(No Model.)

E. E. GOLD.

STEAM SEPARATOR.

No. 557,264. Patented Mar. 31, 1896.

FIG. 1.

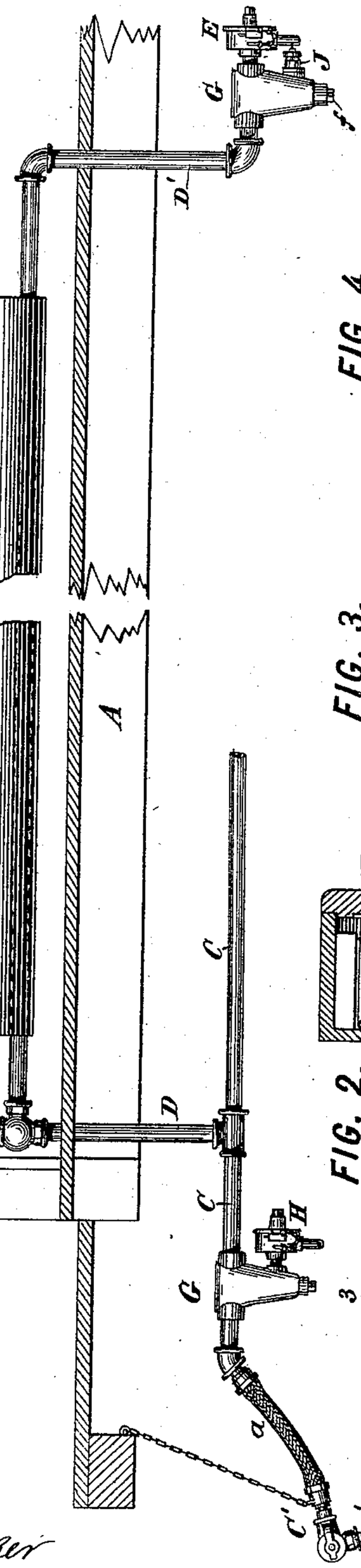


FIG. 4.

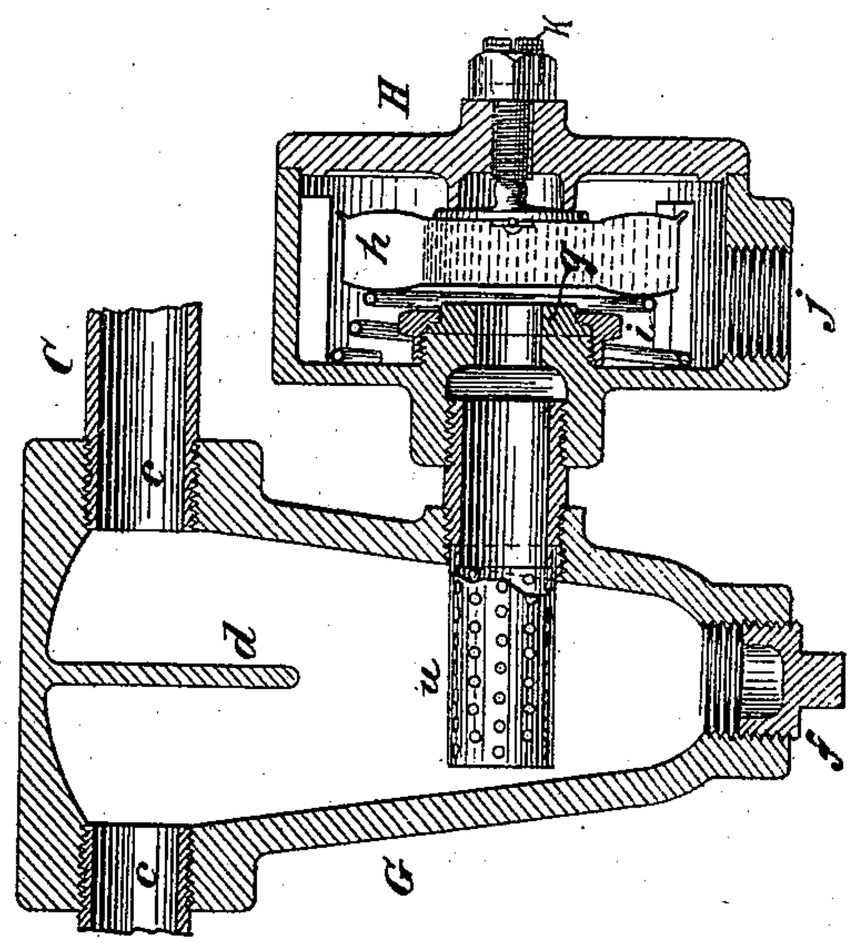


FIG. 3.

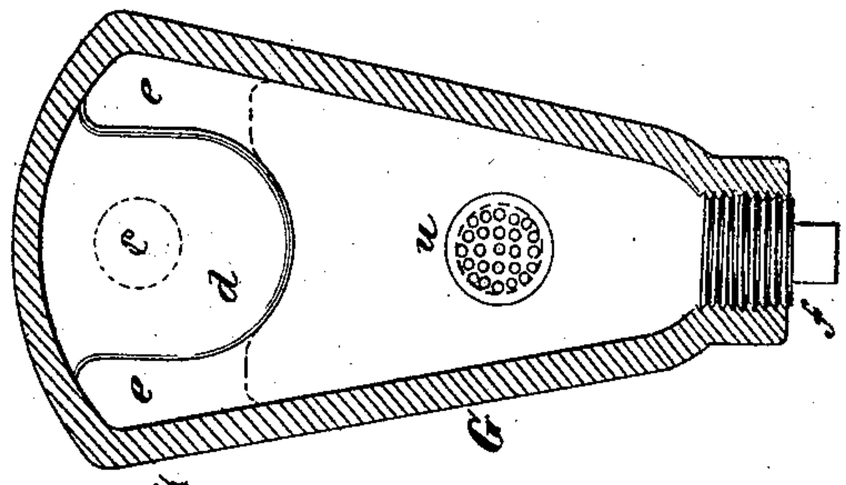
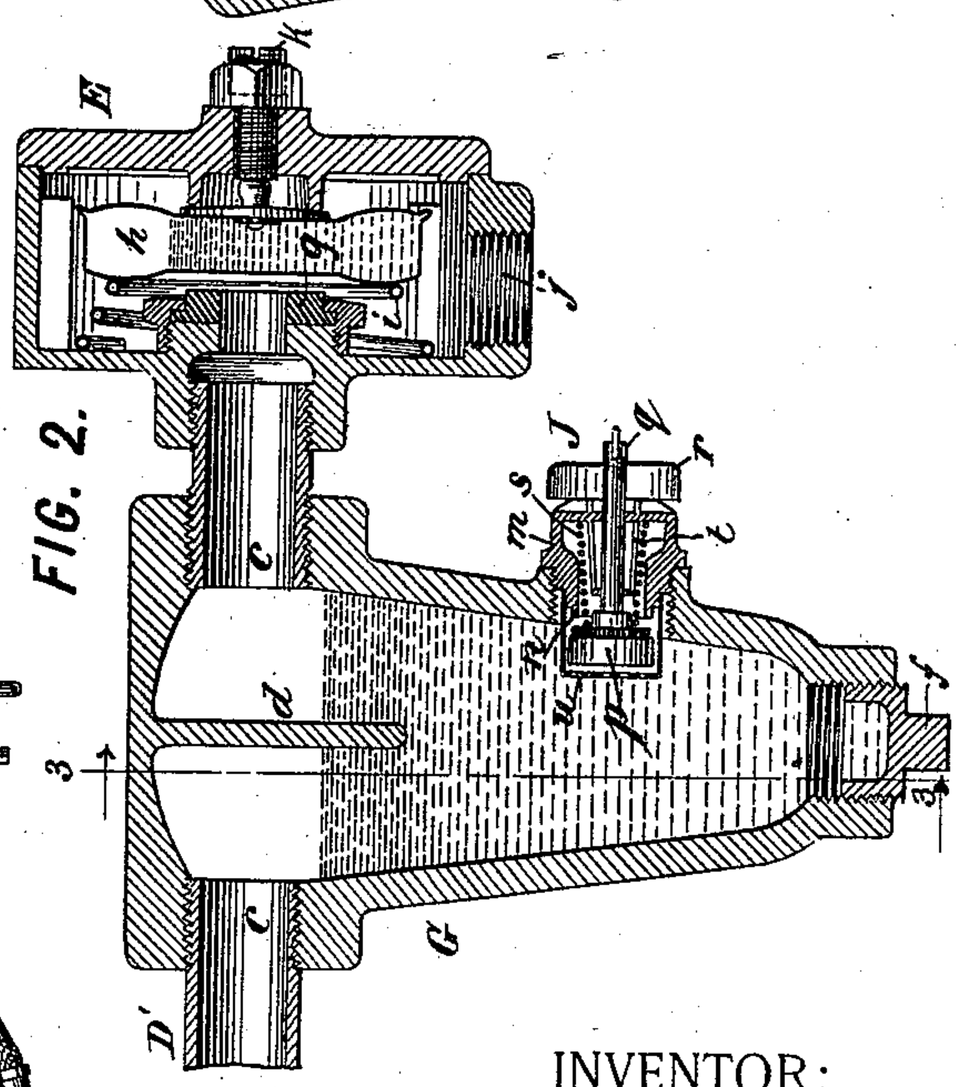


FIG. 2.



WITNESSES:
John Becker
C. K. Fraser.

INVENTOR:
Edward E. Gold,
By his Attorneys,
Arthur G. Fraser & Co

UNITED STATES PATENT OFFICE.

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

STEAM-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 557,264, dated March 31, 1896.

Application filed April 29, 1890. Serial No. 349,894. (No model.)

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, in the county and State of New York, have invented certain new and useful Improvements in Separators for Steam-Pipes of Railway-Cars, of which the following is a specification.

In the steam-heating of railway-cars it is usual to supply steam from the locomotive-boiler, passing it through a succession of lengths of main steam-pipe carried by the respective cars and coupled together between the cars, and to provide heating-pipes, radiators, or storage-heaters within the cars supplied with steam through branch pipes leading from the main steam-pipe. The steam in these branch pipes condenses and the water of condensation is discharged at the ends of the branches remote from their connection with the main steam-pipe. Automatic means are commonly provided in the nature of thermostatic traps or relief-valves for discharging the water of condensation from the branch pipes or the heaters supplied thereby from time to time. Automatic means have also been provided for draining off the water of condensation from the main steam-pipes through the medium of thermostatic or pressure-relief valves located in or adjacent to the couplings by which the lengths of pipe are connected together between the cars.

My present invention provides an improved separator for discharging water from the main and branch pipes. This separator consists in itself of a metal shell or casing forming a chamber and having openings for connecting the steam-pipe at the opposite sides of its upper portion, formed with an intercepting partition within its upper portion to deflect the steam in passing from one opening to the other, and the chamber extended downwardly beneath these openings and a partition to form a pocket for receiving the condensed or disengaged water and sediment. The intercepting partition is constructed with a space or opening at one or both sides or elsewhere above the highest level of water within the pocket at which steam can enter the separator, in order that when the pocket is filled with water, ice, sediment, or any other substance the passage of steam will not be obstructed thereby, the purpose of the partition being simply to deflect the current of steam and prevent suspended particles of water and sediment or other impurities from being carried through with the steam. An automatic strap is provided for draining off the accumulated water of condensation from the pocket.

As applied to the main steam-pipe, the separator serves to disengage from the steam any particles of suspended water that may be carried along with it, these by the deflection of the steam-current being thrown out therefrom and caused to fall into the pocket, from which the water is drained off from time to time.

As applied to the branch pipes or steam-heaters supplied thereby, the separator is connected at or near the outer end of the branch and at the lowest portion thereof, and preferably between the heater or heat-radiating portion of the branch and its terminal thermostatic or other automatic trap for discharging the water of condensation from the branch. The current of steam flowing to this trap is deflected by the intercepting partition, and any particles of water carried with it are collected in the pocket, from which the water is discharged from time to time by the automatic trap.

Figure 1 of the accompanying drawings is a fragmentary longitudinal section of a car-body, showing the main and branch steam-pipes and the separators applied thereto. Fig. 2 is a vertical longitudinal section of the separator and its connections as applied at the end of the branch pipe. Fig. 3 is a vertical transverse section of the separator-chamber cut on the line 3 3 in Fig. 2. Fig. 4 is a vertical longitudinal section of the separator and automatic trap as applied to the main steam-pipe.

Referring to Fig. 1, A is the car-floor. B is the end wall of the car. C is the main steam-pipe extending from end to end of the car and having pipe-coupling heads upon its opposite ends, one of which is shown at C′, the particular coupling here shown being a Gold coupling connected by a hose *a* to the fixed and rigid portion of the pipe C. D is the branch pipe branched off from the main pipe C and entering the car, being controlled by a valve or cock *b* and at its further end passing

down through the floor of the car at D′ and provided with a thermo-expansion drainage-trap E or other automatic means for draining off the water of condensation applied preferably at its end. I have shown a Gold storage-heater F within the car supplied with steam from the branch pipe D in the usual manner; but this heater can be omitted and the branch pipe alone used as a heat-radiator, as shown by the dotted lines; or any other radiator or heater supplied with steam by the branch pipe D may be substituted. Preferably the main steam-pipe C passes beneath the floor of the car and is jacketed; but it may be extended upwardly and carried through inside the car, in which case it serves as a heat-radiating pipe and need not be jacketed.

My new separators are designated by the letters G G. One of them is applied to the main steam-pipe C, preferably between the coupling C′ and the point where the branch D connects with the main pipe. The other separator is connected to the farther end of the branch pipe D, being at the lowest portion thereof and between the heater or heat-radiating portion thereof within the car and the terminal discharge or drainage trap E. The preferred general arrangement of these separators is clearly shown in Fig. 1.

The separator G consists of a metal shell approximately bottle-shaped, its lower portion constituting a pocket for holding condensed water and sediment and its upper portion serving as a steam-passage between the two opposite openings *c c*, into which the lengths of pipe constituting the steam-pipe (either the main or branch pipe) are screwed, or to which they are otherwise connected. These openings are preferably and ordinarily formed with their axes in line with one another in order that the sections of pipe on opposite sides of the separator shall be kept in alinement and the separator may thus be applied to any existing system of piping by simply cutting the pipe and connecting the cut ends to the separator.

Within the upper portion of the separator-shell is formed an intercepting-partition *d*, which occupies a position between the two openings *c c*, so as to cut off direct communication between them and compel the steam or other fluid passing from one opening to the other to be deflected by flowing around the partition. The steam or other fluid will be compelled to flow beneath and to one or both sides of the partition, the deflection in its course being sufficient to disengage any heavier particles and causing them to fall into the pocket beneath. Preferably the partition is a pendent plate projecting downwardly from the roof of the shell in a plane perpendicular to the axis of the steam-pipe and in the middle of the chamber. In order that when the pocket is filled with water or other substance up to or nearly to the level of the openings, so as to submerge or conceal the lower end of the partition, the passage of steam or other fluid shall not thereby be cut off or obstructed, one or more openings through or around the partition are provided, preferably by leaving spaces *e e* at either side thereof, as shown in Fig. 3. These openings can, however, be holes in the partition, provided such holes are out of line with the steam-pipe, so that steam blowing through shall be deflected by the partition to arrest any particles of sediment. It is essential that when the pocket is filled with water to its highest level—that is, up to the openings *c*—so as to seal the lower portion of the partition, there shall be a sufficient area of opening around the partition or through its lateral portions to enable the steam to pass without being obstructed by the water. The passage of steam from either opening into the pendent portion of the separator is wholly unobstructed.

As applied to the main steam-pipe C, the separator serves to disengage from the current of steam passing therethrough any particles of water that may be held in suspension with the steam, throwing these particles downward and causing them to collect in the pocket. It also serves to disengage from the steam any particles of rust, grit, or other foreign substance in the nature of sediment that may find its way into the steam-pipes. Such sediment may be removed from time to time by taking out a screw-cap *f* in the bottom of the separator, or, as the equivalent thereof, any suitable blow-off cock can be provided for discharging the sediment.

The water which accumulates in the pocket of the separator is discharged from time to time through an automatic trap H applied to the side of the pocket sufficiently far above the bottom thereof to leave a space for the collection of sediment beneath the outlet to the trap. This trap is preferably a thermostatic trap, or one which opens when the temperature falls to a predetermined extent—that is, in practice to somewhat below the boiling-point. The particular construction of such trap here shown is the Gold thermostatic trap, patented by me October 12, 1886, by Patent No. 350,880, and of the specific construction disclosed in my Patent No. 424,779, dated April 1, 1890. The particular construction of this trap not being essential to my present invention I will not here describe it further than to state that it consists, essentially, of a casing formed with a valve-seat *g*, through which the fluid discharged through the trap enters the casing, which seat is closed by a hollow diaphragm or hermetically-sealed expansible vessel *h*, containing alcohol or other vaporizable expansible liquid, which, when heated, expands against the seat and closes the outflow therethrough, but when cooled contracts, and being pressed by a spring *i* away from the seat leaves a free opening for the passage of the fluid through the trap, from the casing of which it escapes by an outlet-opening *j*. By the use of this or

any equivalent thermostatic trap the water accumulating in the pocket is automatically discharged whenever it cools sufficiently to open the trap, the latter being preferably adjusted by means of the screw *k*, so that it will open when the water cools to but little below the boiling-point, in order that the accumulated water, although its upper portion is kept hot by the flow of steam over it, may be discharged through the trap to make room for further accumulation without waiting until the steam is turned off.

When applied in connection with the branch pipe D, the separator is of the same construction, except in lieu of being provided with a thermostatic trap, since such a trap is already provided at E adjacent to the separator, it is provided with an automatic trap or relief-valve J, screwed into the said opening in the separator-shell in the same place as the thermostatic trap H. This trap is constructed as a valve closing against a valve-seat and provided with a spring tending to open it, but of insufficient tension to hold it open against the steam-pressure, so that so long as the pressure is maintained the valve remains closed, but it opens automatically as soon as the pressure is turned off. It consequently serves to drain off the accumulated water of condensation irrespective of its temperature and whenever by closing the valve *b* and by the subsequent radiation of heat from the branch pipe or heater the pressure in the branch pipe has fallen sufficiently to permit the spring to act. This valve is constructed with a shell or casing *m*, which screws into the opening in the side of the separator-shell and the inner end of which constitutes a valve-seat *n*, against which seats a valve *p*, mounted on a stem *q*, which passes out through the shell *m*, being guided thereby, and carries on its outer end a deflecting plate or diaphragm *r*, designed to receive the impact of the issuing stream of steam, and utilizing the pressure derived from this impact to assist in closing the valve. The spring *s* of the valve is mounted within the shell *m*, being guided on a conical skeleton guide *t* therein and presses against the valve *p*.

When steam is first turned on, the branch pipe D is full of air, which is blown out through the trap E by the steam and is followed by a jet of steam issuing through this trap until the latter is heated sufficiently to close itself. The accumulations of air and steam are deflected by the partition *d*, so that any dust, particles of rust, grit, sediment, or other impurities are separated and caused to fall into the pocket of the separator instead of finding their way into the trap E, which they would be liable to clog and cause to leak. The steam-pressure in the branch closes the valve J and the steam admitted to the branch radiates its heat and, becoming cooled, condenses in course of time, and the water of condensation runs to the lowest part D′ of the branch pipe and thence into the pocket of the separator, accumulating therein, and finally when the separator is full reaching the trap E. When the water becomes sufficiently cooled to contract the vessel *h* in this trap, the latter opens and the water flows through it down to the level of the outlet therethrough. So long as the valve *b* is open, or partly so, the steam-pressure assists the expulsion of the cool water of condensation through the trap E. The trap closes in each case as soon as the cold water has been discharged and hot water or steam begins to flow out through it. When the valve *b* is closed, the subsequent radiation and condensation of the steam in the branch pipe reduce the pressure therein until the dynamic relief-valve J opens (either before or after the opening of the trap E) and the accumulated water is discharged through this valve. This valve also prevents the formation of a vacuum in the branch pipe D by admitting air thereto to supply the place of the steam and water discharged therefrom.

So long as the cars of the train are coupled to the locomotive and steam is turned on the condensation-water accumulating in the main pipe C will be discharged through the traps H H connected thereto at intervals. Any other water of condensation accumulating in the pendent flexible end portions *a* of the pipe will be forced over by the current of steam and carried into the separator G and eventually discharged through the trap H thereof. When the steam is turned off or the cars are separated from the locomotive, so that the pressure in the main steam-pipe is reduced, the water of condensation therein will flow into the lowest parts thereof—namely, at the couplings C′—and will be discharged therefrom by the dynamic traps or relief-valves J′, of the same construction as the valve J, already described, applied to the coupling-heads, as covered in my Patent No. 398,719, dated February 26, 1889. Thus under all possible circumstances is the automatic discharge of the condensation-water from the entire system of pipes amply provided for, being effected in each instance either through a thermostatic or a dynamic relief-trap, drainage-trap, or simultaneously through both.

The side outlet of the separator-pocket is in either construction provided with a foraminous screen *u* to prevent the passage of any sediment which might clog the trap H or J.

I claim as my invention the following-defined novel feature, substantially as specified, namely:

1. A separator consisting of a chamber having openings for the steam-pipe at opposite sides, extended downwardly beneath said openings to form a pocket, having an intercepting-partition between its upper openings adapted to deflect a stream of fluid flowing between said openings, with an opening or passage around said partition out of line with the steam-pipe openings, and above the highest water-level in the pocket, whereby the

flow of steam is not obstructed by the filling of the pocket with water, ice, or sediment, formed with a bottom opening for the discharge of sediment, and formed at its side with an outlet-opening above said bottom opening so as to leave a space for sediment beneath it, and an automatic drainage-trap applied to said side opening for draining accumulated water from the pocket.

2. The combination with the steam-heating pipes of a railway-car, of a separator consisting of a chamber having openings for the steam-pipe at opposite sides, extended downwardly beneath said openings to form a pocket for receiving condensed water or sediment, and having an intercepting-partition between its upper openings adapted to deflect the stream of fluid flowing between said openings, and with an opening or passage around said partition and above the highest water-level in the pocket, and a thermostatic drainage-trap in connection with said chamber, constructed to open and drain off the condensed water when the latter cools to a predetermined extent.

3. The combination with the main steam-supply pipe of a railway-car, of a separator introduced in said pipe consisting of a single chamber having openings for the steam-pipe at opposite sides, extended downwardly beneath said openings to form a pocket for receiving condensed water or sediment, said pocket formed to communicate unobstructedly with said openings and having an intercepting-partition between the openings adapted to deflect the steam flowing between said openings, and with an opening or passage around said partition out of line with the steam-pipe openings and above the highest water-level in the pocket, and a drainage-opening at the lower portion of the pocket through which to discharge the accumulated water therefrom.

4. The combination with the main steam-supply pipe and branch heating-pipe of a railway-car, and a thermostatic drainage-trap at the end of said branch pipe, of a separator introduced into said branch pipe at the lowest part thereof between the heating portion thereof within the car and said trap, said separator consisting of a chamber having openings for the steam-pipe at opposite sides, extended downwardly beneath said openings to form a pocket for receiving condensed water or sediment, having an intercepting-partition between its upper openings adapted to deflect the stream of fluid flowing between said openings, and formed with a drainage-opening through which to discharge the accumulated water from said pocket, and a dynamic relief-trap applied to said opening, constructed to open automatically when relieved of pressure and to be closed by a pressure within the branch pipe.

5. The combination with a terminal thermostatic drainage-trap, of a separator connected to its inlet to protect it from sediment, said separator consisting of a chamber having upper openings for inflow of steam or water of condensation and for outflow thereof to said trap, extended thence downward to form a pocket for condensation-water and sediment, having a partition at its upper part between the inflow and outflow openings, adapted to deflect the current of steam and prevent the blowing through of sediment into the trap, and provided with a second trap applied to said pocket at a lower level for discharging the water accumulated therein to prevent freezing when out of service.

6. The separator G having upper inlet and outlet openings *c c*, a deflecting-partition *d* between them with side openings *e e* to permit a flow around it, a bottom opening for discharging sediment, and a side opening at an intermediate level, combined with a trap applied to said latter opening.

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

EDWARD E. GOLD.

Witnesses:
GEORGE H. FRASER,
CHARLES K. FRASER.