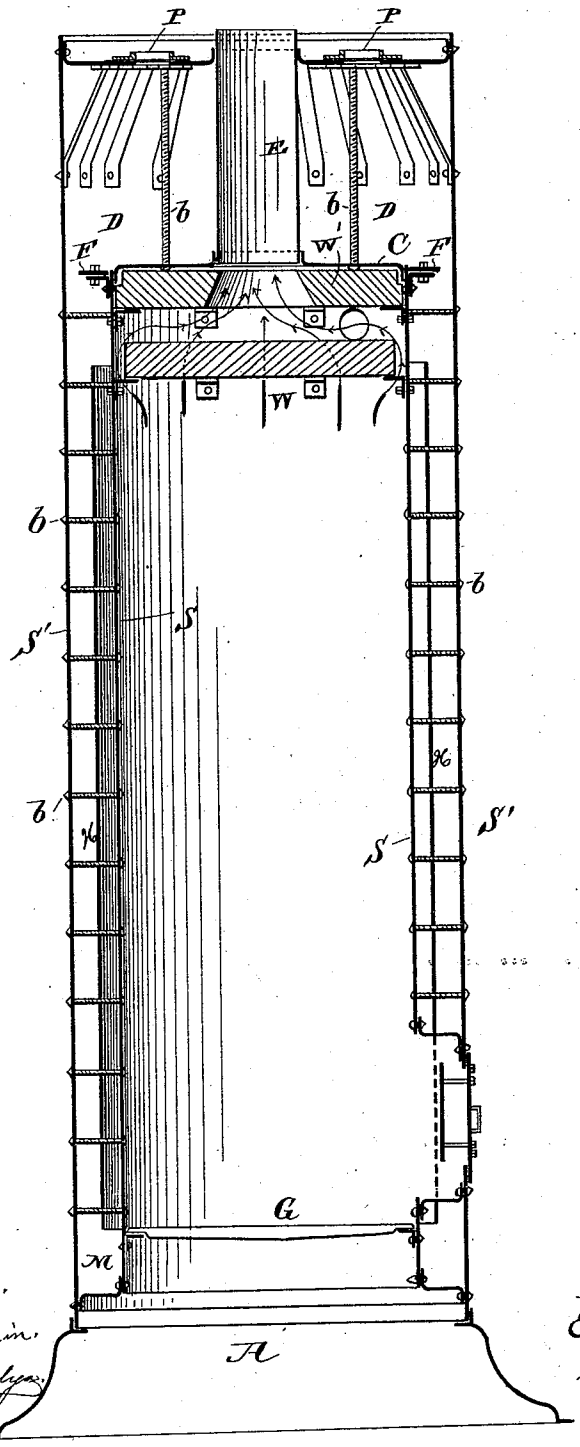
(No Model.)

# E. F. EDGAR.

## STEAM BOILER.

No. 478,320. Patented July 5, 1892.

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# UNITED STATES PATENT OFFICE.

ELLIS F. EDGAR, OF WOODBRIDGE, NEW JERSEY.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 478,320, dated July 5, 1892.

Application filed May 10, 1892. Serial No. 432,475. (No model.)

*To all whom it may concern:*

Be it known that I, ELLIS F. EDGAR, a citizen of the United States of America, and a resident of Woodbridge, in the county of Middlesex and State of New Jersey, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification, reference being had to the accompanying drawing, forming part of the same, in which the single figure is a central vertical sectional view of a boiler embodying my improvements.

The object of my invention is to provide rapid circulation in the boiler, thereby increasing its efficiency, to eliminate undue moisture from the steam, and to lessen the cost of maintenance by preventing the formation of scale and the undue heating of one part more than another.

The boiler consists of an interior shell S, an exterior shell S′, a crown-sheet C, grate G, stay-bolts *b*, heat-accumulator walls W and W′, (these walls are here supported by side lugs, but in very large boilers it may be necessary to provide center supports,) ash-pit A, steam-dome D, draft-exit E, steam outlets or ports P, spatter-plate or fender F, and circulating plate or diaphragm H; and the novelty herein sought to be secured is in the construction and arrangement of the said circulating-diaphragm and spatter-plate—one or both—which may sometimes be used in other forms of boilers than that shown. This circulating-diaphragm, first, while circular to conform to the shape of this boiler, is straight lengthwise from end to end, a point of great importance; second, it is open at the top, and, third, it extends down to about the level of the grate. It also usually extends upward to about the water-level of the boiler.

The spatter-plate is arranged to project from the shell of the boiler to or beyond the line of the upper end of the circulating-diaphragm. Here it consists of a ring having an interior diameter similar to the diameter of the interior shell of the boiler and secured to lugs riveted to said exterior shell.

I prefer to use the circulating-plate shown; but the spatter or priming plate F is equally useful with circulating-plates which do not possess all the peculiarities of the one described.

The operation is as follows: The boiler being supplied with water, fire is supplied upon the grate and an intense heat is created, (especially if the boiler in other respects than those specially noted be as herein shown.) The water in contact with the interior shell is rapidly heated, particles of steam are formed, and both heated water and steam tend to rise in the space between the diaphragm and the interior shell, (a space preferably narrower than that between said diaphragm and the exterior shell.) The diaphragm being straight lengthwise, there is nothing to interfere with this movement of the steam and water and it becomes and is much more rapid and the steam is freed more readily and quickly and with less chance of condensation before reaching the steam-dome than if the diaphragm had turns or bends in its length, which, as is manifest, is the path of the circulating water. The water in its rapid rise, however, would be liable to be projected into the steam-dome and cause the steam issuing from the outlets to be moist if there were nothing to prevent such action, and for that purpose I have provided the spatter-plate extending over the rising water between it and the steam-dome, but sufficiently above the upper edge of the diaphragm to insure that it will not prevent the passage of water over that edge and into the other or return passage of the circulating water. The steam rapidly passes around the edge of this spatter-plate and into the steam-dome; but the water cannot so easily take a circuitous upward course, and, striking the spatter-plate, falls backward and passes down between the diaphragm and the outer shell to supply the place of that which entered between the lower end of the diaphragm and the interior shell and took the place of the water, which, being first heated, had moved upward and now falls back outside. The result is a very efficient circulation and very dry steam. Again, while such rapid circulation takes place particles of matter cannot readily attach themselves to the boiler-shells, but, if in the inner space, are carried up and over the diaphragm and into the outer space, passing down which they naturally gravitate to the mud-leg M of the boiler, from which they may be blown out by ordinary means. This prevention of incrustation not only insures that the water will be

more rapidly heated and steam more rapidly and regularly generated, but it increases the life of the boiler by preventing the burning of the boiler, which is very liable to take place at any point where the shell has been to any extent incrusted. It is on this account that I extend the diaphragm down to the level of the grate.

A boiler, like a chain, is only as strong as its weakest point, and if the diaphragm should end any considerable distance above the grate-level then there would be a space between the level of said lower end and the grate-level, where there would be dead-water. Over this space incrustation might take place, and nevertheless here the shell has as great temperature as at almost any point, the result of which would be incrustation and burning, which would weaken the boiler, and, regardless of the fact that it might be prevented higher up, the shell would be spoiled and a new boiler or repairs needed much sooner than if protected as I have described.

Below the fire the burning is not liable to take place, and the space for dead-water to permit impurities to settle, as in a mud-leg, is located there, where dead-water can do no harm, but rather be a benefit.

What I claim, and desire to secure by Letters Patent, is—

In a boiler, the combination of a circulating-plate located between the inner and outer shells of the boiler and open at both ends, and a spatter-plate located so far or farther above the upper end of the circulating-plate as the width of the space between the circulating-plate and the interior shell and extending from the shell of the boiler to or beyond the line of the said circulating-plate and between the water (which is between said circulating-plate and the interior shell) and the steam space of the boiler, all substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 9th day of May, 1892.

E. F. EDGAR.

Witnesses:
PETER B. VERMILYA,
A. G. N. VERMILYA.