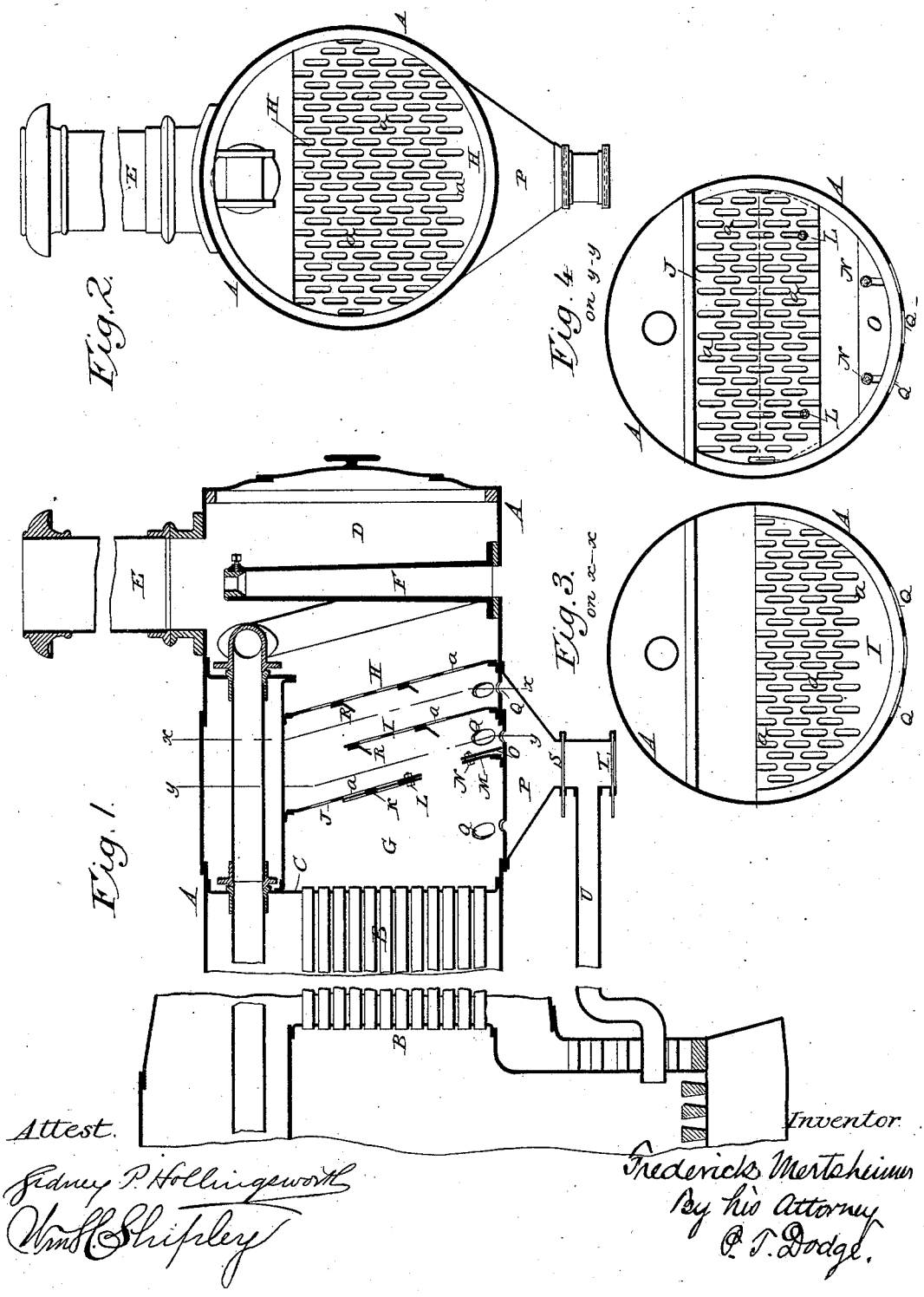
(No Model.) 2 Sheets—Sheet 1.

F. MERTSHEIMER.

SPARK ARRESTER.

No. 302,513. Patented July 22, 1884.



Attest.
Sidney P. Hollingsworth
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(No Model.) 2 Sheets—Sheet 2.

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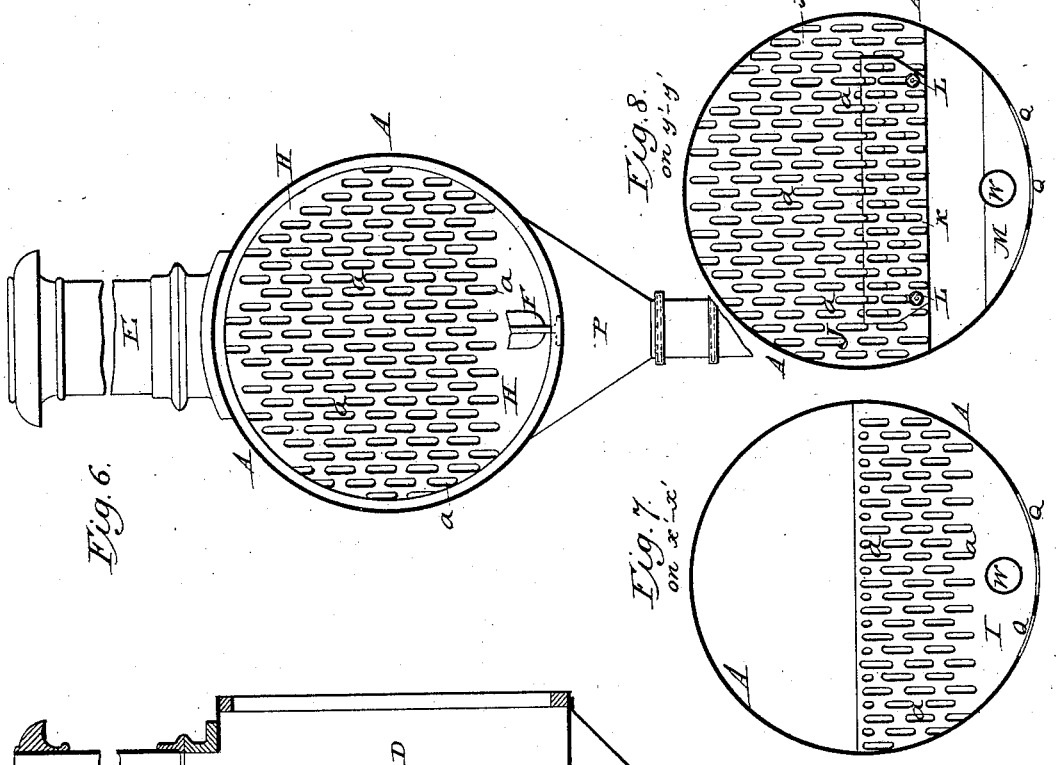

Fig. 6.

Fig. 8. on y-y'

Fig. 7. on x-x'

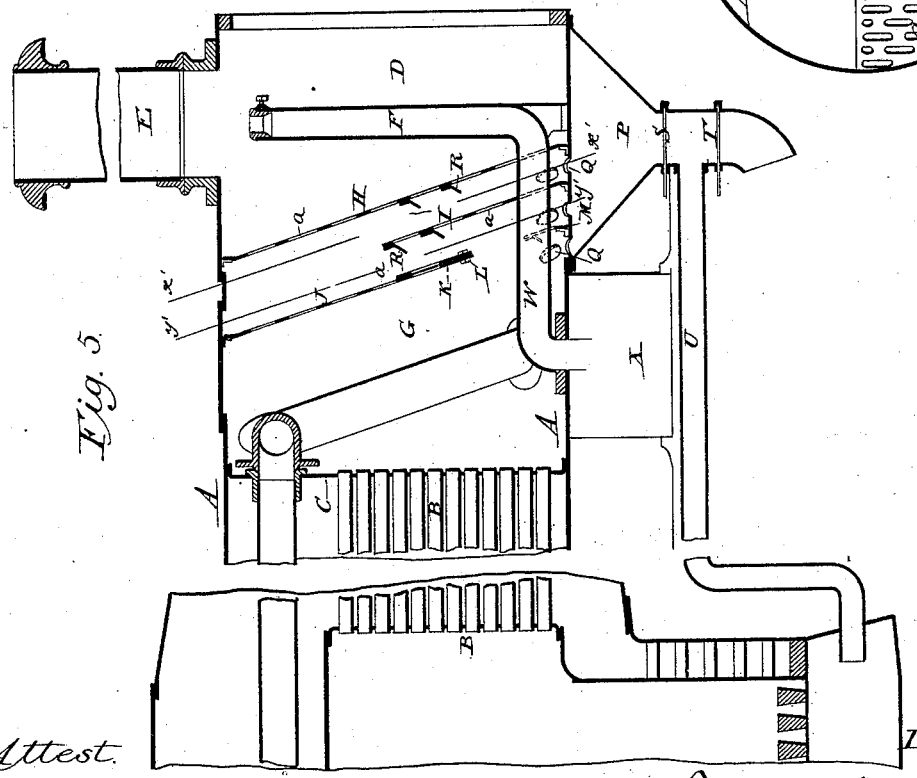

Fig. 5.

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UNITED STATES PATENT OFFICE.

FREDERICK MERTSHEIMER, OF DENVER, COLORADO, ASSIGNOR OF ONE-HALF TO ISAAC H. CONGDON, OF OMAHA, NEBRASKA.

SPARK-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 302,513, dated July 22, 1884.

Application filed December 28, 1883. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK MERTSHEIMER, of Denver, in the county of Arapahoe and State of Colorado, have invented certain Improvements in Spark-Arresters, of which the following is a specification.

The object of this invention is to provide an efficient means for arresting and detaining sparks and cinders, and at the same time to improve the draft and permit the employment of a straight or cylindrical smoke-stack.

The invention is also advantageous in that it may be applied without the necessity of elongating or enlarging the boiler, if desired, or, on the other hand, applied to existing boilers by building a chamber or extension upon their forward ends.

The invention relates to a spark-arresting box or chamber formed between the forward tube-sheet and the ordinary smoke-box at the front of the boiler, and provided with a series of deflecting-plates or spark-arresters, as hereinafter explained in detail. It also relates to a hopper or receptacle at the lower side of the boiler to receive the accumulated ash and cinders, the hopper being provided with an outlet-valve at the bottom, and also connected with a flue or conductor returning to the fire-box.

The accompanying drawings represent my invention in two forms—first, in a boiler of ordinary length, and, second, in a boiler which has been elongated for the purpose.

Referring to the accompanying drawings, Figure 1 represents a longitudinal vertical section through a locomotive-boiler of otherwise ordinary construction provided with my improvement. Fig. 2 is a view looking backward into the forward end of the boiler, the steam-pipes being removed to expose the other parts to view. Figs. 3 and 4 are vertical cross-sections on the lines $x\ x$ and $y\ y$, respectively. Fig. 5 is a longitudinal vertical section of a boiler, the forward end of which has been extended to receive my improved devices. Fig. 6 is a view looking backward into the end of the boiler, the steam-pipes being omitted. Figs. 7 and 8 are vertical sections on the lines $x'\ x'$ and $y'\ y'$, respectively.

Referring to Figs. 1 to 4, inclusive, A represents the body or shell of the boiler; B, the ordinary smoke tubes or flues; C, the forward tube-sheet, in which the ends of the tubes are secured in the ordinary manner; D, the usual smoke-box in the forward end of the boiler; E, the smoke-stack opening from the top of the chamber, and G the spark-arresting chamber located between the smoke-box and tube-sheet.

In boilers of the ordinary construction the rear or inner wall of the smoke-chamber is formed by the tube-sheet; but in my improved boiler the tubes are reduced in length at the forward end to admit of the tube-sheet C being set backward away from the smoke chamber or box D a sufficient distance to produce the intermediate spark-arresting chamber. The smoke-box D and the spark-arresting chamber are separated from each other by means of an upright partition-plate, H, which fills the boiler transversely. This plate, which may be riveted or otherwise secured firmly in place, is preferably given a slight inclination forward toward its lower edge, as represented in Fig. 1, in order that it may deflect the cinders and solid matters downward. It is provided, as represented in Figs. 1 and 2, with numerous perforations, *a*, which are preferably elongated, as shown, in a vertical direction. These openings may be modified in size; but in practice it is found that openings of five-eighths by one-eighth of an inch give good practical results.

Within the spark-chamber G, a short distance in rear of the forward plate, H, I secure a second upright plate, I, extending upward a greater or less distance, as circumstances may require, and in rear of this plate I secure a third plate, J, extending downward from the top of the spark-chamber to a point below the upper edge of the plate I. The plates I and J are each provided with numerous perforations similar in size and form to those in the upright partition-plate H. The plate J is also preferably provided with an adjustable extension-plate, K, perforated in like manner therewith, and secured thereto by means of bolts L, mounted in slots, as represented, this construction permitting the plate K to be raised and lowered, so as to form a continua-

tion of the plate J in a downward direction to a greater or less extent, as circumstances may render advisable.

In the lower part of the spark-chamber, preferably in line with the plate J, I secure a transverse inclined plate, M, which is usually left solid, although it may be perforated, if desired. To this plate M, I secure by bolts N a vertically-adjustable plate, O, which may be raised to form an upward extension thereof, so as to vary the width of the opening between the plates J and M.

It will be perceived that the arrangement of plates is such that the smoke and products of combustion are compelled to pursue a serpentine course, passing downward below the plate J, thence upward between the plates J and I, and finally forward through the plate H into the smoke-box D, from which they escape through the stack. The cinders and other solid matters driven forward by the force of the blast strike upon and are arrested by the plates, which have the effect of arresting their momentum and causing them to be deposited at the bottom of the boiler.

For the purpose of receiving the accumulated ash and cinders, I secure beneath the boiler a hopper or receptacle, P, which communicates by openings Q with the spark-chamber between each plate and the next. These openings permit the solid matters on falling to the bottom to escape at once from the boiler, so they will not obstruct the draft or be in danger of being again taken up and carried out by the force of the blast. Inasmuch as the chamber P communicates with the boiler through the openings of restricted size, the blast has practically no tendency to take up the solid matters, or to keep the same in a constant state of agitation, as would be the case were the hopper left wholly uncovered at the top.

For the purpose of insuring the arrest of the solid matters, I propose to provide the plates H and I on their rear faces with transverse downwardly-inclined flanges or lips R, as represented in Fig. 1. These lips will serve to retard the solid matters and to avoid the danger which might otherwise exist of their being driven by the blast through the openings in the plates.

For the purpose of discharging the ash and cinders from the hopper P, I provide the same at the bottom with two valves, S and T, located one above the other, so that when both are open the material may be delivered from the bottom of the hopper to the ground, or into a suitable receptacle below. From the space between these valves S and T, I extend a pipe, U, backward to the fire-box, usually above the grate, so that by opening the valve S and leaving the valve T closed the ashes or cinders may be caused to pass through the pipe U to the fire-box. If the valve S be left open, a continuous circulation will occur through the openings Q, hopper P, and pipe U from the forward end of the flues to the fire-box, so that burning coals and cinders will be at once returned to the fire-box.

It will be understood that by reducing the length of the flues and setting the tube-sheet backward beyond its usual point, as above described, I reduce the heating-surface of the boiler; but in practice I have found that when the boiler is constructed as shown, I am enabled to use a stack having a straight or cylindrical form, which offers little or no resistance to the escape of the blast, and that also I am enabled to use a longer or higher blast-tube, F, and thus to maintain a draft so far superior to that of ordinary boilers as to fully compensate for the reduction in the length of the flues. The construction is also advantageous in that it permits the ready escape of the exhaust-steam, thus avoiding the back-pressure in the cylinders which frequently occurs in engines of ordinary construction.

Referring now to the construction represented in Figs. 5 to 8, it will be found substantially identical with that represented in the preceding figure, the main difference being that the flues are made of the usual length and the tube-sheet located in the usual place, the forward end of the boiler having an extension built thereon to form the smoke-box and receive the stack. What was originally the smoke-box becomes, under this alteration, the spark-chamber, to receive the perforated plates, which are arranged in the same manner as in Fig. 1. When this alteration is made, it also becomes necessary to move the blast-tube F forward beneath the smoke-stack and connect the same through an intermediate pipe, W, with the exhaust-ports from the cylinders. In this construction the hopper P is necessarily thrown forward in advance of the cylinders X, instead of being located in rear of the same, as in the first-described construction.

Having thus described my invention, what I claim is—

1. In a tubular steam-boiler, the combination of a smoke-box located at the extreme forward end of said boiler, and provided with a smoke-stack at its top, a spark-arresting chamber located between the smoke-box and tube-sheet, the series of spark arresting or deflecting plates located in the spark-arresting chamber, and the hopper or receptacle in the lower side of said chamber, to receive the cinders, ashes, &c.

2. In a locomotive-boiler, the combination of a smoke-box located at the forward end and provided with a stack, a spark-arresting chamber located between the tube-sheet and smoke-box, an inclined partition-plate located between the smoke-box and spark-chamber, and overlapping deflector-plates located within the spark-chamber, substantially as described, whereby the smoke and products of combustion are compelled to pursue a serpentine course before reaching the forward plate.

3. In a steam-boiler, the combination of a

smoke-box located at the forward end and provided with a stack, a spark-arresting chamber located between the tube-sheet and smoke-box, and connected with the latter by restricted openings, a series of deflector-plates mounted within the spark-chamber, a hopper or receptacle located at the base of the spark-chamber, and a tube or conductor leading from said hopper to the fire-box.

4. In a locomotive-boiler, the combination of the smoke-box located at the forward end and provided with a stack, a spark-arresting chamber located between the smoke-box and tube-sheet, a hopper or ash-receptacle, and a conductor leading from said hopper to the fire-box.

5. In combination with the spark-arresting chamber, the hopper or receptacle, the two valves S and T, and the conductor U, extending from the space between the valves to the fire-box.

6. In a locomotive-boiler having the smoke-box at the forward end, the plates H, I, and J, arranged as described, and provided with the elongated openings.

7. In a locomotive-boiler, the smoke-box located at the forward end, and provided with the stack, in combination with a spark-arresting chamber located between the smoke-box and tube-sheet, and inclined spark-arresting plates provided with openings and with inclined lips or flanges R.

8. In a locomotive-boiler, a smoke-box, a spark-chamber in rear thereof provided with spark-arresting devices, and a hopper or receptacle, P, located beneath the spark-chamber, and communicating therewith by restricted openings, substantially as described, whereby the blast from the flues is prevented from agitating and carrying away the contents of the hopper.

9. In a locomotive-boiler, the combination of a smoke-chamber at the forward end, a cylindrical stack at its top, a blast-tube, F, extending upward beneath the stack to a point at or near the top of the boiler, and spark-arresting plates located between the smoke-chamber and tube-sheet, substantially as described, whereby a powerful blast may be applied without causing the discharge of the burning cinders or coals.

FREDERICK MERTSHEIMER.

Witnesses:
A. T. WILKINS,
J. H. EGBERT.