W. WICKERSHAM

FEED WATER HEATER.

No. 180,813. Patented Aug. 8, 1876.

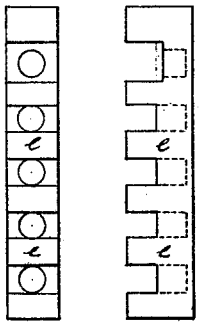

Fig. 5.

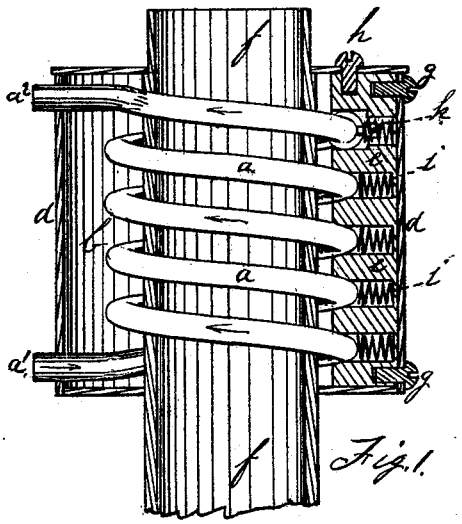

Fig. 1.

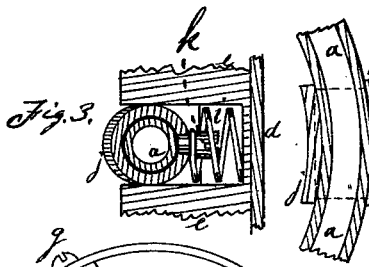

Fig. 3.

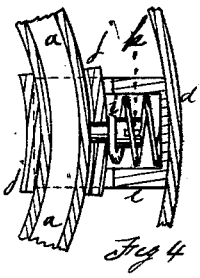

Fig 4

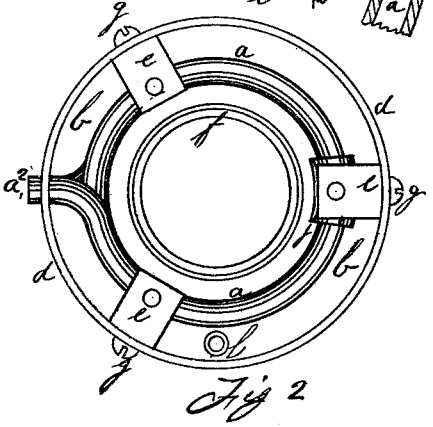

Fig 2

Witness

Edgar L. Kimball

James Horner.

Inventor

William Wickersham

UNITED STATES PATENT OFFICE.

WILLIAM WICKERSHAM, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN FEED-WATER HEATERS.

Specification forming part of Letters Patent No. **180,813**, dated August 8, 1876; application filed May 1, 1876.

To all whom it may concern:

Be it known that I, WILLIAM WICKERSHAM, of Boston, in the State of Massachusetts, have invented an Improved Feed-Water Heater for Locomotives, of which the following is a specification:

The object of my invention is to complete and put into practical form what is called the "Magoon heater," embodied in several patents granted to J. P. Magoon, and to make such additions thereto as may be conducive to its greatest utility; and in order to make the functions and utility of my improvements clear, I will first state a few of the leading features of the Magoon invention.

The purpose of the Magoon heater is to heat the water supplied to the locomotive-boiler in its passage from the force-pump to the same. Magoon accomplished this by having the pipe coming from the force-pump and the one coming from the boiler enter a chamber around the smoke-pipe, and extend thence several times around the smoke-pipe to the top of said chamber, where the two pipes are connected together, making a continuous passage for the supply-water to pass from the force-pump to said chamber; thence several times around said smoke-pipe to the top of the chamber; thence to pass in the other direction several times around said smoke-pipe to the lower end of said chamber, and out into the boiler, and a portion of the exhaust steam is thrown into said chamber, from which the water is continually receiving heat as it passes up and down through the two series of coils of pipe in said chamber. These coils of pipe were permanently fixed in their position by being secured by standards, one end of which was attached to the smoke-pipe, and the other end attached to the coil of the supply-pipe. Now, when one of these heaters was put into operation, it was found that the expansive force of the said coil of supply-pipe, when heated, was so great as to tend constantly to the destruction of the whole apparatus, and render it useless, by disconnection of the two coils at the top, making leakage, breaking the standards, &c. Now, it is the purpose of my invention to remedy these defects, and so far simplifying and perfecting the heater as to render it practicable and eminently useful.

The first feature of my invention relates to the manner of securing the supply-pipe in its position in the heating-chamber; and consists of one or more upright standards or supporting-bars attached to the inner surface of the cylinder forming the heating-chamber, with recesses in their edges to receive and support the coils of the supply-pipe in such manner as to admit of its moving outward freely as it expands by heat.

The second feature of my invention provides for the expansion of the supply-pipe within the heating-chamber; and consists of an independent spring placed in a recess in the supporting-bars outside of the supply-pipe, which springs will constantly press against the outside of the said pipe, but which, at the same time, will yield to accommodate the expansion of said pipe when it is heated.

The third feature of my invention relates to the manner of securing the said springs to the pipe; and consists of a box or piece of metal extending around said supply-pipe, in which said pipe may be clamped, and so formed on its upper and lower sides as to fit in said recess in the supporting-bars, so that it can slide out or in, as the coils in said supply-pipe expand or contract by change of temperature, a spring being attached to the outside of each one of these boxes, which plays in said recesses.

The fourth feature of my invention relates to the recess for the spring and the more positive security against the pipes sliding too far in said recesses; and consists in having separate recesses for the springs outside of those in which the pipe slides as it expands, so that the recess for the pipe shall be extended outward only far enough to provide for its expansion, while the recess for the springs shall be nearly all outside of this.

In my drawings, Figure 1 is a vertical section of my water-supply heater, showing the plan and construction of the various parts inside of the heating-chamber, except the supply-pipe, which is shown, though not in section. Fig. 2 is a plan view with the cover taken off. Fig. 3 is an enlarged vertical section of one of the spaces in the supporting-standard to hold the supply-pipe, also show-

ing the connection of the spring with said pipe, which yields as the pipe expands. Fig. 4 shows a horizontal section of the same. Fig. 5 shows a side and edge elevation of the standard.

a is the supply-pipe. *b* is the heating-chamber, in which the pipe *a* is coiled. *d* is the cylinder or outside wall of the heating-chamber. *e e e* are the standards supporting the coils of the pipe *a*. *f* is the smoke-pipe. *g g g* are screws securing the standards *e e e* to the cylinder *d*. *h* is one of the screws holding the cover over the heating-chamber. *i i i* are springs in the recesses in the standards *e e e* outside of the supply-pipe, so constructed and arranged as to press constantly against said pipe and hold it in its place, yet capable of yielding to accommodate the expansion of said pipe. *j* is a box or piece of thick tube around the supply-pipe, holding and supporting it at each place where the said pipe passes through the recesses in the standard *e*. *k* is the screw which secures the spring *i* and the box *j* to the supply-pipe *a* at the place where it is supported by the standard.

The purpose and operation of my invention are as follows: Its purpose is to heat the water supplied to the boiler, as it passes from the force-pump to said boiler, in the most efficient, practicable, and economical manner. I have the supply-pipe from the force-pump attached to the coil, or that part, *a*, which is in the heating-chamber, at the point a^1, in a manner well known to mechanics; and when this connection with the force-pump is made, the water will pass from the pump through the whole coil *a*, finding its exit at the end of the coil at a^2, at the opposite end of the cylinder forming the heating-chamber, where the end of the coil is attached to the pipe leading to the boiler, so that the supply-water passes through the force-pump, thence to the coil at a^1, thence through the coil *a* in the heating-chamber *b*, as indicated by the arrow-point, to the exit at a^2, and thence to the boiler, where it is discharged, being heated as it passes through the coil in the heating-chamber.

The heating-chamber is supplied with heat from two sources: first, the smoke-pipe *f*, around which the coil extends, is kept hot by the hot air and exhaust steam passing through it; second, a part of the exhaust steam passes into the heating-chamber *b* through the pipe *l*, which is connected with the exhaust-pipe from the cylinders. Hitherto the difficulty of controlling the expansion of the coil in the supply-pipe and preventing injury appears to have been very great, and the means used in the various experiments to prevent said injury was not satisfactory, and I have simplified the coil in the heating-chamber by making it one single continuous coil from a^1 to a^2, instead of having a double coil with a joint in it, which joint was always liable to be broken by the unequal strain of the two coils, they being heated unequally. I have one or more standards, *e e e*, extending from the bottom to the top of the coil placed inside of the heating-chamber, and attached to the inside of the heating-chamber cylinder, as shown in Fig. 2, having spaces cut out of each on the inner edge for the different rounds or volutions of the coil *a* to rest in, and then outside of these spaces are recesses for the springs *i i* to act in, as they constantly exert a force against the outside of the coil, in such manner that the weight of the coil will be sustained by the standard *e*, as it rests in the space in said standard; and when the said coil *a* expands it can do so freely by moving outward in its space in the standard, and by compressing the springs *i i* in the recess in said standard back of said spaces, as shown in Fig. 1, and on a larger scale in Figs. 3 and 4, where I have also shown the arrangement of the box *j* in its position in the standard *e*, and the manner of its connection with the spring *i* and the coil *a* by the screw *k*, the screw *k* holding the spring *i* and the box *j* onto the coil in the recess in the standard *e*, so that the coil can move outward as it expands, but is held in position in other respects, the expansion injuring nothing, and having no other effect than to compress the springs outside of the coils. These springs *i i i*, &c., are independent and separate from each other, because the supply-pipe is differently heated and expanded in different parts of the coil, needing to be controlled separately at each place supported by the standards.

The whole apparatus is attached to the boiler of a locomotive around the smoke-pipe, so that it will be a permanent fixture thereto.

Having thus described my invention, my claim is as follows:

I claim—

1. In a feed-water heater for locomotives, the standards *e e e* within the heating-chamber, as shown, having spaces for the coils of the supply-pipe *a* to rest in and move in freely, as the coil may be expanded by heat, in combination with the said coil, as and for the purpose set forth.

2. Separate and independent springs *i i* for each place in the standard supporting the coils of the supply-pipe, in combination with the coil of supply-pipe *a* and the standard *e*, as and for the purpose set forth.

3. The box *j* around the coil *a*, in combination with the screw *k* and the standard *e*, having a space for the said box to slide in, as and for the purpose set forth.

4. The standard *e*, with recesses deeper and largely outside of the recesses for the coil *a* to rest and expand in, in combination with the spring *i*, as and for the purpose set forth.

WILLIAM WICKERSHAM.

Witnesses:

EDGAR L. KIMBALL,
JAMES HORNER.