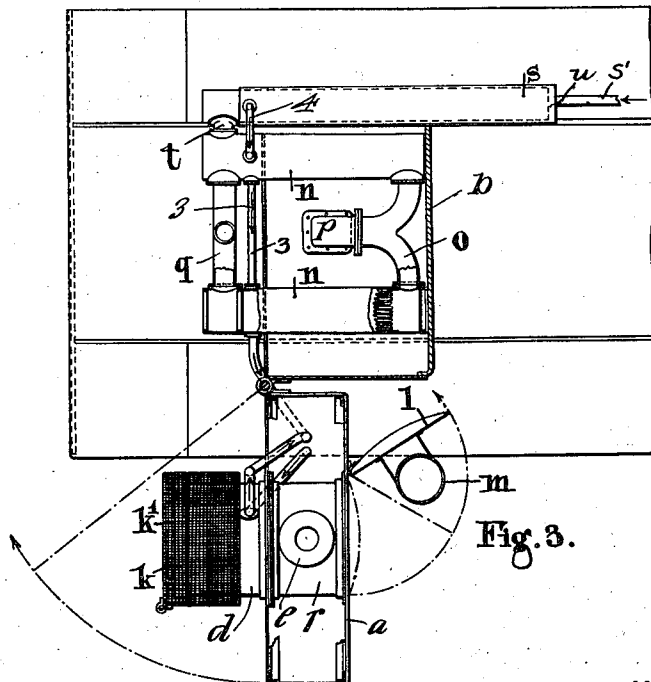
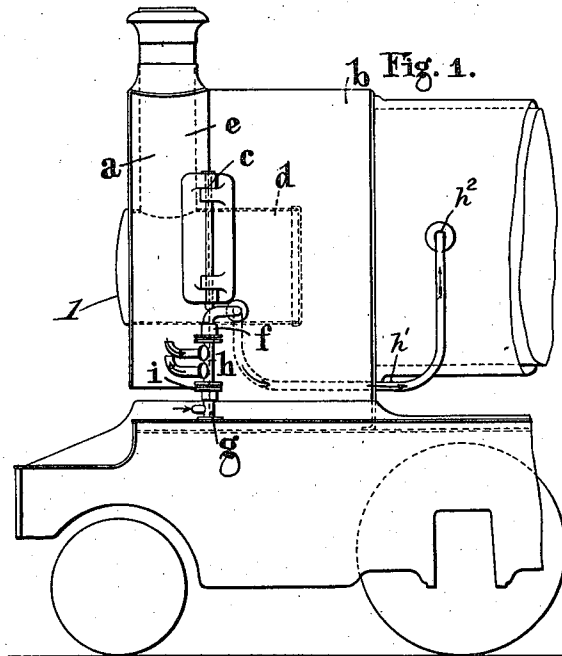


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LOCOMOTIVE AND LIKE BOILER.
APPLICATION FILED DEC. 7, 1912.

1,296,233.

Patented Mar. 4, 1919.
3 SHEETS—SHEET 1.



WITNESSES

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3 SHEETS—SHEET 2.

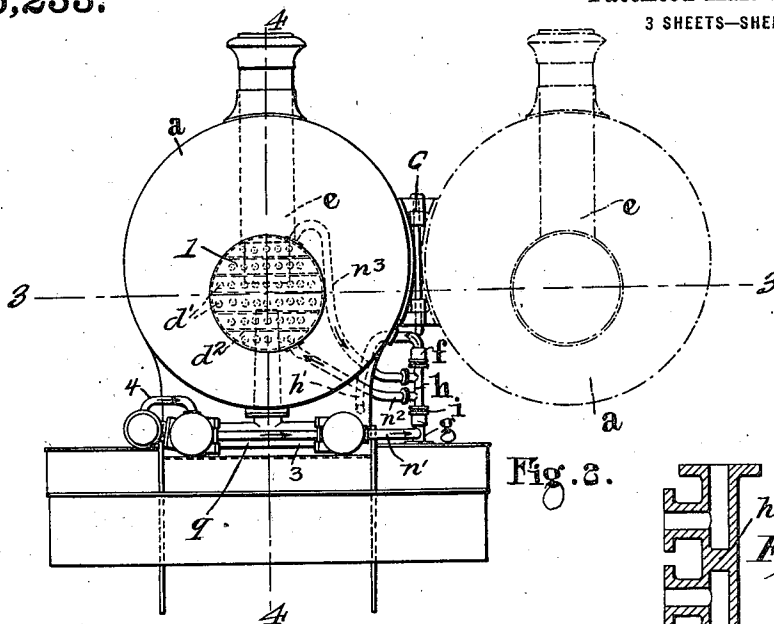


Fig. 2.

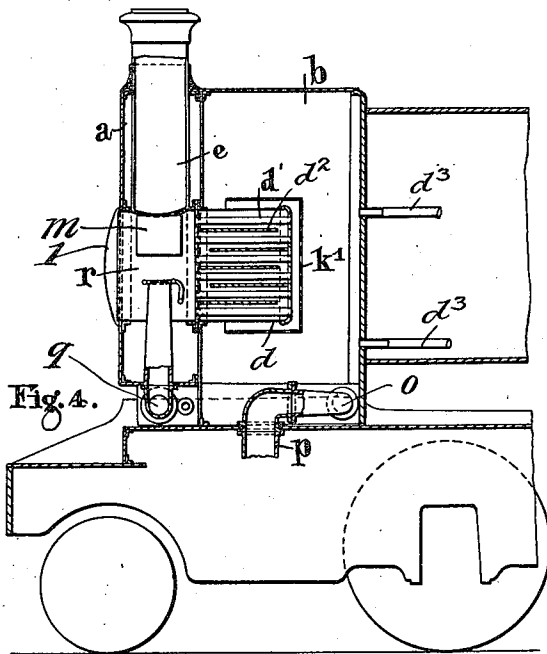
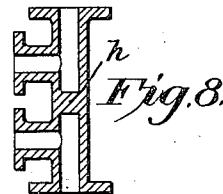


Fig. 4.

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3 SHEETS—SHEET 3.

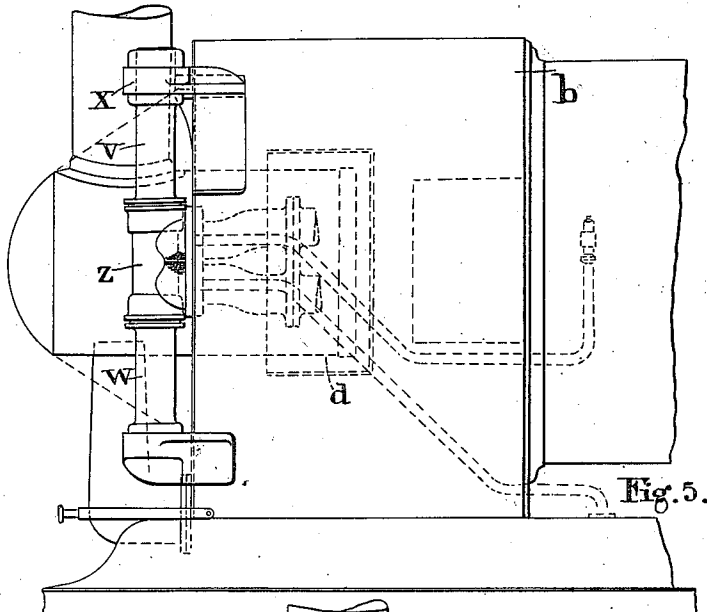


Fig. 5.

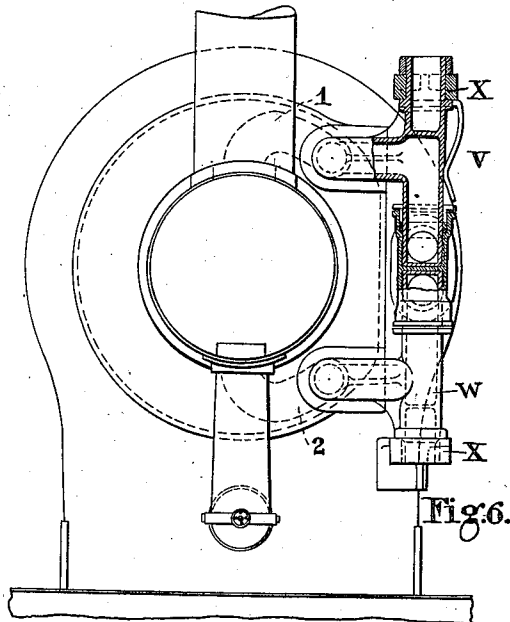


Fig. 6.

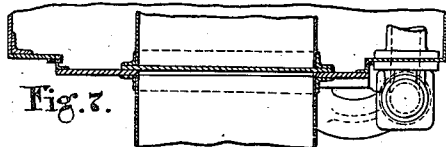


Fig. 7.

WITNESSES

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LOCOMOTIVE AND LIKE BOILER.

1,296,233.

Specification of Letters Patent.

Patented Mar. 4, 1919.

Application filed December 7, 1912. Serial No. 735,470.

To all whom it may concern:

Be it known that I, FREDERICK HARVEY TREVITHICK, a subject of the King of Great Britain and Ireland, and resident of Zeitoun, Cairo, Egypt, have invented certain new and useful Improvements in or Relating to Locomotive and like Boilers, of which the following is a specification.

This invention relates to locomotive marine or other boilers of the kind which are fitted with either feed water heaters or steam superheaters or with both feed-water heaters and steam superheaters.

One object of the present invention is to devise means such as shall insure that the smoke-box heater which may be arranged for either steam-superheating or for feed-water heating or for both these purposes, while normally in the most advantageous position for efficiency in operation, may not unduly encumber the smoke-box when access to the latter is desired for any reason.

A further object of the invention is to so arrange exhaust steam feed-water heaters that the temperature of the feed-water may be raised to a maximum before leaving such heaters.

A still further object of the invention is to prevent undue condensation of the exhaust steam in the feed-water heaters with consequent ejection of water with the exhaust steam from the chimney.

The invention consists in carrying the smoke-box heater and its appurtenances, and if convenient and desirable, the uptake or stack upon the main smoke-box door or upon a portion of the smoke-box hinged to the main smoke-box; such an arrangement insures that while the heater is normally in the most advantageous position for operation, that is, in the line of flow of the flue gases the smoke-box is entirely freed from the heater when the hinged portion carrying the same is open and the smoke-box and the heater are thereby rendered readily accessible.

The invention also consists in adapting the connections between the smoke-box heater and the feed pipe or the exhaust steam heaters, and boiler clack box, when using the heater for feed water, or the connections between the heater and the boiler and the cylinder steam chests when using the heater for drying steam or both when steam drying and feed water heating, so as to make provision for the swinging

movement of the hinged portion above referred to, so that the latter may be opened when required without interfering with the necessary connections.

The invention also consists in providing means which shall insure that the whole of the exhaust steam passes through the exhaust steam feed-water heaters before issuing from the blast pipe so that the temperature of the feed-water may be raised to a maximum before it leaves such heaters.

The invention further consists in the provision of a supplementary exhaust steam-heater in which the temperature of the feed-water may be raised to a certain extent before passing to the main exhaust steam heaters so that the condensation of exhaust steam in the latter may be reduced to a minimum.

The invention still further consists in the various details and arrangements herein-after more particularly referred to.

The accompanying drawings illustrate two modes of carrying out the invention:

Figure 1 is a side elevation showing a portion of a locomotive fitted with one convenient arrangement in accordance with the invention.

Fig. 2 is a front elevation showing also, in dotted lines the open position of the hinged section.

Fig. 3 is a part sectional plan taken on line 3—3 of Fig. 2.

Fig. 4 is a side sectional elevation taken on line 4—4 of Fig. 3.

Fig. 5 is a side elevation showing a modified arrangement, while

Fig. 6 is a part sectional front elevation of the arrangement shown in Fig. 5,

Fig. 7 is a part sectional plan, and

Fig. 8 is an enlarged detail sectional view of one of the pipes.

In carrying my invention into effect in one convenient manner when applying it, for example, to a locomotive boiler and as illustrated in Figs. 1—4, I divide the smoke-box into two portions *a* *b* hinged together by a hinge *c* of suitable size and strength to carry the necessary weight; and to the front or movable portion *a* I attach in any suitable manner the smoke-box heater *d* which may conveniently take the form of one or more drums according to the purpose to which this heater is put, carrying its own smoke-box and the uptake or stack *e*, the various parts being preferably so positioned

that the smoke-box heater is placed comparatively low down in the smoke-box so as to insure an efficient length of stack, this feature being of importance particularly in connection with modern locomotives where the over-all length of stack is limited by tunnels and bridges or other constructions through or under which the locomotive has to pass. The smoke-box heater d may have arranged in it a series of tubes d' , separated by horizontal plates d^2 , the latter being disposed in staggered relation, as indicated in Fig. 4, and the tubes d' opening through the tube plates at the ends of the heater.

It will be seen that with the arrangement so far described the heater, when the smoke-box is closed, is placed in the line of flow of the gases issuing from the fire tubes d^3 and consequently is in the most advantageous position for drawing these gases through said fire tubes and smoke-box heater tubes d' , from which latter the gases pass to the stack e .

Any suitable form of movable connections between the smoke-box heater and the exhaust steam heaters or between the steam cylinders and the boiler may be employed for allowing the movement of the hinged portion of the smoke-box or door carrying the heater without disturbing the connections.

In one convenient construction the connection may take the form of two fixed pipes f g between which is a short movable pipe h divided into two compartments, as shown in Fig. 8. The axis of rotation of the movable pipe h is in alinement with that of the smoke-box hinge c and the upper and lower and fixed pipes f and g are provided with any suitable form of gland and bush i provided with metallic or other packing to make water or steam-tight connections with the movable pipe h and are connected respectively to the feed pipe or exhaust steam heaters and to the boiler clack box. The two compartments of the movable pipe h are connected respectively with the inlet and outlet of the smoke-box heater as clearly seen in Fig. 2.

It is to be understood that the movable connection is a detail incident to my invention and the form of construction above given is by way of example only as it will be obvious that many equivalent forms of construction may be employed for this purpose as, for instance, a lazy tongs arrangement or by simple swivel unions suitably centered, or if convenient or found desirable the smoke-box hinge itself may be arranged to provide the necessary connections, as will be more fully described hereinafter.

The smoke-box heater d may be provided with a spark arrester k of any suitable form and having preferably the part k' hinged so as to swing open, and it may also be ar-

ranged with its own smoke-box r of reduced size, to which a supplementary door l is fitted, thus insuring ready accessibility to the smoke-box heater tubes d' and tube plates d^2 . The gases of combustion, as a matter of fact, pass through the spark arrester k' before entering the tubes d' , and, after leaving said tubes, pass through the smoke-box r before entering the smoke stack e . The smoke stack e may be secured to or form part of the heater smoke-box, and it will be seen that by my improved arrangement I am enabled to secure an efficient length of smoke stack thereby insuring an adequate draft for the exhaust steam up the smoke stack and if desired the usual uptake m may be provided beneath the smoke-stack. The exhaust steam heaters n are preferably connected at one end by means of a Y or other suitable connecting pipe o secured to the exhaust pipe p (Fig. 4) from the steam cylinders while the other ends of the heaters are connected by a T or other suitably shaped blast pipe q , the upper end of which is arranged to discharge into the heater smoke box r . The upper part of the blast pipe may be carried by the movable portion of the smoke-box and any suitable form of jointing may be provided between the upper movable and lower fixed portion of the blast pipe arranged so that such joints may be quickly and easily made and unmade, as, for instance, by means of a stirrup and set screw, or any other convenient device.

It will be seen that by means of this arrangement the whole of the exhaust steam passes from the cylinders through the feed-water heaters n , n , before issuing from the blast nozzle while water passes from one to the other of the heaters n by the connecting pipe 3, and in order to prevent undue condensation of the exhaust steam in these heaters a supplementary heater s may be provided which is fed with water from pipe 4 and with exhaust steam from an extension of the horizontal portion of the blast nozzle as shown at t (Fig. 3) or in any other suitable manner, the supplementary heater being preferably provided with an outer casing u and suitable drain pipes (not shown) from which the condensed exhaust steam may be allowed to drain. The water enters the supplementary heater s through the pipe s' , passes thence through the pipe 4 into the adjacent heater n , and thence through the pipe 3 into the other heater n . From the latter, it passes through the pipe n' (Fig. 2) into the lower portion of the fitting h , whence it passes through the lower part of the smoke-box heater d . Through this smoke-box heater the water is constrained to travel in a zig-zag path by means of the plates or baffles d^2 , being heated in its passage by the gases passing through the tubes d' . The heated water 13

then issues from the upper part of the heater by the pipe n^3 by which it enters the upper part of the fitting h , whence it passes by way of the pipe h' and enters the boiler at the point h^2 (Fig. 1).

Figs. 5 to 7 illustrate a modified arrangement in which the heater suitably incased is supported on or inserted through the smoke box door, instead of being mounted in a movable portion of the smoke-box, and the main hinge is itself adapted to provide the necessary movable pipe connections above referred to.

In the construction shown in the drawings which is given by way of example only the hinge consists of two T pipes $v w$ having their outer ends supported in brackets x while their inner ends work in a casting z bolted or otherwise secured to the smoke-box front plate.

The piece z is provided with glands packed metallically or otherwise or the necessary tightness to steam or water may be insured by employing ground faces held together by rings, collars, etc., or by any other convenient arrangement.

To the T pipes $v w$ which are thus rotatably mounted and retained in position by their extreme end supports is bolted or otherwise secured the movable part of the smoke-box, or as shown in Figs. 5, 6 and 7, the smoke-box door which may be flat and which carries the heater, its smoke-box and the stack in the manner above described with reference to the first form. The pipes $v w$ are further connected by means of pipes 1, 2, suitable for either steam or water as desired to the smoke-box heater. The longitudinal portion of the blast pipe has its end coned and the vertical swinging portion may be correspondingly coned so that an efficient joint may be formed when the whole device is closed.

I do not desire to confine my invention to the details of construction hereinbefore given by way of example as I may modify the size, location and arrangement of the various parts to suit the type of boiler to which my invention is to be applied and the varying conditions under which my invention is to be employed; for example, when applying my invention to a locomotive boiler fitted with a short smoke-box the heater smoke-box and the stack may be arranged in front of the main smoke-box as shown in Fig. 5, the whole being suitably boxed in in order to prevent any unusual or unsightly appearance.

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

1. In a boiler the combination of a smoke-

box, a movable member thereon, an auxiliary heater within the smoke-box and an uptake, both auxiliary heater and uptake being carried by the movable member.

2. In a boiler the combination of a smoke-box having a movable portion hinged thereto, a heater projecting rearwardly into the smoke-box and carried by the movable portion and movable connections from the source of medium to be heated to the heater.

3. In a boiler the combination of a smoke-box having a movable portion hinged thereto, a heater within the smoke-box and carried by the movable portion, movable connections from the source of medium to be heated to the heater and a spark arrester in connection with the heater.

4. In a boiler the combination of a smoke-box, having a movable portion, a tubular hinge uniting the two portions of the smoke-box and a heater projecting rearwardly into the smoke-box and carried by the movable portion.

5. In a boiler the combination of a smoke-box having a movable portion hinged thereto, a heater within the smoke-box and carried by the movable portion, movable connections from the source of medium to be heated to the heater and an auxiliary smoke-box for said heater.

6. In a boiler the combination of a smoke-box having a movable portion hinged thereto, a heater within the smoke-box and carried by the movable portion, movable connections from the source of medium to be heated to the heater, an auxiliary smoke-box for said heater and an uptake connected to said heater smoke-box.

7. In a boiler, the combination of a smoke-box having a movable portion hinged thereto, a heater within the smoke-box and carried by the movable portion, movable connections from the source of medium to be heated to the heater, an auxiliary smoke-box for said heater and a door for said auxiliary smoke-box.

8. In a boiler the combination of a smoke-box having a movable portion hinged thereto, a heater within the smoke-box and carried by the movable portion, a spark arrester connected with said heater, movable connections from the source of medium to be heated to the heater, an auxiliary smoke-box for said heater, and an uptake carried by said auxiliary smoke-box.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FREDERICK HARVEY TREVITHICK.

Witnesses:

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O. J. WORTH.