(No Model.)

C. F. HIRT.

FEED WATER HEATER AND CINDER CONSUMER.

No. 523,350. Patented July 24, 1894.

Fig. 1.

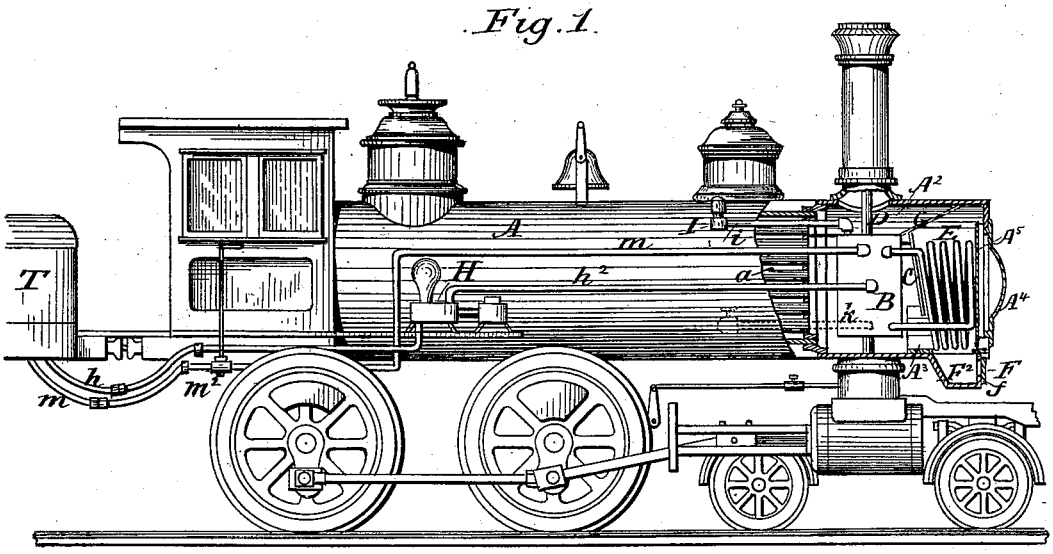


Fig. 2

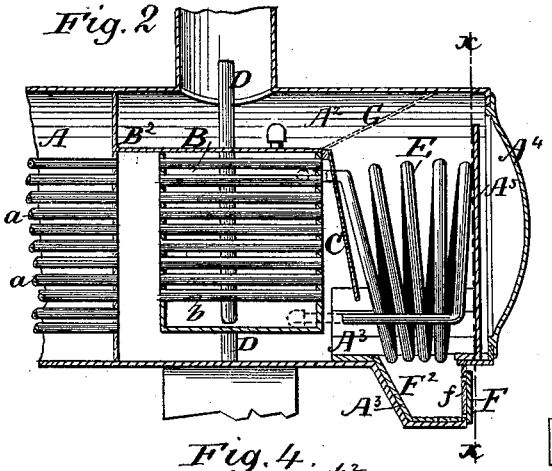


Fig. 3

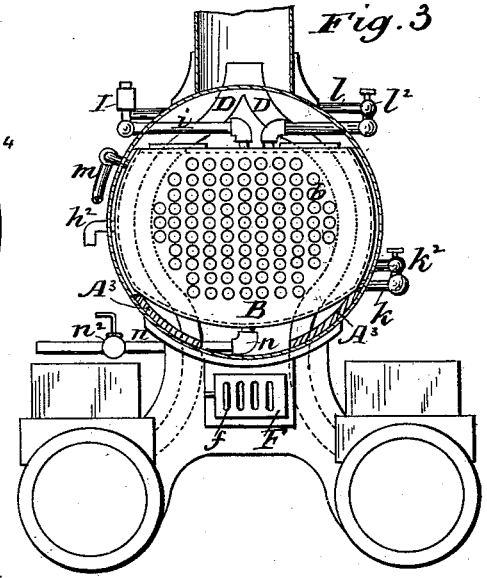
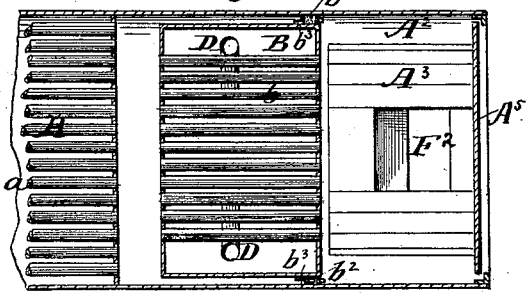


Fig. 4.



WITNESSES

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FEED-WATER HEATER AND CINDER-CONSUMER.

SPECIFICATION forming part of Letters Patent No. 523,350, dated July 24, 1894.

Application filed December 15, 1893. Serial No. 493,786. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. HIRT, a citizen of the United States, residing at Erie, in the county of Erie, State of Pennsylvania, have invented certain new and useful Improvements in a Combined Locomotive Feed-Water Heater and Cinder-Consumer, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to improvements in the class of locomotive feed water heaters and spark arresters that are located in the smoke box thereof; and the objects of my improvement are to utilize the flame escaping from the boiler flues to heat a circulating body of water in a multitubular feed water heater and a coil heater arranged within the smoke box in front of, but separated and at a distance from the boiler flues, to economize fuel and also operate as a spark arrester by deflecting the sparks or cinders in front of said heater and upon the lower portion of said coil, said lower portion of the coil also constituting a grate to support the cinders, to facilitate the ignition and burning of the accumulated cinders and thereby economize the consumption of fuel from the furnace while at the same time clearing the smoke-box from flue clogging cinders. I attain these objects by the construction illustrated in the accompanying drawings, in which—

Figure 1 is a side view of a locomotive having the front portion of its shell removed on one side to show the interior of the smoke box provided with devices constructed in accordance with my invention. Fig. 2 is a longitudinal vertical section of the smoke-box and its contents on a larger scale. Fig. 3 is a transverse vertical section of the smoke box on line *x x* of Fig. 2 but with the water heater coil removed. Fig. 4 is a horizontal section of the smoke box with the multitubular water heater therein but with the water coil removed to show the brick lined bottom of the fire box and the ash pan.

In said drawings A represents the tubular boiler of a locomotive of any suitable and well known construction having smoke flues *a*, in front of which the smoke box A^2 is placed. Within said smoke box is placed the multitubular feed water heater B that is suitably secured to the shell of the fire box at a suitable distance in front of the boiler flues. Said heater B is provided in its central portion with a series of horizontal flues *b* similarly arranged as the flues *a* of the boiler but the lowest row of the flues *b* is on a higher level than the lowest row of the flues *a*, so that the flame issuing from the latter is made to pass under the body of the heater B, and the radiated heat of said flame is caused to ascend between the walls of said heater and the shell of the smoke box, but said ascending heat is prevented from escaping toward the front end of the smoke-box by a packing ring b^2 of asbestus or other yielding fire-proof material clamped between segmental bars of angle iron b^3, riveted to the sides of the shell of the heater adjacent to its front end and segments of flat plates bolted to the web of said angle iron bars. The hot gases passing through the flues *b* of the heater are conducted downwardly by a deflecting plate C, having its upper edge secured to the top of the heater B at a short distance in front of its flues. Said plate C is slightly inclined so as to leave a larger opening between its lower edge and the heater and said lower edge is on the same level as the lower row of flues *b*.

The exhaust pipes D of the engine are made to pass preferably through the body of the heater B to utilize the caloric of said steam heated pipes passing therethrough to, in part, heat the feed water, and also to permit the diameter of the heater to be nearly equal to that of the boiler.

To utilize the heated gases escaping from under the bottom edge of the deflecting plate C and from the under side of the water heater B to heat the water of a secondary heater without materially interfering with their ascent to the smoke stack of the locomotive, a coiled pipe E is placed in front of the heater B. One of the ends of said pipe is connected with the heater B at, or adjacent to its lower end, while the opposite end is connected with the top or upper portion of said heater. The upper portions of the coil are relatively far apart so as not to materially obstruct the ascent of the heated gases, but its lower portions are closer together to constitute a grate for the support of the compacted cinders falling thereon, upon which they are easily made to burn

when air is admitted by opening the register *f* in the door F on the front of the ash pit F^2 pendent from the shell of the smoke box under the coil pipe E. The register *f* can be opened by the fireman while the locomotive is running, by passing from the cab along the foot board, to the front of the locomotive. When said register is open air is admitted in the ash pit and the oxygen thereof will keep ignited the sparks falling within the coil and ignite the heap of cinders that may have accumulated upon the lower portion of the cinder support or coil E and in the ash pit F^2. To prevent said mass of ignited cinders or fine coke from damaging the shell of the smoke box, the lowest half of the latter is lined with fire bricks A^3, and fire bricks are also secured to the bottom and sides of the ash pit. The front casing A^4 of the smoke box is also protected by an internal plate A^5 secured thereto. The heated gases after passing upward between the upper portions of the coil E are conducted through a sheet of wire netting G, that is set in an inclined position above the coil F, the lower end of said netting being secured to the upper edge of the rear flue sheet of the heater B. From the netting G the gases escape into the smoke stack. To prevent the flame and hot gases issuing from the smoke flues *a* of the boiler from ascending directly to the smoke stack without passing through the flues *b* of the heater the upper portion of the passage between the front flue sheet of the boiler and the heater B is closed by a horizontal plate B^2 secured to said parts.

To feed the locomotive with water, said water is taken from the tender T through the pipe *h* to the pump H that is suitably operated on the side of the engine, and thence through the pipe h^2 into the heater B at a point as near the bottom thereof as possible. The water is heated therein and also in the coil E, and is taken from said heater into the upper portion of the boiler A through the pipe *i*, and past the check valve I thereon.

The heater B is connected with the boiler A from a point near the bottom thereof by means of a pipe *k* controlled by a cock k^2 thereon, and from a point near the top thereof by means of a pipe *l* controlled by a cock l^2 thereon; so that when said cocks k^3 l^2 are open, the heater B forms substantially a continuation of the boiler A.

To provide for raising the temperature of the water in the tender, the latter is connected with the upper portion of the heater by means of a water return pipe *m* upon which there is placed a cock m^2 the handle of which is accessible to the engineer in his cab.

To blow off the sediment that may accumulate in the heater B, it is provided in the bottom thereof with a pipe *n* that extends over the side of the engine and the latter is provided with a cock n^2, the handle of which can be controlled by a rod, not shown, from the cab of the engine.

Having now fully described my invention, I claim—

1. In a locomotive the combination of the boiler thereof, the multitubular water heater B in front of, but at a distance from the boiler, pipes connecting the top and bottom of said heater with the locomotive boiler, cocks on said pipes, and a pipe *i* with a check valve thereon connecting the top of the heater with the locomotive boiler substantially as described.

2. In a locomotive the combination of the boiler thereof, the multitubular water heater B in front of the boiler pipes connecting the top and bottom of said heater with the locomotive boiler, and a coiled pipe E in front of the heater B and having its ends connected with the top and bottom thereof.

3. In a locomotive the combination of the boiler and smoke box thereof, the multitubular water heater B in front of, but at a distance from the boiler and the yielding packing ring b^2 between the heater and the walls of the smoke box substantially as described.

4. In a locomotive the combination of the boiler and smoke box thereof, the multitubular water heater B in front of the boiler, a deflecting plate in front of said heater B, a coiled pipe in front of said deflecting plate and having its ends connected with the heater B, and wire netting above the coiled pipe substantially as described.

5. In a locomotive the combination of the boiler and smoke box thereof, the multitubular water heater B in front of the boiler and pipes connecting it therewith, and the exhaust pipes of the locomotive passing through the walls and interior of the water heater substantially as described.

6. In a locomotive the combination of the boiler and smoke box thereof, the water heater in front of the boiler, a spark deflecting plate in front of said heater, a pipe coiled in front of said deflecting plate, the coils of said pipe being closer together at the bottom than at the top substantially as and for the purpose described.

7. In a locomotive the combination of the boiler and smoke box thereof, an ash pit in the bottom of the smoke box, brick lining surrounding the upper edge of said ash pit and covering the bottom of the smoke box, a water heater in front of the boiler, and a coiled pipe connected with said heater and located over the ash pit substantially as and for the purpose described.

8. In a locomotive the combination of the boiler and smoke box thereof, an ash pit in the bottom of the smoke box, a lining surrounding the upper edge of said ash pit and covering the bottom of the smoke box, a water heater in front of the boiler and a cinder support located over the ash pit.

9. In a locomotive the combination of the boiler thereof, the multitubular water heater B in front of the boiler, pipes connecting the

top and bottom of said heater with the locomotive boiler, a blow off pipe *n* connected with the bottom of said heater, and a cock on said pipe, with a coiled pipe E in front of the heater B and having its ends connected with the top and bottom of said heater substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES F. HIRT.

Witnesses:
E. E. MASSON,
A. B. DEGGES.