiated from this circuit throughout the entire car. As the steam condenses in the coil *d* its water of condensation flows to the bottom of this coil and fills the pipe *g*, but is prevented from escaping by the thermotrap *h* so long as it remains sufficiently hot to keep the trap expanded. When, however, it becomes somewhat cooled, this trap opens and permits it to drain off, whereupon the trap is closed again and permits a new accumulation of condensed water. This operation continues as long as the steam continues to be supplied from the pipe E.

Upon reaching the end of the journey and disconnecting the car from the train, or upon the disconnection of the locomotive or other source of steam therefrom, or when from any cause the steam supply in the pipe E ceases, the attendant will light the fire in the stove B. He will close the valves *f*, *m*, and *q* and open the valve *r*. He will then fill the circuit F with water or other liquid by pouring it in through a funnel *s*, which is mounted over the circuit F and which connects therewith through a short pipe closed by a valve *t*, which valve the attendant will open. The water thus poured in will run down into the coil *d*, and thence across through the pipe *p* into the coil *b*, expelling any air that may be in these coils out through the pipe *n* and through a pipe *u*, extending upwardly from the circuit F, (on the opposite side of the valve *q* from the funnel-inlet,) thence into an air-chamber G and out therefrom through a stop-cock *v*, which the attendant will open to serve as an air-vent. The attendant will know when the circuit F is full of water by the running out thereof from the faucet *v*. He will then close the faucet *v* and valve *t* and open the valve *q*. The system is then ready for heating from the stove B. The fire therein heats the water in the coil *b* and causes an upward circulation thereof through the pipe *n* and down through the coil *d*, thence returning to the bottom of the coil *b*, as indicated by the arrows. The liquid in the circuit F is heated to a high temperature by the fire, and in flowing through the coil *d* it gives up this heat to the liquid in the radiating-circuit C, whereby the latter is heated by the coil *d* as it was formerly heated thereby when the heat was derived from the steam introduced through the pipe E. The circuit F being a closed or sealed circuit the water which it contains may be heated to a high temperature by the fire, its temperature corresponding to the pressure, according to a well-known law. The air in the cylinder G serves as a cushion to give some degree of elasticity to the system, and as a protection against the possibility of explosion a pipe *w* extends upwardly from this cylinder or from any part of the circuit F and terminates outside the car in a diaphragm *y*, which is constructed to be ruptured by a pressure sufficiently in excess of the maximum normal pressure and considerably within the limit of strength of the pipes of the circuit F. This diaphragm *y* thus serves as a safety blow-off or relief. Any safety-valve might be substituted for it. In order that the attendant may know the pressure existing in the circuit F, a pressure-gage H is connected thereto, preferably by connecting it to the air-chamber G. When the heating apparatus is operated by steam, this same gage may be used to indicate the steam-pressure.

Instead of filling the circuit F with water by pouring it in through the funnel *s* the attendant might close the valve *m* a sufficient

time before the steam supply through the pipe E is cut off to enable the circuit F to become entirely or sufficiently filled with water of condensation from the steam. In such case the valves *q r* should both be left open in order that the steam may condense in both the coils *b* and *d*. If the circuit F is not entirely filled with water, the portion not so filled will contain a mixture of air and steam during the time that the circuit is heated by the stove B.

When a supply of steam is available again through the pipe E and it is desired to discontinue the heating by the stove B, the attendant will open the valve *m* and blow-off cock *k* and will then open the valve *f*, whereupon the steam will enter the coil *d* and blow the water out therefrom through the blow-off pipe *j*, whereupon the cock *k* should be closed again. If it is desired to retain the water in the portion of the circuit F, comprising the coil *b* and the portions of the pipes *n* and *p* to the right of the valves *q* and *r*, these valves should be closed by the attendant before opening the others. If, however, he leaves them open, the steam from the pipe *e* will enter both coils *d* and *b* and will expel water from both. Upon closing the blow-off pipe *k* the normal operation as a steam heating apparatus commences and will continue as long as the steam is supplied. While thus heating by steam, the valves *q r* may, as already stated, be left either open or closed. If they are closed, the coil *b* is cut off from the steam and remains inactive. If, however, these valves are opened, the steam enters the coil *b* and heats it. The coil *b* then acts to heat the air within the shell of the stove B, which at this time should have no fire in it. In order to utilize the heat thus imparted, a circulation of air into the stove and out of it into the car should be provided for. For this purpose the usual damper *x* in the stovepipe should be closed in order to prevent the escape of the heated air through the stovepipe, and the usual ash door or damper *z* should be opened in order to permit the cool air to enter the bottom of the stove, and the usual door or damper *z'* in the upper part of the stove should be opened in order that the air thus heated in the stove shall be permitted to escape out into the car. Thus when the car is not sufficiently heated by the action of the radiating-circuit C it may be further heated by opening the valves *q* and *r*, so as to utilize the stove B and heating-coil *b* as an air-heater for heating and circulating the air in the car.

My invention avoids the difficulties heretofore encountered in car-heaters wherein the liquid or radiating circuit C is passed through the coil in the stove B, by reason of the deposition or incrustation within the coil of salt from the brine with which this circuit is charged, which deposit results in burning out the coil. With my improved apparatus there is no flow of brine through the coil *b* in the stove, and consequently there can be no incrustation or deposit within this coil, and there is no danger of the coil being burned out, because when in use it is charged with water in circulation. There will be no incrustation of brine within the heater D, because the heat radiated by the coil *d* therein is not sufficient to cause incrustation, or if any incrustation were to occur the heat would not be sufficient to burn out or injure in any way the coil or any part of the heater. A much greater heating-surface is secured within the heater D than it has heretofore been possible to secure within a car-stove, so that an equally high temperature may be imparted to the liquid in the radiating-circuit C without necessarily heating the coil to so high a degree.

Heretofore in the ordinary Baker system the radiating-circuit C has had to extend not only throughout the entire car where it is subjected to a greater or less number of bends or angles, but has had to traverse a considerable length of the coil in the stove B or other heater. According to my present invention I divide the friction necessary to the liquid circulation between two circuits, the circuit C having little if any frictional retardation beyond that due to its necessary extension through the car, while the frictional retardation due to the passage of liquid through coils is confined to the circuit F, which, it will be observed, is free from the retardation which is experienced in a circuit that is extended through the car for the purpose of radiation. Thus by dividing the circulation of liquid between two circuits and reducing the friction in the radiating-circuit I secure a more rapid circulation of liquid and a higher heating capacity.

In case from any cause the stove B or its coil *b* should get out of order the steam-heater is not rendered useless, as is the case with prior heating systems, as by simply closing off the valves *r* and *q* the stove is isolated from the steam-heating system, and the car may be heated by steam in the ordinary manner.

Any practicable number of circuits C might be heated from the one circuit F, or any practicable number of circuits F might be heated from one stove B.

In place of the stove B any source of heat equivalent thereto might be employed, and the stove or its equivalent may be located either inside the car or apartment or exterior thereto.

The heater D may be of any suitable construction and may be arranged in any suitable way, it being only essential that it shall have two passages through it, one to be traversed by the liquid of the radiating-circuit and the other by the liquid or fluid of the intermediate circuit F, and that the two passages shall be in such intimate conducting communication that the heat may be readily transmitted from the one to the other. I have shown the construction which I consider preferable for the reasons already given.

In my present application for patent I make no claim to a heating apparatus wherein a system of circulating-pipes within the car is provided with two heaters, both in operative contact with said circulating system or with branches thereof, and adapted to be operated simultaneously or separately for imparting heat thereto. Such a system I know to have been in existence prior to my present invention.

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

1. The combination with a liquid-radiating circuit, of a heater traversed thereby, a stove or equivalent source of heat, an intermediate fluid-circuit in operative contact with said stove and heater, a source of steam and a connection therefrom to said intermediate circuit, whereby the latter may be traversed by fluid circulating between the stove and heater, or by steam from said steam-pipe.

2. The combination with a liquid-radiating circuit, of a heater traversed thereby, a radiating-coil in such heater, a stove or equivalent source of heat, a heating-coil therein, pipes connecting the terminals of said coils together to form an intermediate circuit, a source of steam and a pipe for conducting the steam to said intermediate circuit, whereby it may be admitted into the radiating-coil of said heater, and valves for controlling its admission thereto and for controlling the discharge of water therefrom.

3. The combination with a liquid-radiating circuit, a stove or equivalent source of heat, and an intermediate fluid-circuit in operative contact with said stove and said radiating-circuit, of valves for closing communication between the part of said intermediate circuit which is in operative contact with the stove and the part thereof which is in operative contact with said radiating-circuit, and a steam-pipe connecting with the latter part of said intermediate circuit, whereby the radiating-circuit may be heated by steam.

4. The combination with the liquid-radiating circuit, of a heater traversed thereby, a stove or equivalent source of heat, an intermediate fluid-circuit in operative contact with said stove and traversing said heater, whereby it is adapted to communicate heat from the stove through the heater to said radiating-circuit, a source of steam and a pipe leading thence to said heater and communicating with said intermediate circuit, a valve for controlling the admission of steam through said pipe, two valves in said intermediate circuit between said heater and stove, and a valve for controlling the discharge of water of condensation.

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

EDWARD E. GOLD.

Witnesses:
ARTHUR C. FRASER,
JNO. E. GAVIN.