(No Model.) 2 Sheets—Sheet 1.

E. E. GOLD.

CAR HEATING APPARATUS.

No. 571,359. Patented Nov. 17, 1896.

FIG. 1.

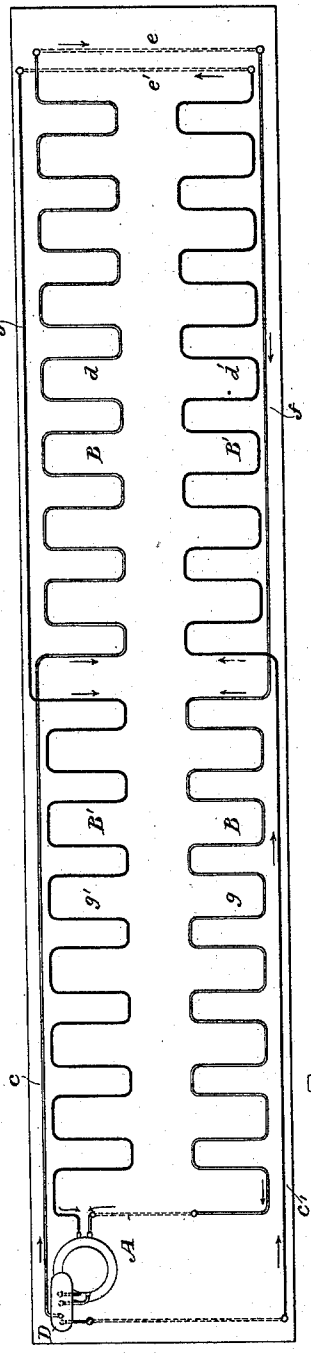


FIG. 5.

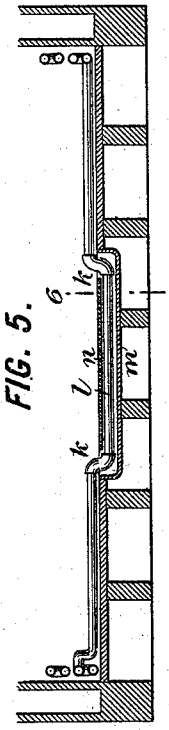


FIG. 6.

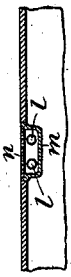
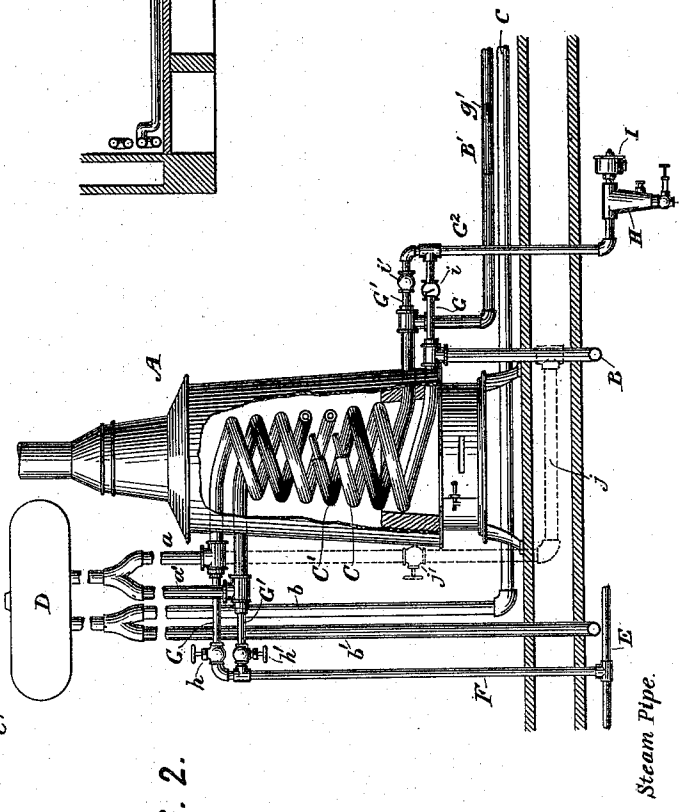


FIG. 2.



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(No Model.) 2 Sheets—Sheet 2.

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FIG. 3.

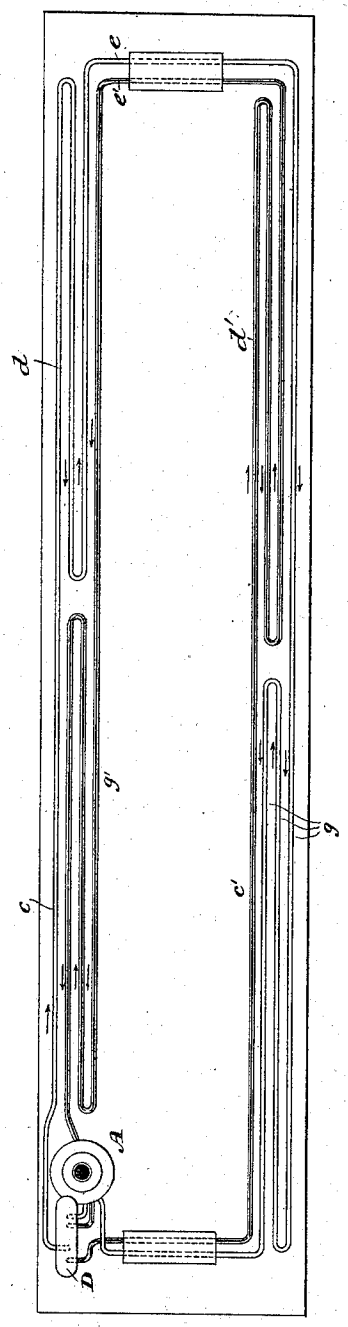
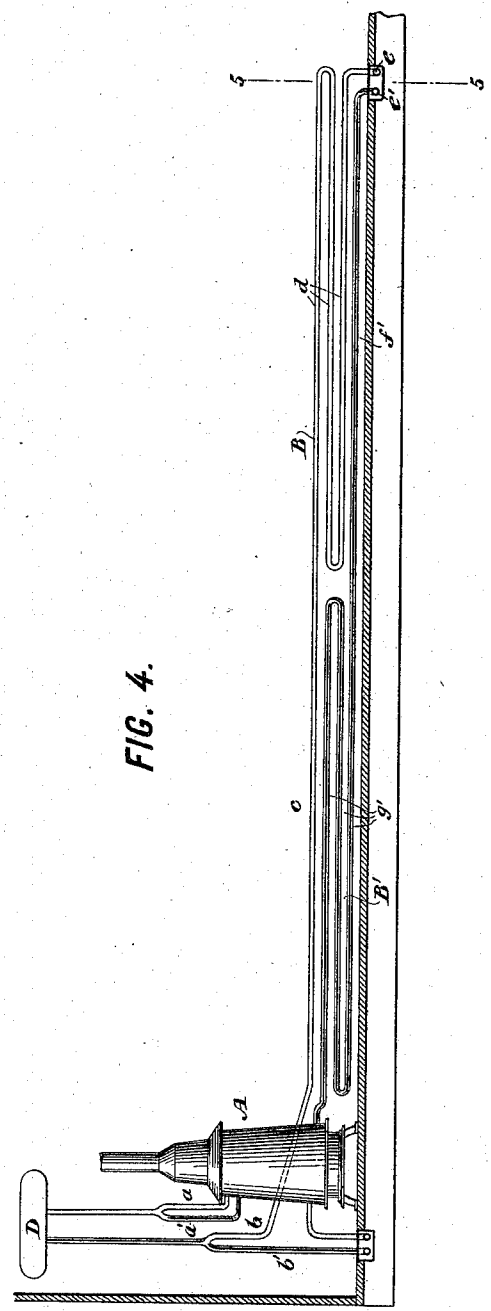


FIG. 4.



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UNITED STATES PATENT OFFICE.

EDWARD E. GOLD, OF NEW YORK, N. Y.

CAR-HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 571,359, dated November 17, 1896.

Application filed January 24, 1891. Serial No. 378,867. (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 Car-Heating Apparatus, of which the following is a specification.

This invention relates to that class of car-heaters wherein a coil of pipe containing a suitable liquid is extended through the car and communicates with the heating-coil arranged in a stove or steam-heater. Heat is imparted to the coil in said stove or heater to set the column of liquid in the circuit into circulation, and by its circulation it carries the heat to all parts of the car and gradually radiates it from the circulating-pipes. Heretofore it has been customary to provide one such coil in a heating-stove in communication with only one circuit of pipes throughout the car. This involves the disadvantage that the radiating-surface is always the same, there being no means for reducing the radiating-surface in mild weather and increasing it in cold weather, as is desirable. It is impracticable with a given length of radiating-pipe to control the radiation of heat by accelerating or retarding the rate of flow of the liquid. It has also been proposed to provide a heater with two coils, both heated alike by the fire, with two radiating-circuits in connection with the respective coils; but with this construction also the radiating-surface is always the same, since when the heater is used at all both circuits are always in action.

According to my present invention I subdivide the radiating-pipe into two distinct coils or liquid-circuits, both heated by one heater, and I provide the stove or heater by preference with two separate spiral coils or worms, which are connected in the two circuits, respectively. When there is a fire in the stove, both coils are heated alike, but by means of a valve in either circuit the circulation therein may be stopped or short-circuited and one circuit alone be used to heat the car, which suffices in mild weather, while in cold weather both circuits will be employed. To provide for heating by steam when the fire in the stove is extinguished I form the spiral coils or worms in the stove each of two pipes, the smaller being inserted within the larger and coiled together, and I introduce steam into preferably the smaller pipe, leaving the annular space between the smaller and larger pipes to constitute the liquid-passage in communication with the pipes of the liquid-circuit. The admission of steam into the steam-pipes of the two worms is governed by valves, so that when heating by steam only one of the worms need be heated, the steam-pipe leading to the other worm being closed, which will be the case in mild weather.

Where a stove or heater is employed, it is arranged usually at one end of the car and usually radiates enough or nearly enough heat to suitably warm the car at that end. Ordinarily the radiating-pipes of the liquid-circuit are arranged uniformly throughout the car, so that the hottest portion of the pipes as they emerge from the heater radiate the greatest heat nearest the stove where the car is already partially or sufficiently warmed by the stove itself, thereby heating the end of the car containing the stove to a greater degree than the remote end, which is left comparatively cold. My invention overcomes this disadvantage by arranging the pipes of each liquid-circuit in such manner as to afford a reduced radiating-surface adjacent to the stove and an increased radiating-surface in the remote portions of the car. For example, each circuit on leaving the stove passes by a single pipe to the farther half of the car, where it is arranged in such manner by coiling back and forth as to afford a radiating-surface approximately four times that of the single pipe. It then passes to the opposite side of the car and returns to the middle, where it is again coiled to provide an extended radiating-surface through the half of the car at the end of which the stove is arranged; but as the circuit has already lost the greater part of its heat by radiation the heat radiated in this end of the car is much less than that in the farther end, so that the tendency to overheat the end of the car containing the stove is practically overcome. The two circuits have their radiating-coils on opposite sides of the car, the one on one side at one end and on the other side at the other end, and the other in the remaining spaces; but the hottest portions of both radiating-circuits are confined to a reduced surface on leaving the

stove and present an extended surface only at the farther end of the car, until by radiation the temperature of the liquid is reduced, whereupon it returns to the radiating portion of pipe in the end of the car containing the stove.

Figure 1 of the accompanying drawings is a diagrammatic plan showing the floor of a railway-car with the liquid-radiating circuits arranged according to my present invention. Fig. 2 is a vertical longitudinal section showing the respective steam and liquid pipes in and adjacent to the heater, the latter being partly broken away and dissected to show the pipes. Fig. 3 is a diagrammatic view showing the circuits applicable to a parlor-car, the respective radiating-pipes, however, which stand one above another, as shown in Fig. 5, being here shown side by side as though laid upon the floor, in order to make the circuits clear. Fig. 4 is a vertical longitudinal section showing the arrangement of pipes on one side of the car in the system shown in Fig. 3. Fig. 5 is a transverse section on the line 5 5 in Fig. 4, showing the arrangement for passing the pipes across the car. Fig. 6 is a fragmentary section on the line 6 6 in Fig. 5.

In Figs. 1, 2, 3, and 4 the liquid-circulating pipes of the two circuits are distinguished by being shown, the one black or darkly tinted and the other white or lightly tinted.

Let A designate a heater of any suitable form, which may be the well-known Baker heater.

B and B′ are the two liquid-circuits consisting each simply of a pipe of suitable size carried through the car and bent back and forth where desired to afford the proper surface for radiation. The cool end of each of these circuits enters the lower part of the heater A and is coiled therein into a worm, the two worms being lettered C and C′, respectively, in Fig. 2. On emerging from the upper part of the heater the pipes pass upwardly, as at *a a′*, Fig. 2, and enter the usual expansion-box D, whence pipes *b b′* pass downwardly to or beneath the floor of the car and constitute the most highly-heated portion of the circuit.

The circuit B consists of a pipe *c*, leading from the pipe *b* to the middle or farther end of the car. In the farther half of the car the pipe is coiled back and forth to afford an extended radiating-surface in what may be called, for the sake of distinction, a "radiator," lettered *d*. The pipe then crosses the car transversely at *e* and passes at *f* in a single pipe to the opposite half of the car, in which it is coiled into a second radiator, lettered *g*, after which the pipe returns to the bottom of the heater. In similar manner the circuit B′ consists of a pipe which crosses directly from the down-pipe *b′* to the opposite side of the car and extends as a pipe *c′* to the middle or farther half of the car, where it is coiled to form a radiator *d′*. It then crosses the car at *e′*, extends back to the middle at *f′*, and is coiled into a radiator *g′*, from which it reënters the heater. This arrangement of pipes is clearly shown in Fig. 1, where the pipes are bent back and forth in loops beneath the seats, which arrangement is suitable for ordinary passenger-cars and for sleeping-coaches, and in Fig. 3, where the pipes are coiled longitudinally one pipe above another, as shown in Figs. 4 and 5, which is the arrangement employed on parlor or drawing-room cars.

The pipes *c c′* are most highly heated, but afford only a limited radiating-surface, while the radiators *d d′* radiate the greater portion of heat into the half of the car remote from the heater A. The circulating liquid after being partially cooled returns and in the radiators *g g′* radiates heat for heating the end of the car containing the stove.

In making the heater A a steam-heater as well as a stove-heater I employ by preference the construction of combined coils or worms claimed in my Patent No. 388,772, dated August 28, 1888. According to this construction the coil or worm consists of two pipes, the smaller inserted within the larger and coiled together into a spiral, the smaller being by preference the steam-pipe and the larger the pipe in connection with the liquid-circuit. This construction is shown in the dissection of the pipes in Fig. 2. From the main steam-pipe E, extending longitudinally through the train, a branch pipe F leads into the car and is divided into two branches G and G′, respectively, provided with regulating-valves *h* and *h′*. These pipes G and G′ enter the upper or emerging ends of the worms C C′ and pass spirally through them, emerging from them at the lower or entering ends of the coils, as shown in Fig. 2, where they are fitted with check-valves *i i′*, respectively, to prevent backflow, after which the two branches reunite in a pipe G^2, which passes down through the floor of the car and is fitted with suitable means for drawing off water of condensation. These consist, preferably, of a sediment well or chamber H and a thermostatic trap I of the constructions now well known in the art in connection with the Gold system of car-heating.

In mild weather only one coil—B, for example—is used for heating the car. When heating by a fire in the stove, both worms C and C′ are heated, which would cause a circulation in both coils; but to prevent this and consequent overheating of the car one of the circuits—B′, for example—may be provided with a shunt or short-circuiting pipe *j*. (Shown in dotted lines in Fig. 2.) By opening a valve *j′* therein the liquid may circulate in this shunt instead of through the entire liquid-circuit, thereby practically preventing circulation in the latter. When heating by steam the heat is regulated by the valves *h h′*. By opening both steam will heat both worms, and a circulation will be maintained in both circuits B B′, which will keep the car warm in cold weather. In mild weather one of the valves *h h′* is closed, so that the worm corre-

sponding therewith is not heated, (except to a slight degree by radiation from the other worm,) and the one circuit the worm of which is heated serves to sufficiently warm the car. When using only one worm, the steam passing through its pipe G or G′ on entering the pipe G^2 tends by its pressure to flow back into the steam-pipe of the other worm; but this is prevented by the check-valves *i i′*, which prevent any such backflow, so that the heating is confined to the one worm into which steam is admitted by the valve *h* or *h′*. This construction of reuniting the two branches *g g′* and providing them with check-valves *i i′* enables both branches to drain into the one sediment-well H and automatic trap I instead of requiring a separate well and trap for each branch of the steam-pipe, as would otherwise be necessary; but such separate well and trap may be used for each branch, if preferred.

The two coils C C′ may have their water-pipes *a a′* joined together, so that both enter the one expansion-box D, and one return-pipe may descend therefrom, branching into the two pipes *b b′*, as shown in Fig. 2. This results in a commingling of the liquid of both circuits, which I find is practically somewhat disadvantageous when only one circuit is in use, because it induces a slight flow in the other circuit. To prevent this it is better to keep the two circuits entirely distinct by dividing the expansion-box into two compartments.

Where the pipes pass transversely across the car, it is necessary that they shall be carried beneath the floor. Heretofore this has ordinarily been done by carrying the pipe down and across beneath the floor, means which necessitates a considerable descent of the pipe, and this pipe exterior to the car must necessarily be wrapped with non-conducting covering to avoid wasting heat by radiation. My invention provides an improved construction whereby this transverse portion of pipe may be utilized for radiation instead of being, as heretofore, a waste length of pipe. This is best shown in Figs. 5 and 6. In case there is a central aisle, so that the pipes may be arranged above the floor until they reach this aisle, they will be carried above the floor at *k k* in Fig. 5, and the middle portion *l* will be dropped sufficiently to bring it beneath the floor. To provide room for this depressed portion of pipe, the floor is cut away and the longitudinal floor-beams slightly cut into, and a transverse box or channel *m* is set in so that it fills the opening cut in the floor. The pipe being dropped into this channel, a cover *n* is placed over it, standing flush with the floor, as shown in Fig. 6. This cover is preferably perforated to permit heated air to rise from the pipes *l l*. By this means the entire transverse portion of pipe is kept to all intents and purposes within the car. For a drawing-room car it may sometimes be desirable to depress the entire transverse portion of pipe, in which case the box or channel will be made longer to extend the entire width of the car.

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

1. The combination on a railway-car of a heater at one end thereof, two liquid-circuits heated thereby, each circuit having its hot-water pipe carried to the remote portion of the car and there formed with an extended radiating-surface, whereby the hottest liquid in the circuit is utilized for heating the portion of the car most remote from the direct-heat radiation of the heater, and the pipe of each circuit carried thence back to the portion of the car more nearly adjacent to the heater and there formed with an extended radiating-surface for radiating heat from the partially-cooled water, and carried thence back to the cool-water inlet of said heater, and means for effecting the heating and circulating of either one or both said circuits, whereby for mild weather one only may be operated, and in cold weather both may be operated, and whereby in either case the heat throughout the car is equalized.

2. The combination on a railway-car of two radiating-circuits, a heater containing two distinct water-heating passages, forming part of said circuits respectively, and two steam-passages in operative contact each with one only of said water-passages, so that each water-passage is heated by its corresponding steam-passage, a steam-supply pipe divided into two branches leading to said two steam-passages in the heater, and means for controlling the admission of steam to one only or to both said steam-passages, whereby to determine the heating and circulating of the liquid in one only of said circuits (for mild weather) or in both of said circuits (for cold weather) without necessitating valves in said circuits, and said heater provided with a fire-chamber inclosing both said water-passages, whereby the making of a fire therein heats both passages and circulates the water in both circuits.

3. The combination on a railway-car of a heater containing two distinct heating-coils, each coil consisting of a steam and a liquid pipe the one within the other, two liquid-radiating circuits to which the liquid-pipes of said coils are respectively connected, and a steam-pipe divided into two branches in which the steam-pipes of said coils are connected respectively, said branches on emerging from the opposite ends of said coils being reunited, valves for admitting steam to said branches independently, check-valves in said branches between the coils and the junction of the branches, to prevent backflow of steam from either branch into the other, a single pipe leading from said junction, and a drainage-trap for discharging condensed water therefrom.

4. The combination on a railway-car of a heater containing two distinct heating-coils,

each coil consisting of a steam and a liquid pipe the one within the other, two liquid-radiating circuits to which the liquid-pipes of said coils are respectively connected, and a steam-pipe divided into two branches in which the steam-pipes of said coils are connected respectively, valves for admitting steam to said branches, said branches on emerging from the opposite ends of said coils being reunited in a single pipe, and a drainage-trap for discharging condensed water from said pipe.

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

EDWARD E. GOLD.

Witnesses:
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GEORGE H. FRASER.