

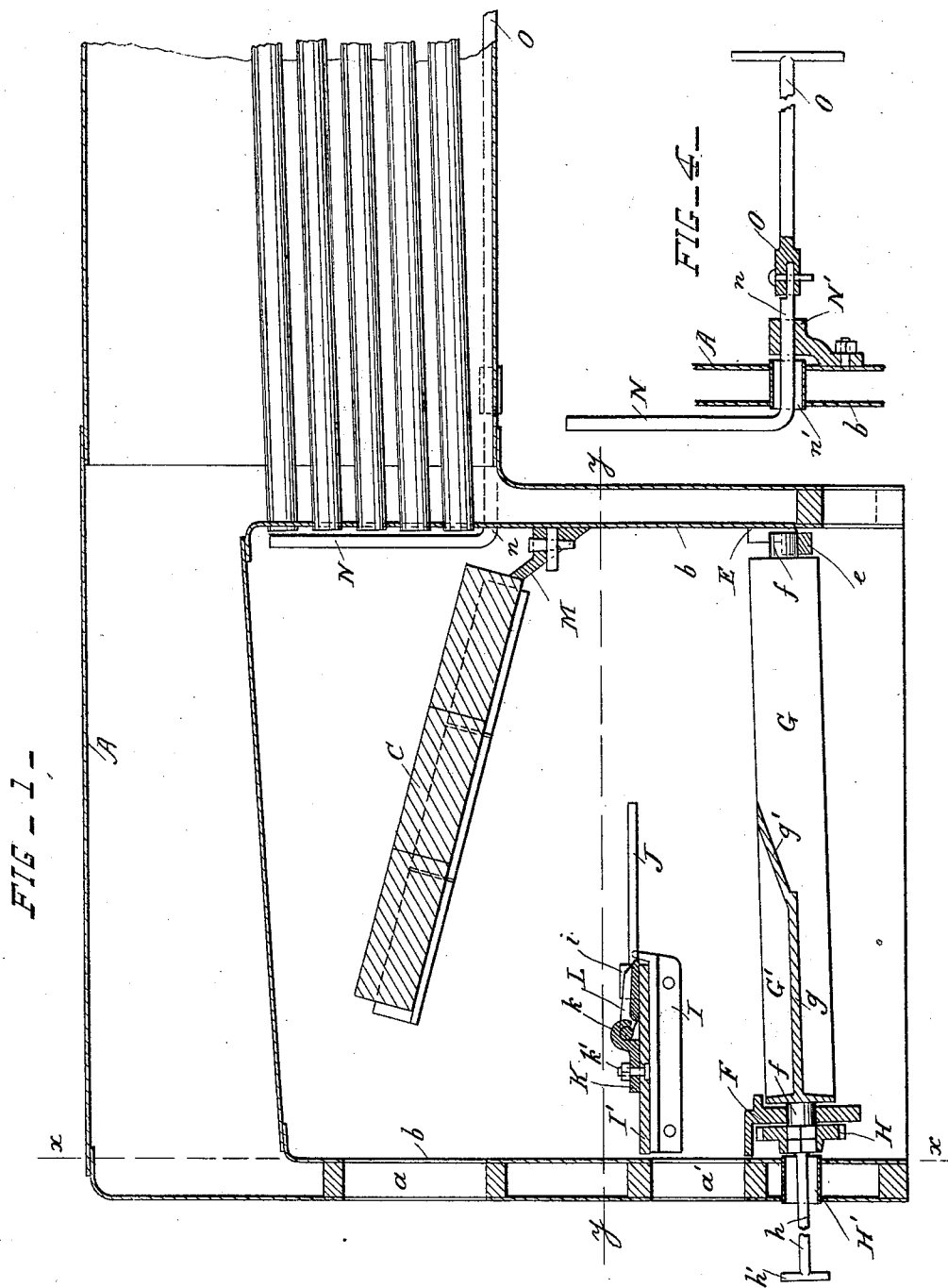
(No Model.)

2 Sheets—Sheet 1.

F. F. LANDIS.
STRAW BURNING BOILER.

No. 512,555.

Patented Jan. 9, 1894.



WITNESSES:

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FIG. 3—

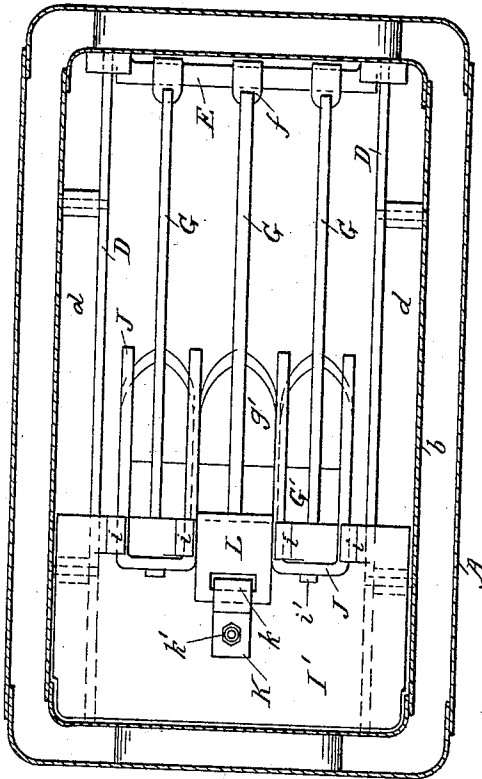


FIG. 5—

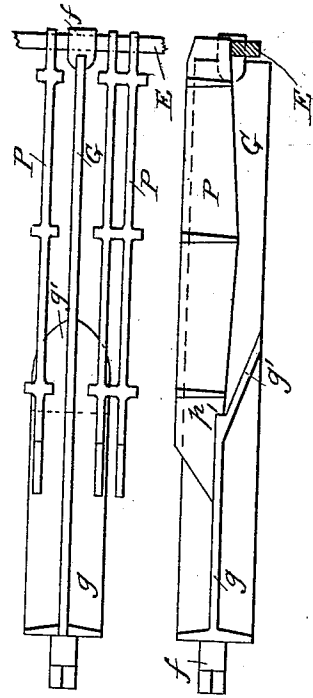
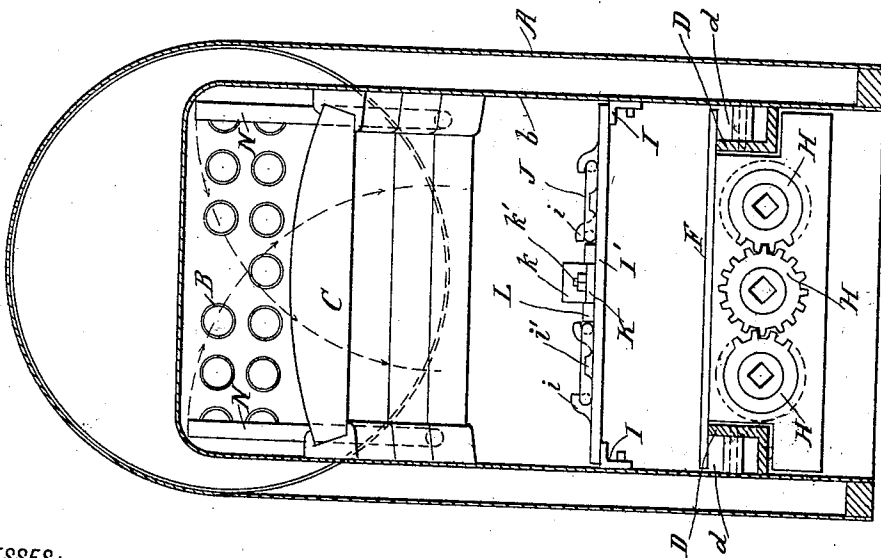


FIG. 2—



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UNITED STATES PATENT OFFICE.

FRANK F. LANDIS, OF WAYNESBOROUGH, PENNSYLVANIA.

STRAW-BURNING BOILER.

SPECIFICATION forming part of Letters Patent No. 512,555, dated January 9, 1894.

Application filed May 25, 1893. Serial No. 475,445. (No model.)

To all whom it may concern:

Be it known that I, FRANK F. LANDIS, a citizen of the United States, residing at Waynesborough, in the county of Franklin and State of Pennsylvania, have invented certain new and useful Improvements in Straw-Burning Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to boilers specially adapted to be heated by burning straw or refuse; and it consists in the novel construction and combination of the parts hereinafter fully described and claimed.

In the drawings: Figure 1 is a longitudinal section through the fire box end of a boiler constructed according to this invention. Fig. 2 is a cross-section taken on the line $x x$ in Fig. 1. Fig. 3 is a sectional plan view taken on the line $y y$ in Fig. 1. Fig. 4 is a detail side view of the slag breaker partly in section. Fig. 5 is a detail plan and side view of an inverted grate bar showing the bars for burning coal.

A is the shell of the boiler, and b is its fire-box.

B are the heating tubes.

C is the baffle plate.

An opening a is provided for feeding coal to the furnace, and a' is an opening for feeding straw to the furnace.

The furnace is fed with straw or coal according to the convenience of obtaining fuel, and all the above mentioned parts are of ordinary approved construction.

Two longitudinal bars D are secured to the side of the firebox and are provided with pockets d which are filled with fire-clay making a kind of dead-plate at the sides of the furnace.

E is a bar supported by the bars D at the rear end of the furnace and provided with bearings e .

F is a bar supported by the bars D at the front end of the furnace.

G are the reversible grate bars upon which the straw is burned in the furnace. Each of these bars is provided with the horizontal plates g at its front end and the inclined

plates g' . These plates on each two adjacent bars form the receptacles G' which have narrow openings between the plates g through which the air may pass upward from the ash pan.

The grate bars G are provided with pivots f which are journaled in the bars E and F, and the front pivots f have intergearing toothed wheels H secured upon their ends which project through the bar F. The hubs of the wheels H preferably have square holes which are forced upon the square ends of the pivots f leaving room for the insertion of the square end of a bar h provided with a handle h' . A tube H' is secured in the front of the boiler so that the square end of the bar h may be inserted into the hub of one of the wheels. The wheels are turned and the bars G are turned over simultaneously when it is required to free them of ashes and slag or to adapt the grate for burning coal.

I are brackets secured to the sides of the firebox about level with the top of the straw opening a' .

I' is a flat plate which rests on the brackets I and is provided with two pairs of lugs i at its front end.

J are looped bars which rest upon the plate I' and are slid laterally under the lugs i . The bars J project over the spaces between the grate bars and are held in position by the lugs i and by the projections i' on the plate I'. The pairs of lugs project toward the center of the plate so that the bars are slid under them in opposite directions.

K is a plate provided with a hook k and secured to the plate J' by the bolt k' . A plate L is hinged upon the hook k in the middle of the plate J'. When this plate is let down, as shown in Fig. 3, it secures the bars J in position, and the said bars are readily removed after raising the plate L.

M is a distance piece secured to the tube plate to hold the fire-bricks of the baffle plate a little distance away from the tube plate.

N is a club provided with a bent lower end n , which passes through a tube n' in the shell of the boiler, and is journaled in the bearing N' secured on the outside of the boiler. The projecting end of the club is flat on one side,

or it may be made square, to receive the end of a handle O. Two similar clubs are provided, one on each side of the fire box as shown in Fig. 2.

5 When straw is burned, the dirt and silica of the straw forms a brittle slag or glass which accumulates on the ends of the fire tubes and would stop them up if not frequently removed. The handle O is preferably made long enough
10 to project beyond the smoke-box of the boiler. The clubs are oscillated periodically by means of the handle and break away the slag from the ends of the tubes. The clubs are also moved longitudinally in the space between
15 the baffle plate and the ends of the tubes so as to pound up the adhering masses of slag. When not in use the clubs lie on the distance piece M behind the end of the baffle plate. The broken slag is carried through the tubes
20 by the draft, and accumulations of it which cannot be carried away by the blast are removed periodically by hand.

The straw which is fed through the opening a' is ignited on the bars G by means of
25 the incandescent pieces of straw which accumulate in the receptacles G'. The combustion of the straw is slow until it reaches the rear part of the furnace where it burns fiercely. The burning straw is kept down by
30 the bars J which prevent it from being carried on top of the baffle plate by the draft.

When the furnace is used to burn coal, the bars J and plate I' are removed, and the opening a' is closed so as to prevent the ingress
35 of air. The grate bars G are then inverted, as shown in Fig. 5, and short and narrow bars P are placed upon them. The rear ends of the bars P rest on the bar E, and their front ends rest on the plates g of the grate bars G.
40 The bars P are prevented from moving longitudinally by their shoulders p .

What I claim is—

1. In a straw-burning boiler, the combination with a horizontal plate supported over
45 the straw inlet opening and provided with the pairs of lugs i and the projections i' , of the projecting looped bars engaging with the said lugs and projections, and the central pivoted plate L adapted to hold the said bars in position, substantially as set forth.
50

2. In a straw-burning boiler, a club pro-

vided with a bent lower end passing through the shell of the boiler, in combination with means for oscillating the club in front of the tube plate to break away the slag from the
55 ends of the tubes, substantially as set forth.

3. In a straw-burning boiler, a longitudinally-movable and oscillating club provided with a bent lower end passing through the shell of the boiler, in combination with a handle for operating the said club, whereby the
60 accumulated slag is removed from the ends of the fire tubes, substantially as set forth.

4. In a straw-burning boiler, the grate bars provided with laterally projecting plates at
65 their front ends and having narrow openings between them, thereby forming receptacles for incandescent material adapted to ignite the incoming straw on the tops of the bars, substantially as set forth.
70

5. In a straw-burning boiler, the revoluble grate bars provided with pivots at each end and laterally projecting plates at their front
75 ends, said plates having narrow openings between them and forming receptacles for incandescent material, substantially as set forth.

6. In a straw-burning boiler, the combination with the plates supported at the ends of the firebox, of the grate-bars provided with
80 pivots journaled in the said plates and having laterally projecting plates at their front ends thereby forming receptacles for incandescent material, the intergearing toothed wheels secured on the projecting ends of the pivots, and means for revolving the said
85 wheels, substantially as set forth.

7. The combination, with the plates supported at the ends of the firebox, and the reversible grate-bars provided with pivots journaled in the said plates and having laterally
90 projecting plates at their front ends; of the narrow removable grate-bars provided with shoulders at one end and resting on the said laterally projecting plates and on the supporting plate at the back of the firebox, substantially as set forth.
95

In testimony whereof I affix my signature in presence of two witnesses.

FRANK F. LANDIS.

Witnesses:

HERBERT W. T. JENNER,
A. D. MORGENTHAU.