(No Model.)

W. R. PARKS.

BOILER FURNACE.

No. 524,296. Patented Aug. 7, 1894.

Fig 1.

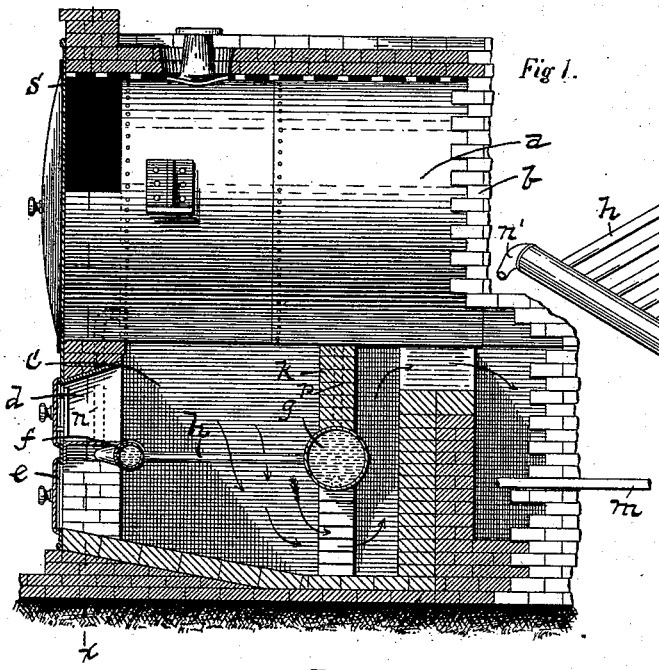


Fig 3.

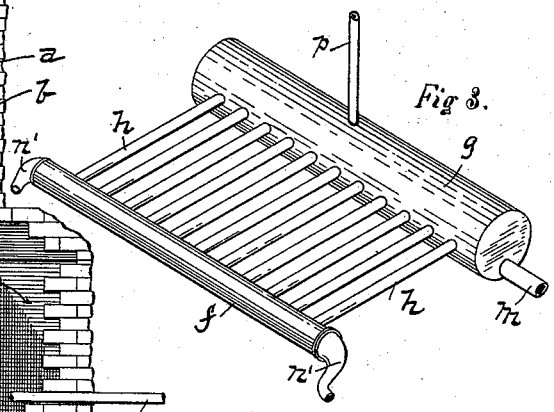


Fig 2.

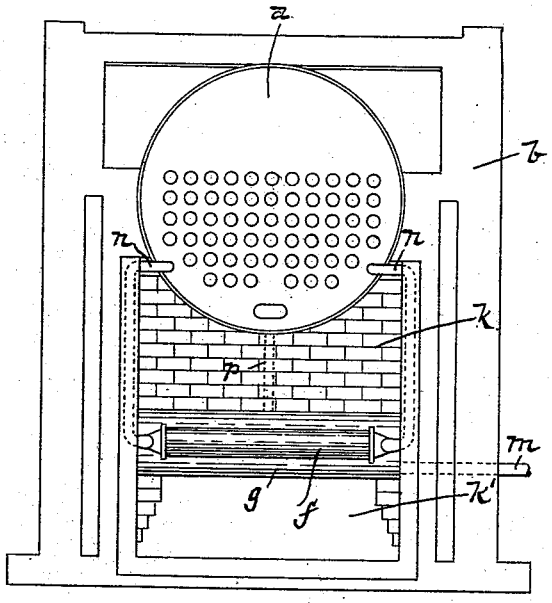
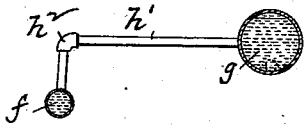


Fig 4.



WITNESSES:

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WILLIAM R. PARKS, OF PALMER, MASSACHUSETTS.

BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 524,296, dated August 7, 1894.

Application filed July 13, 1893. Serial No. 480,332. (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 "downward draft" furnaces for boilers, in which the current of air for promoting combustion passes downwardly through the fuel on the grate, thereby compelling the gases generated by combustion to pass through the hot fire on the grate, and securing a material economy in fuel and freedom from smoke.

The object of the invention is to provide an improved form of water grate for such furnaces, and to provide means whereby the feed-water is compelled to pass through said grate on its way to the boiler, thereby greatly expediting the action of the boiler in generating steam and lessening the amount of fuel required therefor.

To this end, my invention consists in the boiler furnace constructed and operating 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 side elevation, partly in vertical section, of a portion of a steam boiler having its furnace equipped with a water-grate embodying the invention. Fig. 2 is a vertical section of the same, taken upon line *x*—*x* of Fig. 1. Fig. 3 is a view in perspective of the water-grate detached. Fig. 4 is a sectional view of a grate of a slightly modified form.

The letter *a* designates a steam boiler of the return-tubular type, which is, or may be, surrounded by the usual brick or other walls *b*, and is provided at its front end with the usual combustion chamber *c* and with the fuel inlet *d*, communicating with said chamber above the water-grate presently to be described, and the outlet *e* for ashes, below said grate.

The water-grate devised by me is composed of a water-front *f*, a water-back *g*, and a series of tubes *h* extending between said water-front and water-back, parallel with each other, in such manner as to form a grate to support the fuel introduced within the combustion chamber through the opening *d*. As herein shown both the water-front and water-back are made of circular form in cross-section, and while I prefer to make them of such form I do not wish to limit myself thereto as their particular shape is not material to their successful operation as hereinafter described.

The water-back *g* is supported in the bridge-wall *k* about midway the height of the latter as shown, a passage or flue *k'* for the products of combustion being located in said bridge-wall beneath the water-back, the course of the products of combustion being indicated by arrows in Fig. 1. The water-front *f* is suitably supported upon the front wall of the combustion chamber, between the openings *d* and *e*, as shown.

The letter *m* designates the feed-pipe which supplies water to the boiler, said pipe leading from the source of water supply to and into the water-back *g*, preferably through one of the end-walls of the latter as shown.

The letters *n n* designate two pipes connecting the opposite ends of the water-front *f* with the boiler, said pipes passing upwardly within the front wall of the combustion chamber, as indicated by broken lines in Fig. 1, and being connected to the ends of the water-front by reducing couplings or ends *n'* of a well known form. The feed-water, on its way to the boiler, is thus compelled to pass through the water-back, through the tubes *h*, and through the water-front and the pipes *n*, and in so doing becomes heated to such an extent as to materially expedite the steam generating action of the boiler and lessen the amount of fuel required for the operation of the boiler. The connection of the water-grate with the boiler by the pipes *n*, moreover, insures a certain amount of circulation of water from the boiler, through the grate, and back to the boiler, which serves to increase the steam producing capacity of the boiler. With a view to still further facilitating such circulation of water through the grate, I prefer to connect the water-back *g* directly with the boiler by means of a pipe or tube *p*, said pipe being shown by full lines in Fig. 3 and by broken lines in Figs. 1 and 2. I thus provide for a

free circulation of water through the grate at all times whether the feed-water pipe be open or closed.

In Fig. 4 I have illustrated a slightly modified form of the water-grate, in which the tubes h' connecting the water-front with the water-back are provided with a bend and a coupling h^2 between their ends. This construction enables either of said tubes to be removed in case of a leak, and a new one inserted, without disturbing either of the other tubes or the remaining portions of the grate. The operation of this form of the water-grate is the same as that of the first described form. The continuation of the bridge-wall from the top of the water-back to the under side of the boiler compels the products of combustion to pass downwardly through the grate and through the flue or passage k', as indicated by arrows in Fig. 1, from whence they pass beneath the boiler to the rear end of the latter, and from thence to the front end of the boiler to the uptake s in a well known manner. The gases from the fuel are thus entirely consumed, thereby securing a great economy in fuel and freedom from smoke.

The water-grate herein described is adapted to be placed within the combustion chamber of any furnace whether originally designed for an up or a down draft, without making it necessary to cut the boiler shell, and when so located performs the function of the usual water-grate and also that of a feed-water heater.

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

1. A water-grate for boiler furnaces, comprising a water-front, a water-back, a series of connecting, tubular grate bars, a pipe connection between the water-front and the boiler, and means for causing the feed-water to pass through said grate on its way to the boiler, combined and operating substantially as described.

2. The combination with the shell of a return-tubular boiler, of a water-front, a water-back, a series of grate tubes extending between the same, pipe connections between the water-front and the interior of the boiler, and a feed-water pipe leading from the source of water supply to and into said water-back, substantially as set forth.

3. The combination with the shell of a return-tubular boiler, of a water-front, a water-back, and a series of intermediate grate tubes, pipe connections between both the water-front and the water-back and the interior of the boiler, and a feed-water pipe leading into said water-back, substantially as described.

4. The combination with the shell of a return-tubular boiler, of a water-front, a water-back, and a series of intermediate grate tubes, a bridge-wall extending between said water-back and the under side of the boiler shell, pipe connections between the water-front and the boiler, a pipe connection between the water-back and the boiler, and a feed-water pipe leading into the water-back, substantially as set forth.

5. The independent water-grate for boiler furnaces herein described, comprising a water-front, a water-back, and a series of grate tubes extending between the same, said tubes each having between their ends a bend and a coupling as described, whereby either of said tubes can be removed from the grate without disturbing the others, and a feed water leading into said water-back substantially as set forth.

WILLIAM R. PARKS.

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

Correction in Letters Patent No. 524,296.

It is hereby certified that in Letters Patent No. 524,296, granted August 7, 1894, upon the application of William R. Parks, of Palmer, Massachusetts, for an improvement in "Boiler-Furnaces," an error appears in the printed specification requiring the following correction, viz: In line 79, page 2, before the word "leading" the word *pipe* should be inserted; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 21st day of August, A. D. 1894.

[SEAL.]

JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:

JOHN S. SEYMOUR,
Commissioner of Patents.