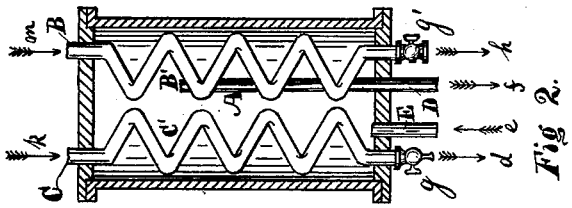
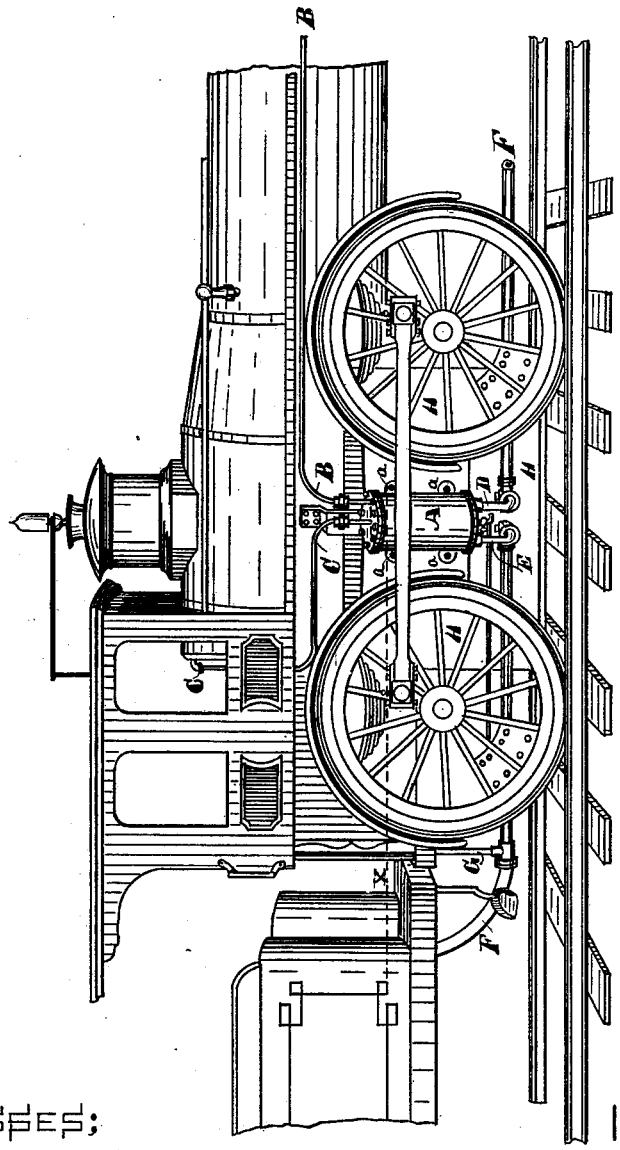
N. W. KIRBY.

FEED-WATER HEATERS FOR LOCOMOTIVES.

No. 191,597. Patented June 5, 1877.





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IMPROVEMENT IN FEED-WATER HEATERS FOR LOCOMOTIVES.

Specification forming part of Letters Patent No. **191,597**, dated June 5, 1877; application filed April 19, 1877.

To all whom it may concern:

Be it known that I, NAHUM W. KIRBY, of Indianapolis, county of Marion and State of Indiana, have invented a new and useful Improvement in Heaters for Heating Feed-Water for Supplying Locomotive-Boilers, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates, first, to the location and arrangement of the heater A with reference to the tank and locomotive; and, second, to the construction of the heater.

The peculiar location and arrangement of the heater with reference to the locomotive and tank constitute an important feature in my invention. Previous to my invention, heaters of various kinds have been located at other places on the locomotive than the place selected by me; but their location in each case has materially interfered with the success of the heater. While the arrangement of a heater with a stationary engine is always a matter of ease, simplicity, and convenience, so that, as a general rule, all stationary engines have heaters to heat their feed-water by means of dead steam, the arrangement of a heater with a locomotive has hitherto been attended with difficulties deemed insurmountable, because the location and bulkiness of a heater large enough to be of use have interfered with its efficiency and with room belonging to other parts of the locomotive, and the result has been that locomotive-heaters have generally been failures. I have discovered that by locating and arranging the heater at the side of the fire-box H H H, between the drivers and below the level of the water in the tank, as shown in the side elevation of a section of a locomotive and tender, Figure 1, locomotive-heaters become practicable, and important results and advantages are obtained not incident to heaters as heretofore arranged and located.

Among these advantages and results are contiguity to the small engine which runs the air-brakes, when my invention is used on locomotives having air-brake engines, so that the dead steam from the air-brake engine may be conveniently used to heat the water without having to be conducted to such a distance as to lose a part of its heat before being used; also, contiguity to the line of passage of the feed-water pipe, on its way from the tank to the pump; also, its proximity to the ground, by which it becomes convenient, without the aid of a long conducting-pipe, to run the waste live or dead steam, or both, (which becomes, in a measure, condensed, after being used to heat the water,) away from the rails toward the center of the track, so that the rails shall not be wet by the drip from the heater; also, greater security of attachment of the heater to the locomotive, by means of the flat surface of the fire-box, is afforded; also, the contact of the heater with the hot surface of the fire-box, by which heat in addition to that derived from the live or dead steam used in the heater is conducted to the water in the heater and assists in heating it; also, the inconvenience and expense of displacing other portions of the machinery, and changing patterns of existing styles of building locomotives by locating the heater at other places where it has heretofore been used, are avoided, so that at my location it can be easily attached, at any locomotive repair-shop, to all locomotives of existing patterns without change of other parts; also, disproportion in form and unsightliness of parts are avoided. Another and very important advantage resulting from this location is that, by means of it, I am enabled by the head of water in the tank, even when the water is at its lowest point, to conduct cold water to be heated into the heater without aid from the ordinary force-pump of the locomotive, or from any other pump, and thereby heat the water in its passage between the tank and the force-pump before it reaches the force-pump, so that the heated water may enter the boiler in the usual manner, and by the usual course, directly from the force-pump, without having to be conducted out of its proper course to be heated after leaving the force-pump. The dotted line X shows the highest end of the heater to be on a level with the low-water line of the tank.

The heater itself is, for convenience, constructed in the form of a half-round cylinder, with lugs *a*, by which its flat surface is attached to the flat surface of the fire-box H H H. At the arrows *k* and *m* the respective

pipes B and C enter the heater, and are respectively formed with the coils B′ and C′ in the inside of the heater, passing through it and out at its lower end, all as shown in Fig. 2. Through one of these coils of pipe C′ live steam from the boiler is conducted by the pipe C. Through the other coil, B′, dead steam from the exhaust, either of the air-brake engine or the locomotive-cylinders, or both, is conducted for the purpose of heating the water passing through the heater A.

Where both coils emerge from the heater, they are each supplied with waste-cocks, although the waste-cock for conducting the dead steam may usually be dispensed with. When used it should be a large cock, as shown at *g′*, with a free opening for the exhaust. The other cock, *g*, has a small opening for the drip of the live-steam coil, and is kept open while the heater is in operation for the purpose of maintaining a circulation of hot steam through the coil.

An opening, fitted with the inlet-pipe or branch pipe E, is provided at the lower end of the heater, to receive cold water from the feed-pipe F on its way from the tank to the pump, and also another opening, fitted with the outlet-pipe or branch pipe D, is provided for the water to pass out again in a heated condition into another section of the feed-pipe F, to be pumped into the boiler. This outlet-pipe D should project well toward the top of the heater, so that the heater may be nearly full of water before the outlet-pipe D begins to deliver the heated water to the pump. The arrow *e*, Fig. 2, shows the direction of the cold water passing into the heater, and the arrow *f* the direction of the hot water out of the heater into the feed-pipe F on its way to the force-pump. The arrows *d* and *k* show the direction of the live steam through the heater, a slight circulation of live steam being kept up by means of the small orifice opened by the cock *g*.

Section B of the exhaust-pipe can be turned to receive the exhaust either from the air-brake engine or from the locomotive-engine, as may be desired.

The operation of my heater is as follows: The engineer admits the water from the tank into the feed-pipe F by turning the lazy-cock G. The water then passes, by the branch pipe E, into the heater A. The head of water in the tank raises the water in the heater to the top or open end of the branch pipe D, which projects upward to near the top of the heater. By the time the water has thus reached the top of the branch pipe D, and begins to flow into it at its open end, it has become heated either by the dead steam in the coil B′ or the live steam in the coil C′, as one or the other, or both, may be used, and thus heated it passes downward through the branch pipe D, out of the heater into the pipe F, Fig. 1, in the direction of the arrow *f*, Fig. 2, to the force-pump, and from thence directly to the boiler.

I claim as my invention—

1. A feed-water heater located between the forward and rear drivers of a locomotive, and at a point below the low-water line of the tender, whereby water from the tender is heated before reaching the pump, as and for the purposes set forth.

2. The locomotive-engine heater A, with the inlet water-pipe or branch pipe E, the outlet water-pipe or branch pipe D extending its mouth or open end up into the body of the heater, so that the heater shall be filled or partly filled with water before the water shall pass out of the heater through the branch pipe D, and provided, also, with the dead-steam coil B′, with a large opening permitting a free exhaust, for heating feed-water for locomotives, substantially as shown.

3. The locomotive-engine heater A, with the inlet water-pipe or branch pipe E, the outlet water-pipe or branch pipe D extending its mouth or open end up into the body of the heater, so that the heater shall be filled or partly filled with water before the water shall pass out of the heater through the branch pipe D, and provided, also, with the live-steam coil C′, with a small drip-cock at its lower end, for heating feed-water, substantially as shown.

4. A locomotive-engine heater located at a point below the low-water line of the tank, provided with an inlet water-pipe, branching from the main feed-water pipe leading from the tank to the force-pump, an outlet-pipe projecting its open end up into the interior of the heater, and connecting the heater with said feed-water pipe, whereby water from the tender is heated before reaching the pump, as and for the purposes described.

5. The feed-water heater A, provided with the two coils of pipe, the one conducting live steam having a small pet-cock at its lower end where it emerges from the heater, and the other conducting dead steam from the exhaust having a free opening at its lower end, substantially as and for the purposes specified.

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Witnesses:
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