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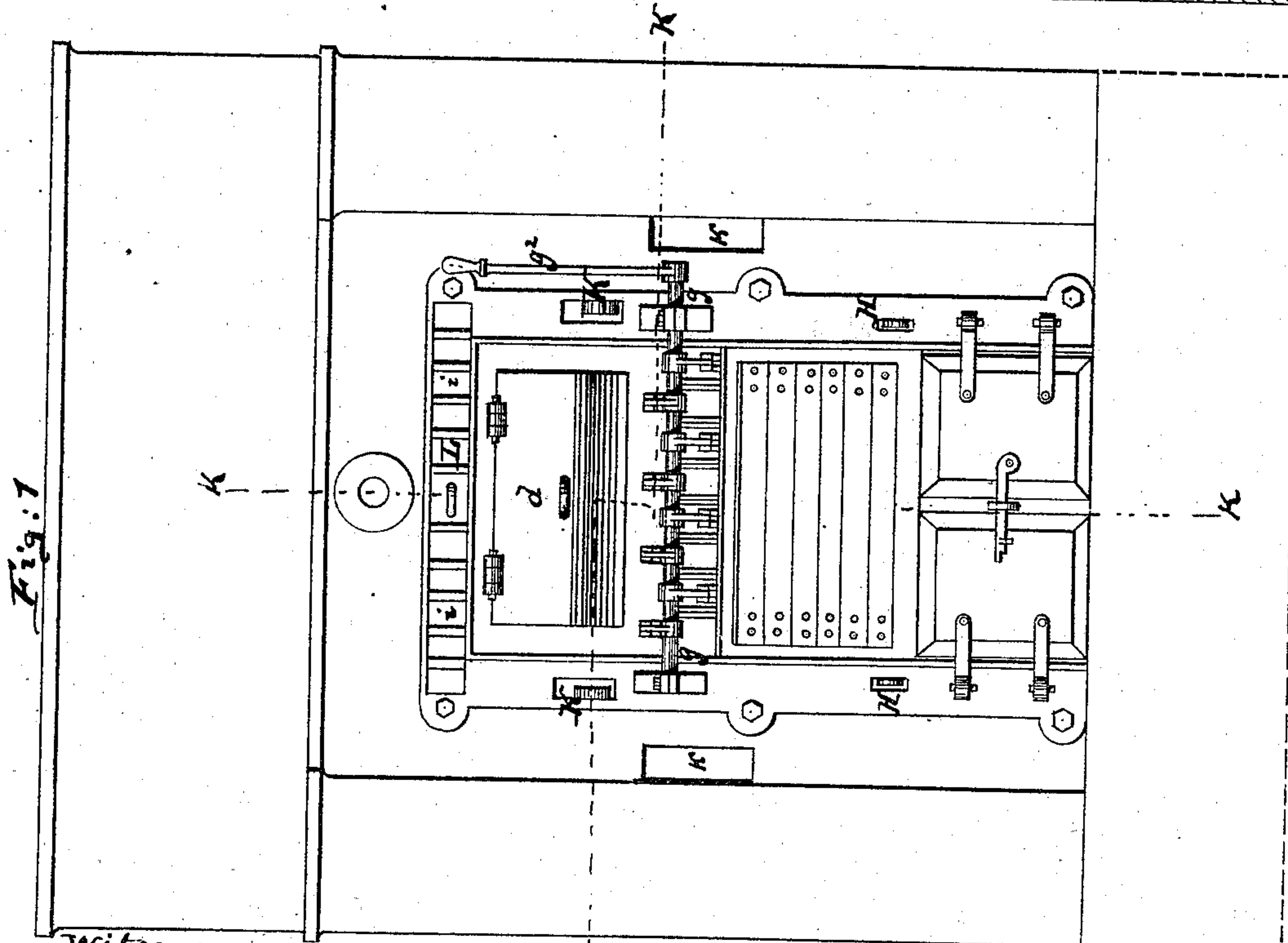
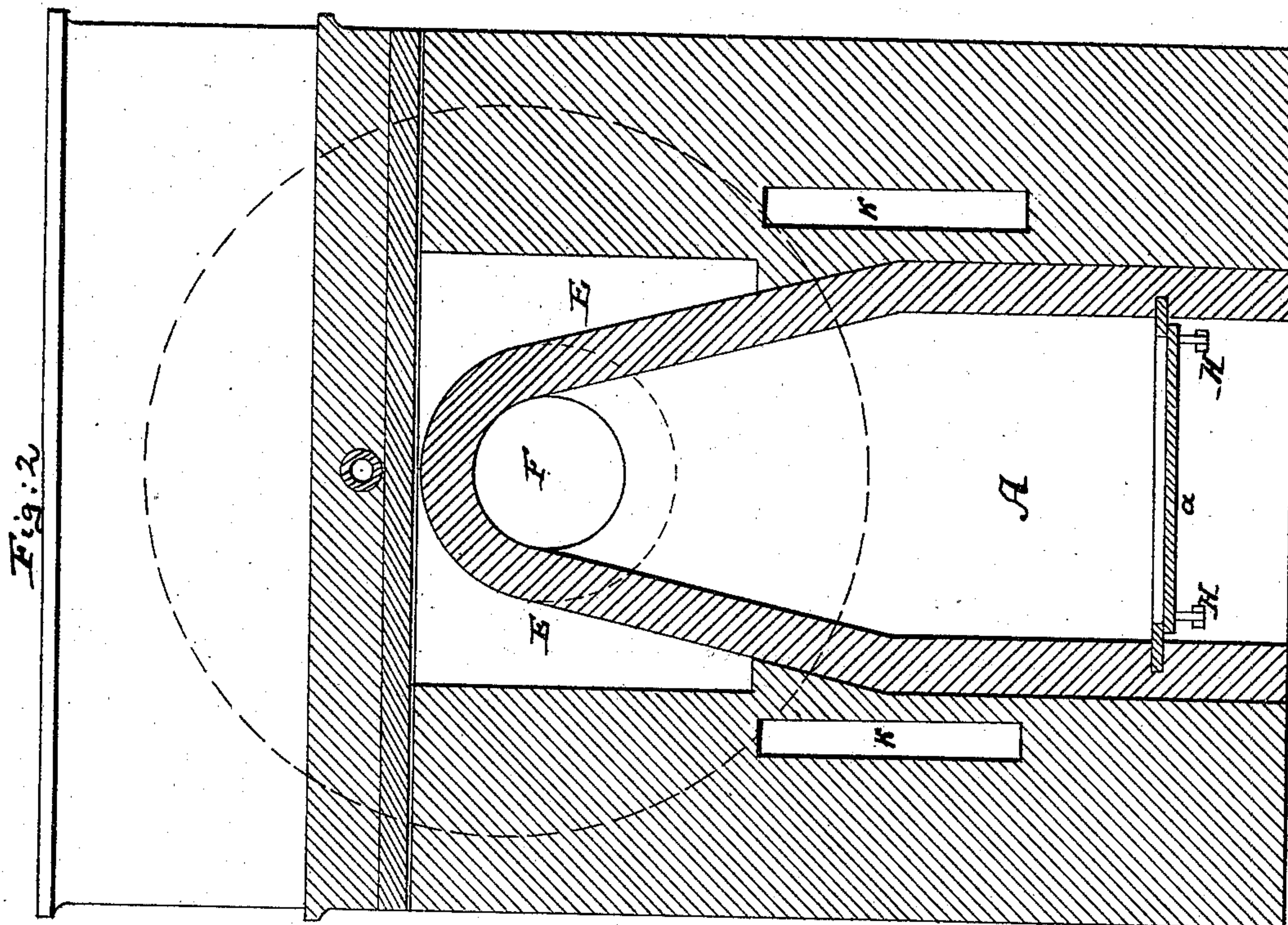
3 Sheets—Sheet 1.

M. KRUEWIG.

SMOKE AND GAS CONSUMING FURNACE.

No. 305,457.

Patented Sept. 23, 1884.



Witnesses:
John B. Tunbridge.
John M. Speer.

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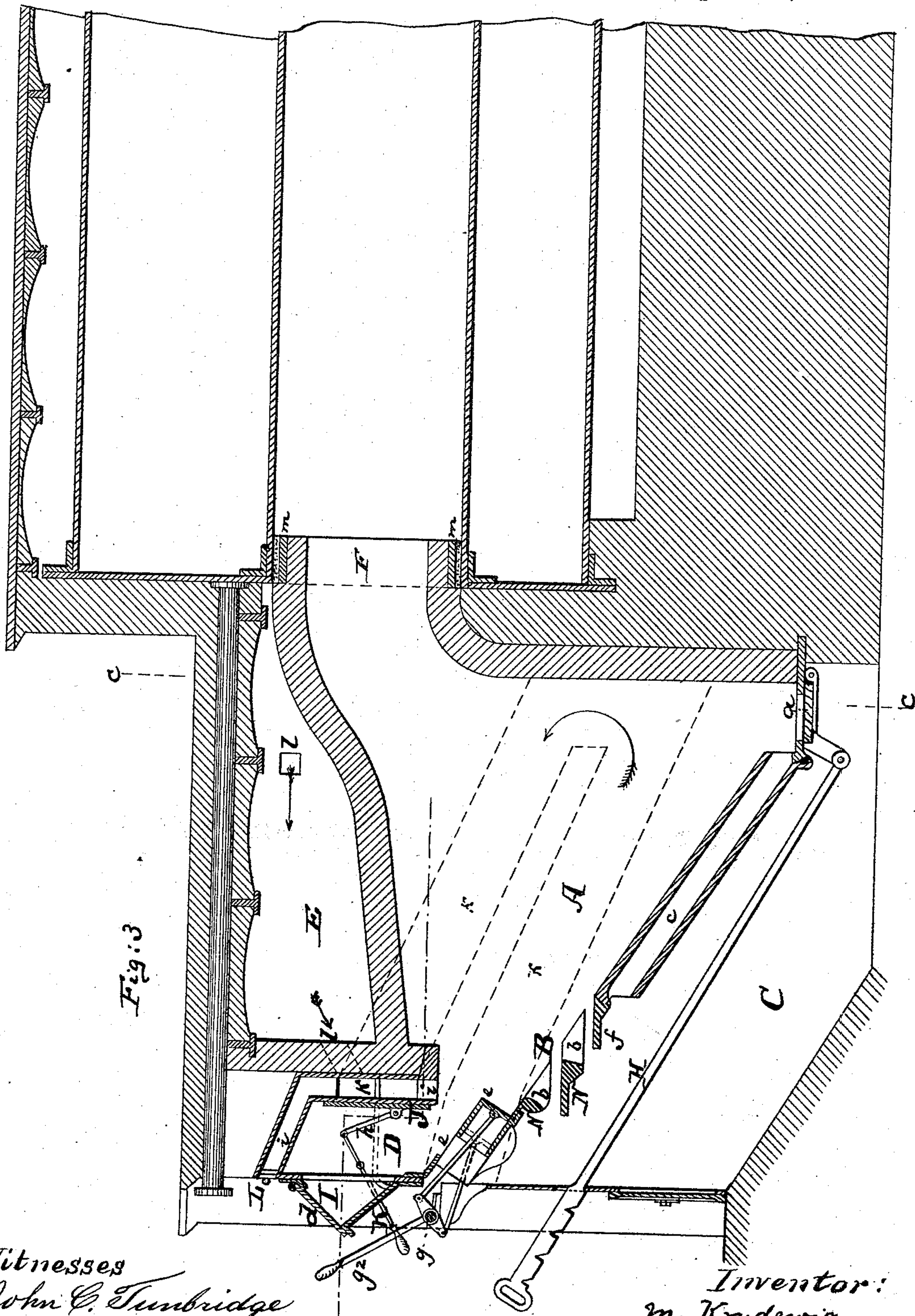
M. KRUEWIG.

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No. 305,457.

Patented Sept. 23, 1884.



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(No Model.)

3 Sheets—Sheet 3.

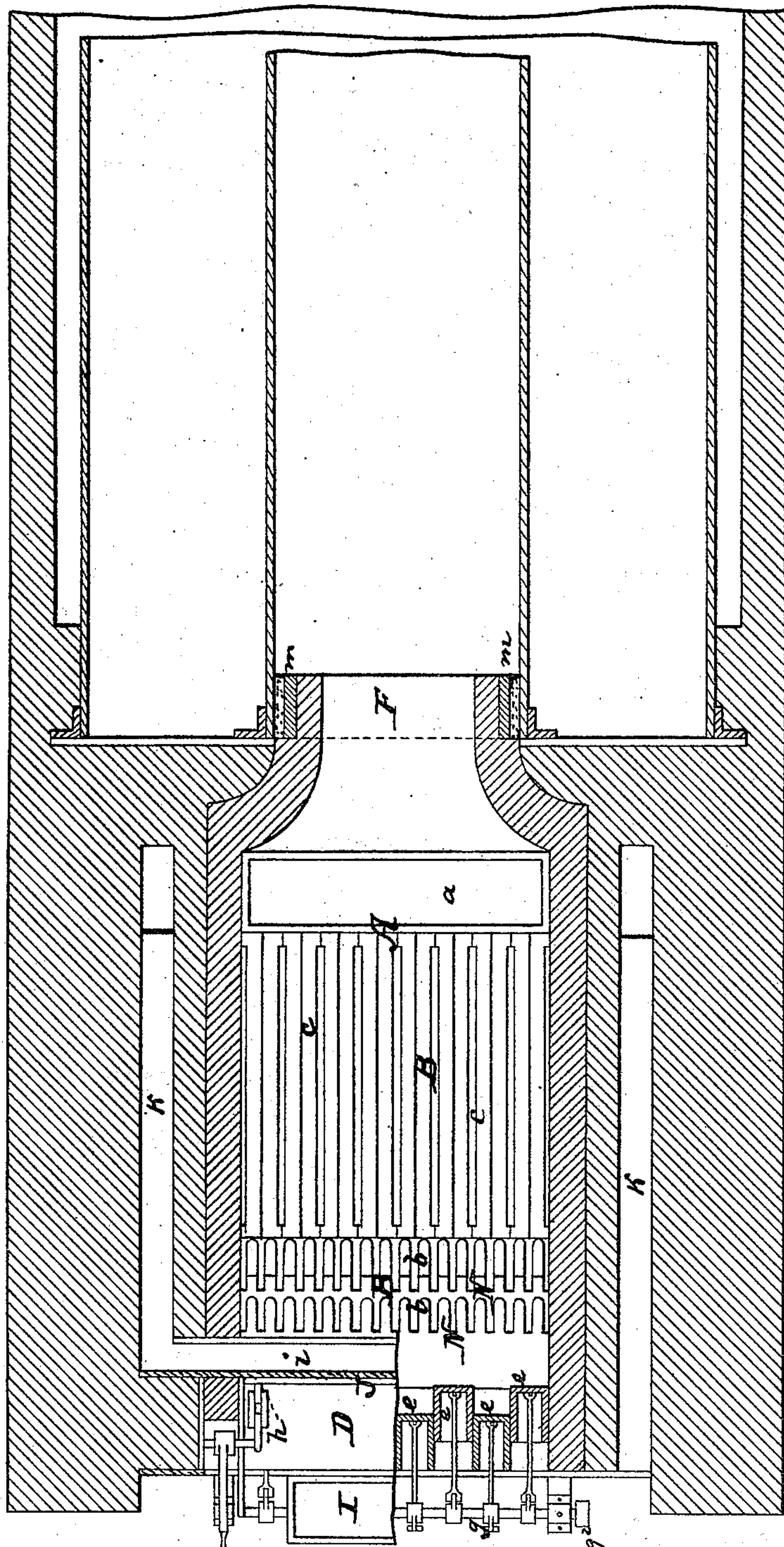
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Fig. 4



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UNITED STATES PATENT OFFICE.

MATHIAS KRUEWIG, OF FRANKFORT-ON-THE-MAIN, GERMANY, ASSIGNOR,
BY DIRECT AND MESNE ASSIGNMENTS, TO HIMSELF, AND WILLIAM
KLOH AND ISIDOR HYMES, BOTH OF NEW YORK, N. Y.

SMOKE AND GAS CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 305,457, dated September 23, 1884.

Application filed May 9, 1883. (No model.)

To all whom it may concern:

Be it known that I, MATHIAS KRUEWIG, of Frankfort-on-the-Main, in the Empire of Germany, have invented a new and useful
5 Improvement in Smoke and Gas Consuming Furnaces; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked
10 thereon, making a part of this specification.

My invention relates to a new construction of smoke-consuming furnace.

It consists in the combination of a bin or reservoir placed within the furnace, with an
15 inclined grate, a series of sliding blocks or plungers fitted to reciprocate back and forth under the fuel-aperture upon the upper end of the grate, and actuated by a rock-shaft and lever outside of the furnace, and with a series
20 of air-flues in the sides and top of the furnace to produce a delivery of hot air into the fire-box over the fire, and with a slide and register, as hereinafter fully described.

In the drawings, Figure 1 is a front view of
25 my improved furnace; Fig. 2, a vertical cross-section of the same on the line *c c*, Fig. 3. Fig. 3 is a vertical longitudinal section of the same on the line *k k*, Fig. 1. Fig. 4 is a horizontal section of the same on the line *c k*, Fig. 1.

30 A in said drawings represents the fire-box or combustion-chamber of my improved furnace; B, the inclined grate; C, the ash-pit; D, a bin or reservoir for fuel, formed within the furnace over the front or upper end of the
35 grate.

E is a hot-air chamber formed over the fire-box.

F is the mouth of the furnace, from which its heat and products of combustion are led
40 off under the boiler to be heated.

The inclined grate, or in some cases its upper end only, is constructed of a series of parallel bars, *N N*, having teeth which project, like the teeth of a comb, from said plates. The
45 plates *N N*, with their projecting teeth *b b*, are arranged horizontally one over the other, so that the teeth of the one tier of plates shall project over the solid portion of the plates beneath, as shown, the front ends of the teeth
50 being beveled to form an incline. By this ar-

range ment the ashes and unconsumed fuel falling from each upper tier drop upon the tier below it, where they are subjected to a fresh draft of air, and their combustion so promoted thereby, by reason of a fresh supply of oxygen, 55 as to burn up finally all the combustible matter. The constant progression of the fuel over the grate-bars for this purpose is assisted by a mechanical pushing forward of the fresh fuel by means of the pushers or pistons *e e*, arranged at the upper end of the grate, to slide back and forth thereon. The plate or plates
60 *N* of the upper tier may be set at an inclination corresponding with the plane of inclination of the teeth of the tier below, and the 65 teeth *b* of these upper plates are beveled on their under side, so as to leave a horizontal opening of uniform width between the upper tier and that next below. The grate may be constructed entirely of these "comb-plates;" 70 or in many cases I prefer to construct the upper part only of the inclined grate with said plates, and the lower portion of a series of parallel hollow grate-bars, *c c*, which are supported at an inclination conforming to that 75 required in the grate. The lower ends of these bars *c* are left open and terminate immediately over a hinged plate or door, *a*, at the bottom of the fire-box. An opening is formed on the under side of their upper flanges, *f*, 80 so that a current of air will be constantly drawn through them from the ash-pit below and discharged therefrom into the bottom of the fire-box against its rear wall. This current of air passing through each bar *c* will 85 not only cool it and prevent it from burning out, but, becoming thoroughly heated, will, when discharged into the fire-box, serve to produce a perfect combustion of the smoke and gases therein. 90

The hinged door *a* in the bottom of the fire-box and at the lower end of the grate is opened from without by means of a lever, *H*, for the purpose of discharging any clinker or ashes accumulating thereon. 95

The pushers or plungers *e e*, adapted to slide back and forth on the upper end of the grate, are each connected by a coupling-rod with a crank-shaft, *g*, supported in brackets upon the outside of the furnace, and which is oper- 100

ated by a lever, *g*². The fuel may be thus forced forward down the grate without opening the furnace.

The cranks are so disposed on the shaft *g* 5 that the plungers shall reciprocate alternately, so that as one advances that next to it will move back, and vice versa. The upper surface of this series of plungers *e* is made to constitute the bottom of the coal bin or reservoir 10 *D*, formed in the upper front portion of the furnace, so that the coal shall drop from the bin over the front edge of the plungers down upon the grate, its delivery from the bin being controlled or arrested by means of a 15 vertical slide, *J*, on the rear side of the bin. This slide is moved up and down by means of a lever, *K*, pivoted to the side of the bin, at one end thereof, whose shorter arm is connected to the slide by a link, *h*, and whose 20 longer arm projects out in front of the furnace, as shown. The height at which the slide *J* is set determines the depth of the fuel upon the grate.

The coal is fed into the bin *D* through a 25 chute or front hopper, *I*, closed by a door, *d*.

To complete the combustion within the fire-chamber of the furnace, an air-inlet passage, *i*, is formed over the top of the bin *D*, to extend down behind it and open into the fire- 30 box immediately in front of the feed-opening that is closed by the slide *J*. This air-passage is governed by a register, *L*, at the front of the furnace. Air-passages *k k* are also formed in the side walls of the furnace, to lead 35 from the front thereof to the rear, and thence back again, to communicate with the side of

the cold-air passage *i*, so as to deliver a volume of heated air in front of the fuel entering the fire-box of the top of the grate. A circulation of air is also established, by means of 40 suitable passages, *l*, between the air-chamber *E*, over the furnace, and the air-inlet *i*, to heat thereby the air-supply furnished to the fire-box.

The discharge opening or mouth *F* of the 45 furnace is above the level of the upper end of the grate, and for use with a Cornish boiler the furnace is built in front of the boiler and its mouth is extended into the central flue thereof, as shown in Fig. 3. In this case the 50 mouth *E* of the furnace is adapted to extend into the end of the flue, a non-conducting lining being interposed to protect the seam or joint of the flue and boiler, and supported by means of a metallic band or wing, *m*. The 55 door *J*, it will be seen, is above the plungers *e*, that have been pushed inward; otherwise it would obstruct the action of the plungers.

I claim—

The combination, in a furnace, of the in- 60 clined grate *B*, fire-box *A*, plungers *e e*, fuel-bin *D*, air-passages *k k* and *i*, with the slide *J*, register *L*, and bottom door, *a*, substantially as herein shown and described.

In testimony whereof I have signed my name 65 to this specification in the presence of two subscribing witnesses.

MATHIAS KRUEWIG.

Witnesses:

A. S. HOGUE,
J. GRUND.