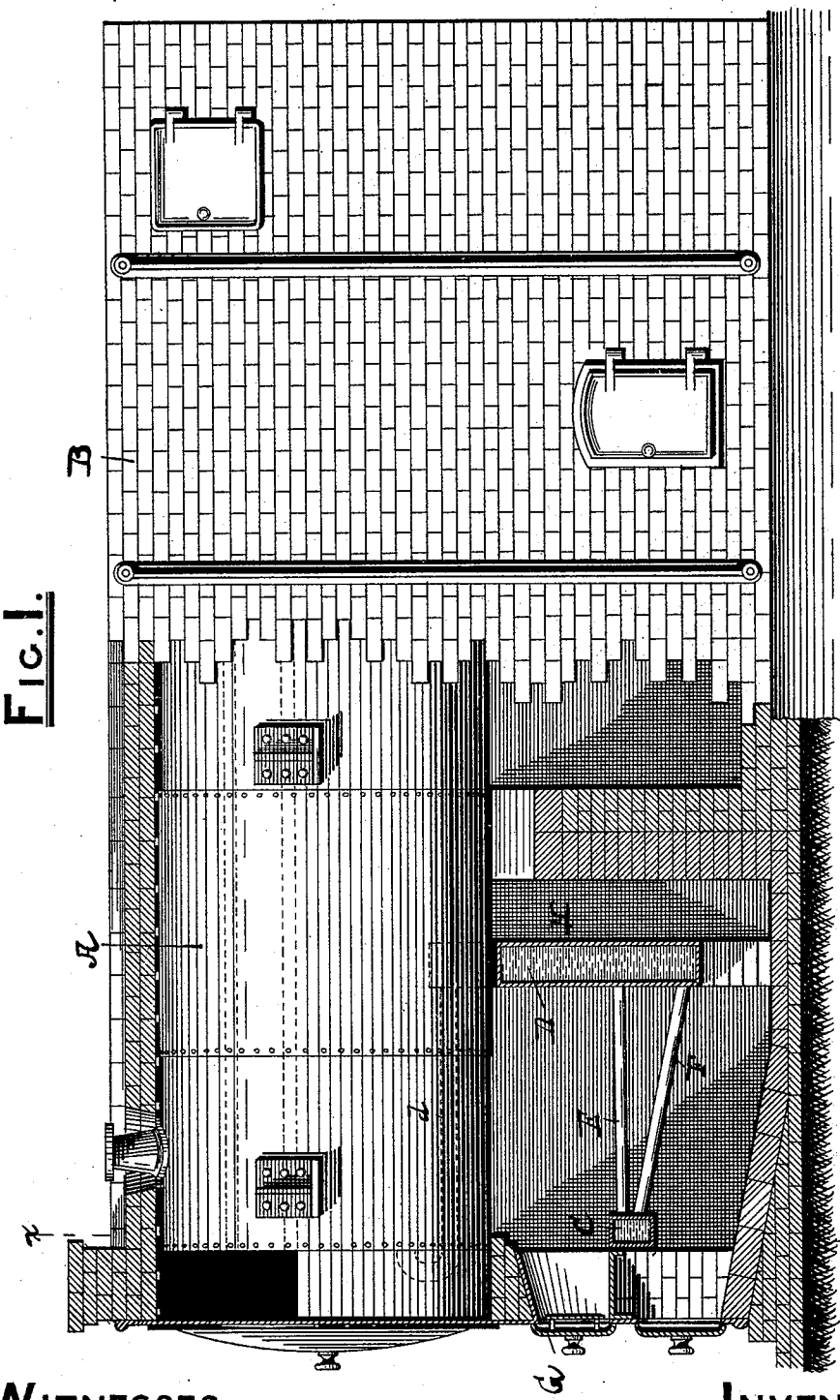
(No Model.) 2 Sheets—Sheet 1.

W. R. PARKS.

BOILER FURNACE.

No. 486,955. Patented Nov. 29, 1892.

FIG. 1.



WITNESSES.

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(No Model.) 2 Sheets—Sheet 2.

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FIG. 3.

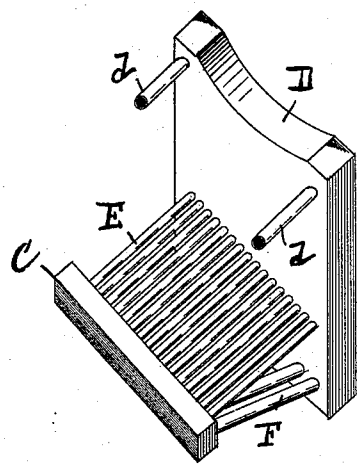
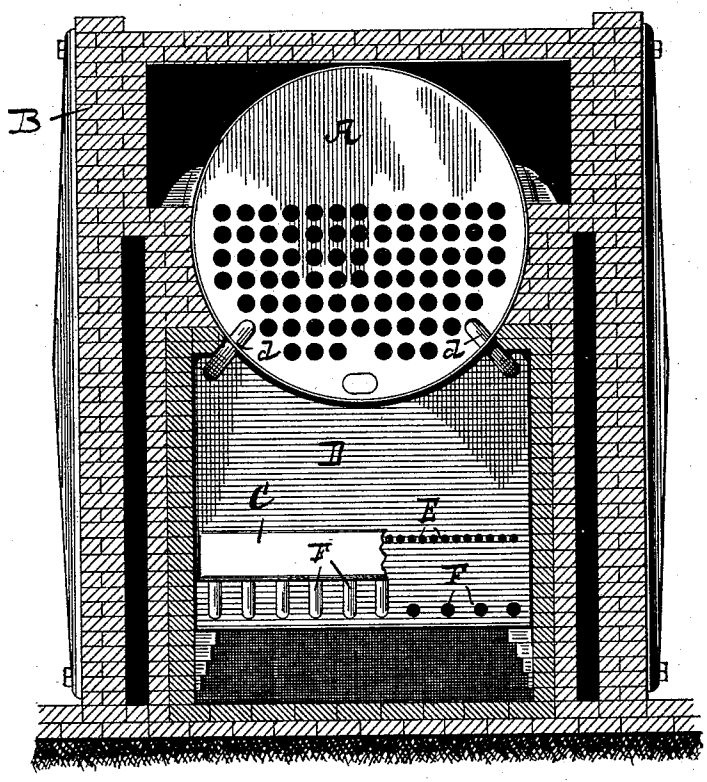


FIG. 2.



WITNESSES.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM R. PARKS, OF PALMER, MASSACHUSETTS.

BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 486,955, dated November 29, 1892.

Application filed March 7, 1892. Serial No. 423,970. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM R. PARKS, a citizen of the United States, residing at Palmer, in the county of Hampden and State of Massachusetts, have invented a new and useful Improvement in Boiler-Furnaces, of which the following is a specification, reference being had to the accompanying drawings, forming part thereof.

My invention relates to that class of boiler-furnaces known as "downward-draft furnaces," in which the air necessary to promote combustion is admitted above the fuel on the grate and a lateral and downward draft is maintained, whereby all the gases from the fuel are compelled to pass downwardly through the hot fire upon the grate, and a great economy in fuel and entire freedom from smoke are secured.

The principal object of my invention is to improve and simplify the construction of the water-grate, which is essential to a downward-draft furnace, in order that it may be more readily applied to boilers now in use.

To this end my invention consists in an independent water-grate for boiler-furnaces composed of a water-front, a water-back, a series of grate-tubes extending between the same, and one or more circulating-tubes also extending between said parts beneath said grate-tubes, the whole being so constructed and arranged that the water-grate can be readily applied to existing furnaces, as hereinafter fully described, and particularly pointed out in the claims.

Referring to the drawings, in which like letters designate like parts in the several views, Figure 1 is a view in side elevation of a boiler or generator having its furnaces equipped with a water-grate embodying my invention. Fig. 2 is a vertical section of the same, taken upon line *x x* of Fig. 1. Fig. 3 is a detail perspective view of the water-grate detached from the boiler.

The letter A designates a boiler of the return tubular class, it being mounted in a suitable manner and inclosed by the usual brick or other walls B.

C designates the water-front of an elongated form, as shown, and D designates the water-back, which extends upwardly to the under side of the boiler-shell to form a bridge-wall, but is independent of said shell, the said water-front and water-back being connected together by a series of water or grate tubes E, upon which the fuel used to generate the steam is placed. The water-front and water-back are also connected by one or more circulating-tubes F, arranged beneath the grate-tubes E so that a constant circulation of water may take place between the water-front and water-back through said grate and circulating tubes. Either the water-front or water-back, or both, will be connected with the boiler A, and in the example shown I have illustrated the water-back D as being so connected with the interior of the boiler-shell by means of tubes or pipes *d*, which are represented as extending forwardly beneath the boiler-shell, then passing upwardly through the extended part thereof, which forms the usual chamber or uptake at the front end of the boiler, and are then turned inwardly through the front tube-sheet into the boiler-shell, as clearly shown in the drawings. By means of these pipes a constant circulation of water is maintained between the boiler and the water-front and water-back and through the grate and circulating tubes.

The fuel will be delivered upon the grate-tubes E through a suitable door G, and when ignited the products of combustion will pass downwardly through the grate and circulating tubes, beneath the water-back D into the combustion-chamber H, thence along beneath the boiler-shell in the usual manner, and back through the tubes in the boiler to the uptake at the front end thereof.

The gases from the fuel placed upon the fire will become thoroughly consumed in passing through the hot fire upon the grate-tubes in a downward direction, thereby insuring the greatest economy in fuel and entire freedom from smoke.

It will be seen by reference to the drawings that the water-front and water-back, independent of any boiler-shell, with their connecting grate and circulating tubes, which together constitute this invention, may be placed in the combustion-chamber of any furnace originally constructed for an updraft and said furnace converted into a downward-draft furnace, and this without making it necessary to cut the shell of the boiler.

The pipe or pipes connecting the water-back or the water-front with the boiler may be most easily connected through the front tube-sheet, as herein shown.

I do not wish to limit myself to the particular shape or relative dimensions of the water-front and water-back herein shown, nor to the particular arrangement of the connecting-tubes, as various modifications therein can be made within the spirit of my invention.

I am aware that boiler-furnaces have heretofore been devised in which grate-tubes connected at their front end with a water-front and at their rear end with a water-leg depending from the boiler are employed. I am also aware that in one instance both grate and circulating tubes connected at their front end to a water-front and at their rear end to a water-leg depending from and forming part of a water-jacket surrounding the boiler and its furnace have been devised, such instance being found in Letters Patent No. 459,435, granted September 15, 1891, to James F. Bliss. My invention differs materially, however, from either of these constructions in that the water-grate devised by me, composed of the independent water-front, water-back, and intermediate grate and circulating tubes, is complete in itself, forming an independent article of manufacture and sale, and is ready to be applied to the furnace of any steam-boiler without change, whereas in said previous constructions the depending water-leg is in the one case an integral part of the boiler itself and in the other case forms part of an inclosing water-jacket, and the water-grate is not a separate and independent structure, as is the one devised by me.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. An independent water-grate for boiler-furnaces, composed of a water-front, a water-back, a series of grate-tubes extending between said water-front and water-back, one or more circulating tubes also extending between said parts beneath said grate-tubes, and a connection by which said water-grate can be placed in communication with the boiler, substantially as described.

2. The combination, with a return tubular boiler and its furnace, of an independent water-grate located within the combustion-chamber of said furnace, said water-grate consisting of a water-front, a water-back, and a series of grate and circulating tubes connecting said parts together, as described, and a pipe or pipes leading from said water-back and entering the boiler through the front tube-sheet thereof, substantially as set forth.

3. The combination, with a boiler-furnace and boiler, of an independent water-grate located within said furnace, said water-grate being composed of a water-front which is suitably supported at the front end of the furnace between the fuel-inlet and ash-outlet openings of the latter, a water-back which forms the rear wall of the combustion-chamber and extends to but is independent of the boiler, a series of substantially-horizontal grate-tubes connecting said water-front and water-back with each other, a series of circulating tubes extending between the water-front and water-back below said grate-tubes and standing at an acute angle to the latter, and a pipe or pipes connecting said water-back with the boiler, substantially as set forth.

WILLIAM R. PARKS.

Witnesses:
W. H. CHAPMAN,
J. E. CHAPMAN.