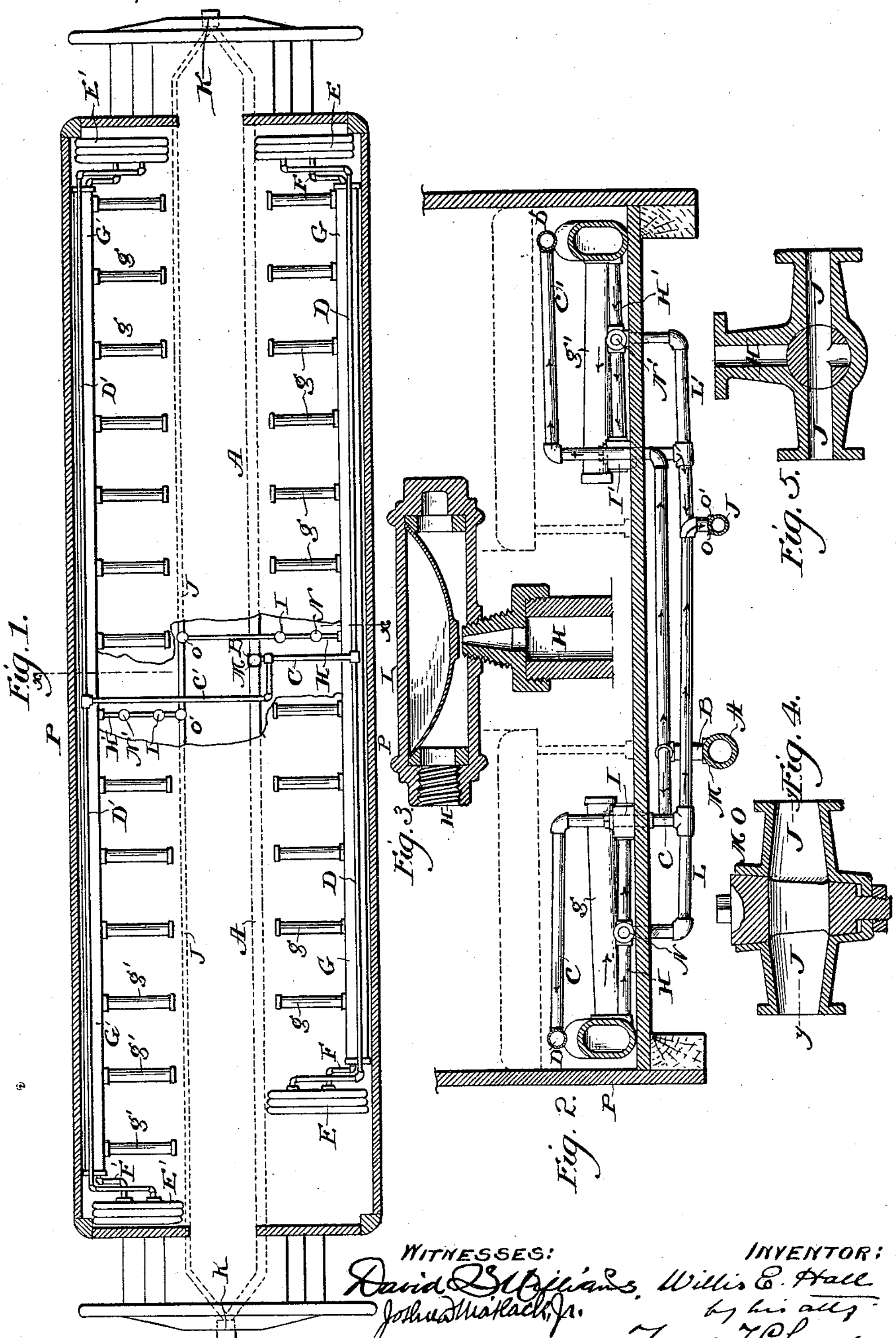
(No Model.)

W. E. HALL.

STEAM HEATING APPARATUS.

No. 454,964. Patented June 30, 1891.



WITNESSES: David S. Williams, Joshua Matlack, Jr.

INVENTOR: Willis E. Hall by his atty Francis T. Chambers

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIS E. HALL, OF ALTOONA, PENNSYLVANIA.

STEAM-HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 454,964, dated June 30, 1891.

Application filed May 9, 1890. Serial No. 351,205. (No model.)

To all whom it may concern:

Be it known that I, WILLIS E. HALL, of Altoona, county of Blair, State of Pennsylvania, have invented a certain new and useful Improvement in Steam-Heating Apparatus, of which the following is a true and accurate description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to steam-heating apparatus in which provision is made for the return of the steam or condensed steam through a flue or pipe provided for that purpose, and to which some mechanism is attached for sucking or drawing the exhausted steam away. Cars, for instance, equipped in this way are generally heated by steam drawn from the boiler of the locomotive, and a pump or similar device is connected with the exhaust-pipe to draw off the steam after it has heated the cars and return it as low-pressure steam or water to the water-tank of the engine. As heretofore constructed, systems of this kind have had the radiating system in the car connected with the exhaust-pipe and a valve placed in the connection, which valve was adjusted to permit the steam and condensed water to escape into the return-pipe at a regulated rate, and much difficulty has been found in the proper adjustment and manipulation of these valves, the rate of condensation of the steam varying, of course, with the temperature of the day, and also with other conditions, and each change of condition requiring a delicate adjustment of the valve, which it is impracticable to make in service with a required nicety. The greatest trouble found to exist has been that at times the steam from the radiating system would escape at an undue pressure into the return-pipe, and expanding in said pipe it would cause a back-pressure in the radiating system and steam-supply pipes which seriously interfered with the efficiency of the purpose. This trouble is due to the fact that many radiating systems discharge into one return-pipe. Thus in railway use many cars are coupled together, so that their return flues or pipes are continuous. Consequently an escape of steam from several of the cars into the return-flue might and did practically choke it and prevent the continuous operation of the system.

My invention consists, essentially, in combining with the return-flue steam-heating system a steam trap or traps situated in the passage or passages connecting the radiator system with the return-flue. These thermostatic steam traps or valves are adjusted in the usual way, so as to close the passage when they are surrounded by steam and open them again when they are flooded by the water of condensation, and in the combination in which I employ them they act as automatic self-regulating valves, insuring the most economical use of steam in the radiating system, and also as each one acts entirely independent of the other or others in the chambers, cars, or train it becomes for all practical purposes impossible that the return-flue should be choked by the escape of steam into it in too great quantity.

Reference is now had to the drawings which illustrate my invention, and in which—

Figure 1 is a plan view of a railway-car equipped with a return-flue steam-heating system and provided with my improvement, and Fig. 2 is a cross-section through the car on the line X X of Fig. 1. Fig. 3 is a sectional view of a thermostatic steam-trap valve; Fig. 4, a sectional elevation of a three-way cock used in my apparatus; and Fig. 5, a sectional view on line *y y* of Fig. 4.

P indicates the car.

A is the steam-supply pipe running beneath the car, and from which rises a pipe-section B, which in turn connects with the pipes C and C′, leading into and to the sides of the car, where they connect, respectively, with the steam-pipes D and D′, situated on each side of the car. As shown, these pipes D and D′ connect at each end of the car with a radiator-coil E E E′ E′, and these coils connect by pipes F F F′ F′ with the radiator convents G and G′, from which, as shown, arms *g* and *g′* project under each seat. The convents G and G′ slope from the ends of the car toward a point at or near its center, from which point pipes H H′ lead to the return flue or pipe J, situated, as shown, beneath the floor of the car. In each of these pipes leading from the radiator system to the return-flue I place thermostatic steam-traps, indicated at I and I′—such, for instance, as is shown in Fig. 3. Any of the well-known

thermostatic valves in use for this purpose can be used in my new combination. That shown in my patent, No. 432,269, of July 15, 1890, is well adapted for the purpose.

L and L′ are by-pass pipes leading around the steam-trap, and by which connection can be made from the radiating system to the return-pipe irrespective of the steam-trap. Valves N and N′ are provided to close or open these by-passes.

Three-way cocks of ordinary construction may advantageously be provided in the steam-pipe A where the pipe B leads off from it, the location of such a cock, if used, being indicated at M. They may also be used at the points indicated by O and O′, where the connecting-pipes L and L′ unite with the return-pipe J. In Figs. 4 and 5 I have illustrated such a cock, marking it M O.

K K indicate couplers, by which the steam and return pipes of the car are united to the steam and return pipes of the tender, or of another car in making up a train.

The operation of the system indicated in the drawings is as follows: Steam from the engine passes through the pipe A and a certain quantity is drawn from it through pipe B and pipes C and C′ to the internal steam-pipes D and D′, through which it flows through the radiator-coils E E′ and through the radiator-convents D and D′, filling said convents, and also the arms *g g*, extending from it. The water of condensation flows toward the lowest points in the convents G and G′ and into the pipes H and H′, leading from such lower points of the convents G and G′, and through these pipes or connections the water or water and steam escape into the return-pipe J. The steam-traps I and I′, when surrounded by steam, close the passages H and H′ and prevent the steam from escaping into the return-pipe. When thus acting they in effect cut the car or portion of the car out of the return system, so that no steam escapes from that portion of the system, which they regulate until a sufficient condensation has occurred to flood the steam-trap and cause it to move and open the convent in which it is situated. The water then flows through the passage into the return-pipe, and after the water has passed out the steam continues to issue through the trap into the return-pipe until its heat again causes the trap to close. The circulation thus effected is amply sufficient and the plan, as already noted, is more economical of steam and better adapted for the return system than those constructions in which the passage from the radiator system to the return-pipe is regulated by an adjustable, but not self-adjusting, valve. It is important that the valve should at intervals permit the escape of steam to the return-pipe, as well as water, the essence of the system being that the steam should be sucked into radiators, rather than forced into them by boiler-pressure. Hence an ordinary float-valve will not take the place of a thermostatic valve, and my invention is confined to the use of a thermostatic valve in the combination described.

Having now described my invention, what I claim as new, and desire to protect by Letters Patent, is—

In a steam-heating system, the combination, with a steam-pipe leading from the boiler, a radiating system connecting with the steam-pipe, and a return-pipe connecting with the lower part of the radiating system, of a thermostatic steam-trap situated in the connection between the radiating system and the return-pipe, all substantially as and for the purpose specified.

WILLIS E. HALL.

Witnesses:
LISLE STOKES,
H. F. GRAYBILL.