

(No Model.)

W. KING.
DIAPHRAGM FOR BOILERS.

No. 510,347.

Patented Dec. 5, 1893.

Fig 1

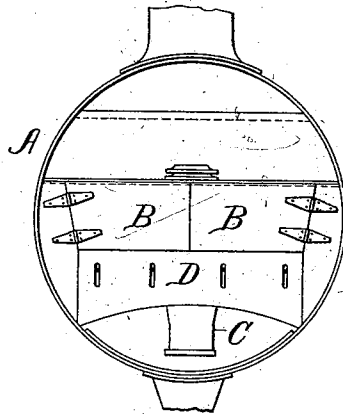
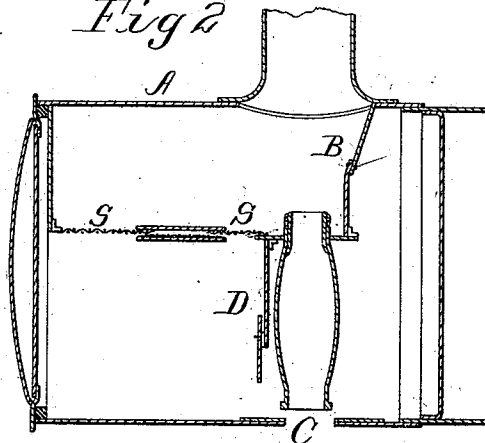


Fig 2



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM KING, OF OTTAWA, CANADA.

DIAPHRAGM FOR BOILERS.

SPECIFICATION forming part of Letters Patent No. 510,347, dated December 5, 1893.

Application filed July 27, 1893. Serial No. 481,629. (No model.) Patented in Canada June 9, 1893, No. 43,184.

To all whom it may concern:

Be it known that I, WILLIAM KING, locomotive-engineer, a subject of the Queen of Great Britain, residing at Ottawa, in the county of Carleton and Province of Ontario, Canada, have invented certain new and useful Improvements in Diaphragms for Locomotive and other Boilers, (for which I have received Canadian Letters Patent No. 43,184, dated June 9, 1893,) of which the following is a specification.

Reference is made to the accompanying drawings in which—

Figure 1 is a cross section of the smoke box of a locomotive boiler showing my invention in place. Fig. 2 is a longitudinal section of the smoke box or chamber of a locomotive boiler embodying my invention.

My invention relates to the diaphragm plate which is placed in the smoke box of steam boilers in which it is necessary to have a forced draft, and especially in locomotive boilers.

The object of my invention is to regulate the passage of the smoke and heated gases from the fire box through the boiler tubes and smoke box, in such a manner that the draft shall be evenly and uniformly drawn through the fire over the whole extent thereof and evenly distributed through all the tubes of the boiler. By its use the air is compelled to pass through the whole bed of fuel and is not drawn forcibly at the sides of the fire box as is the case in boilers not provided with my invention. Combustion is even all over the fire box and the fuel is as thoroughly consumed in the center as it is at the sides. A great saving in fuel is thus effected and coal of a low class can be used to advantage and without impairing the efficiency of the engine or filling the smoke box with cinders. The fuel is in fact thoroughly consumed in the fire box itself. Very few cinders are formed and only rarely are any discharged through the smoke stack. All the tubes of the boiler are heated to the same degree. Unequal strain upon the tubes resulting from frequent expansion and contraction is avoided and leaky tubes and the difficulties which now arise from them are entirely obviated. Owing to the thoroughly heating of all the tubes

steam is quickly and economically generated and the efficiency of the boiler enormously increased.

With my invention it is no longer necessary to diminish the size of the nozzle on the exhaust pipe for the purpose of increasing the draft. The use of a small exhaust nozzle while necessary with the present diaphragm to make steam where a heavy grade is to be ascended by a large train, increases greatly the consumption of fuel; and the back pressure under a strongly forced draft frequently impairs the working of the engine at a time when the utmost efficiency is desired. So thorough is the combustion secured by my invention and so vastly does it increase the steaming qualities of the boiler that the nozzle used with the ordinary diaphragm may be considerably enlarged and the working powers of the engine greatly increased. Heavy grades may be thus ascended without waste of fuel, the engine all the time steaming well.

In the drawings A A represent the shell of the smoke box of a modern locomotive.

C is the exhaust pipe. S S the wire netting to prevent the cinders from passing into the smoke stack.

B B are the doors in the diaphragm plate as usually constructed and D is the diaphragm plate constructed according to my invention.

In the boilers now in use there are various kinds of diaphragm plates. In some the whole plate is in one piece plain or perforated but it is usual to have the upper part divided and hinged as shown in drawings to give access to fore end of boiler and facilitate the cleaning and repairing of the tubes. The lower part of the diaphragm plate is usually detachable and so arranged that it may be adjusted at different heights by means of slots and bolts, so that the draft may be in some measure regulated to suit the fuel and the purposes for which any particular boiler is utilized. The plate so bolted on the doors B B is now made with the top and bottom parallel, and owing to the fact that the exhaust pipe largely checks the draft in the center the smoke and heated gases accumulate in the center and have a free passage only

at the sides. As a natural consequence the gases are drawn with greatest force through the tubes at the sides of the boiler and from the sides of the fire box. Cold air is thus
 5 drawn in, the tubes suffer from unequal expansion and contraction and the fire burns unevenly and it is impossible to do effective work without great waste of fuel and subjecting the boiler to severe strain. I obviate
 10 all these inconveniences and secure the results above stated by cutting away from the lower side of the ordinary diaphragm plate a circular, elliptical or otherwise curved segment thereof, varying in height at the center
 15 from five to seven inches according to the nature of the fuel to be consumed, refractory fuel requiring a greater draft. The check which the air forced through the boiler receives in consequence of the exhaust pipe
 20 blocking the way, is thus compensated for, and the gases flow equally through all the tubes of the boiler and the fuel is thoroughly consumed with the effects stated. While an elliptical, circular or other curved form is
 25 preferable, a plate with a triangular or rhomboidal segment cut from it, highest in the center, and tapering to the sides or one with its lower edge of broken or irregular lines in any way approximating in the whole a curve,
 30 would have similar but not equal results.

I make no claim to the manner in which the plate is shown adjusted in the drawings. While such a method is convenient when doors are placed in the diaphragm other methods of securing my invention in place may
 35 be adopted. Instead of an adjustable plate bolted to the upper portion of the diaphragm, the whole plate may be made in one piece and bolted to the screen or to the shell of the

smoke box in any manner which will secure it in place, and permit of its removal. I accordingly make no claim to the form of the doors B B or to any method by which such doors, or plate filling the functions which they do, are placed in or attached to a smoke
 40 box of a steam boiler. Nor do I claim the particular method in which the plate D is shown connected with the remaining portion of the plates B B, nor a diaphragm having a straight lower edge; but
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What I do claim as my invention, and desire to secure by Letters Patent, is—

1. In combination with the smoke box, a diaphragm the lower side of which is concaved by having cut from it a circular elliptical or otherwise curved segment, or a segment of triangular, rhomboidal, or other outline approximating a curve, substantially as shown and described.
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2. In combination with the smoke box and the exhaust nozzle, a diaphragm having its lower edge cut away opposite said nozzle to compensate for the space occupied by the exhaust nozzle all substantially as shown and described.
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3. In combination with the smoke box a diaphragm located therein and curved on its lower edge substantially as shown and described.
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In testimony whereof I have signed, at the city of Ottawa aforesaid, in the presence of the undersigned witnesses, this 21st day of July, A. D. 1893.
 70

WILLIAM KING.

Witnesses:

MARGARET MCKAIN,
 A. SEYMOUR RATHBONE.