

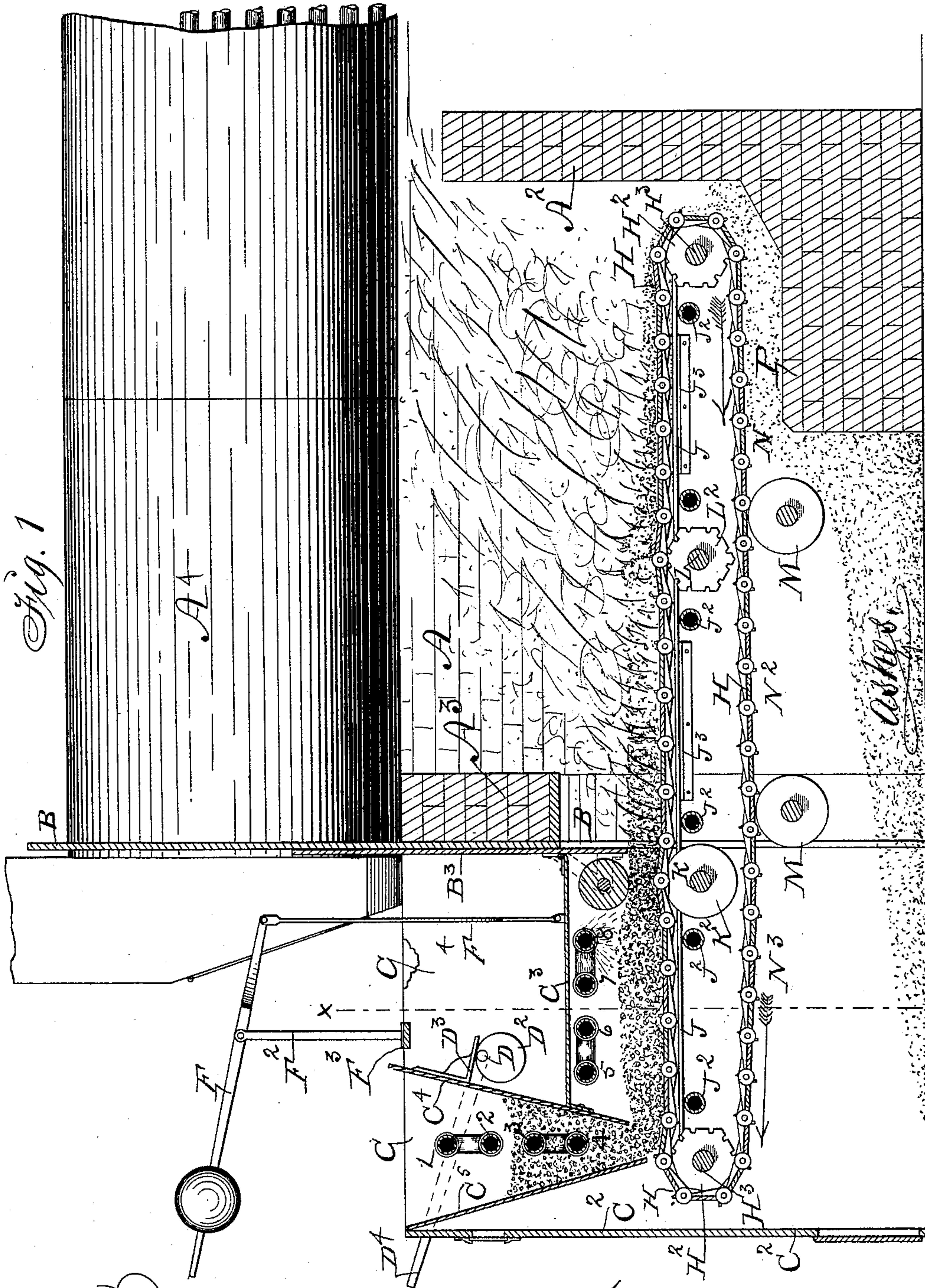
(No Model.)

2 Sheets—Sheet 1.

S. J. LOUGHRAN.
BOILER FURNACE.

No. 475,329.

Patented May 24, 1892.



Witnesses:
W. J. Sankey.
R. H. Orwig.

Inventor: Stephen J. Loughran,
By Thomas G. Orwig, atty.

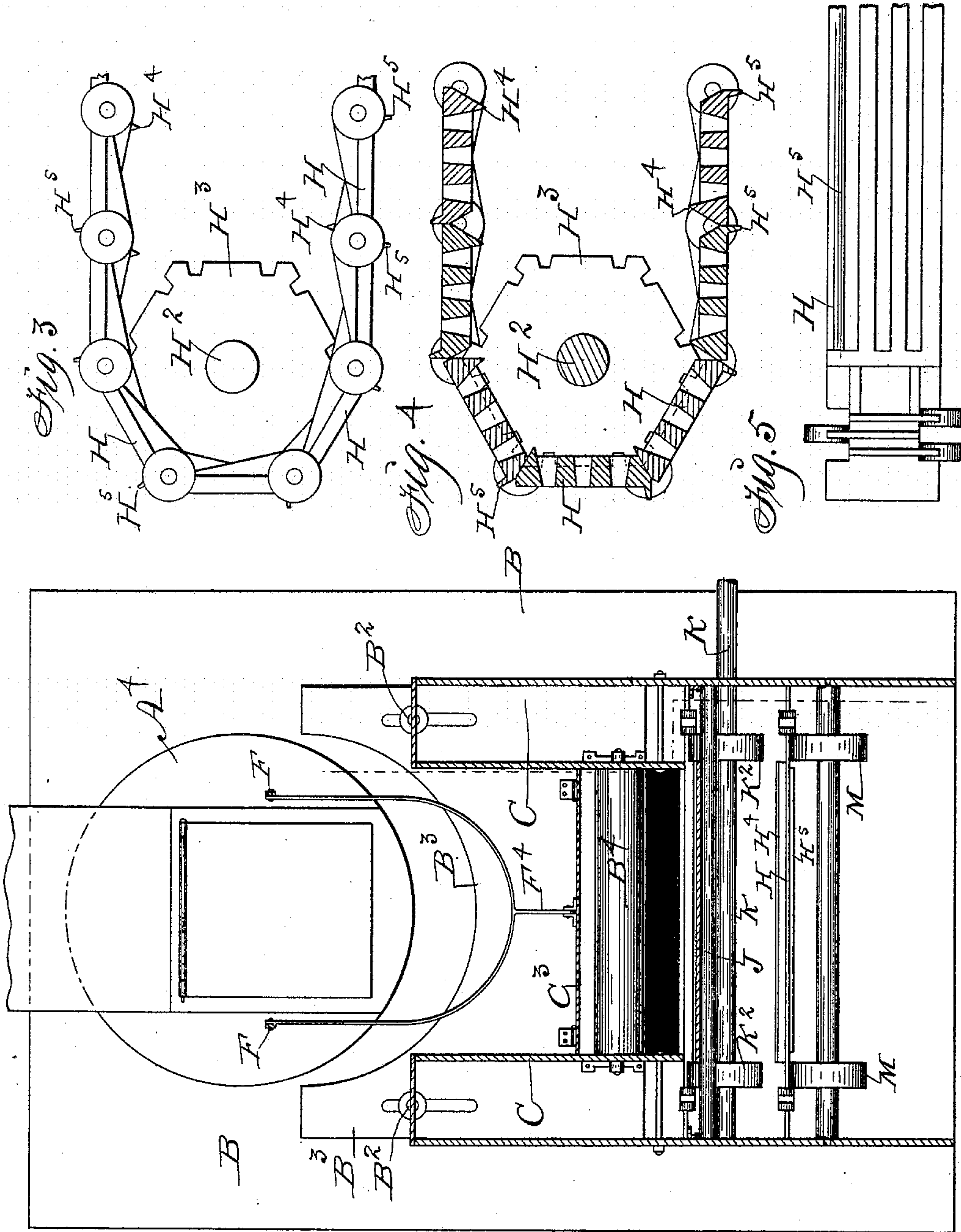
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2 Sheets—Sheet 2.

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Witnesses: *Fig. 2*
W. J. Sankey.
R. H. Irving.

Inventor: Stephen J. Loughran,
By Thomas G. Orwig, Attorney.

UNITED STATES PATENT OFFICE.

STEPHEN JOHN LOUGHRAN, OF DES MOINES, IOWA.

BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 475,329, dated May 24, 1892.

Application filed January 9, 1892. Serial No. 417,526. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN JOHN LOUGHRAN, a citizen of the United States of America, residing at Des Moines, in the county of Polk and State of Iowa, have invented an Improved Boiler-Furnace, of which the following is a specification.

My invention relates to the furnace for which United States Letters Patent No. 468,482 were granted jointly to myself and John B. Loughran February 9, 1892; and it consists in the construction, arrangement, and combination of mechanism for regulating the flow of fuel from the magazine to the grate, a movable cover for retaining the heat in the fuel, a roller for engaging fuel as it is advanced by the grate to support a self-adjusting cut-off which prevents fire from communicating from fuel carried on the grate within the combustion-chamber to the gases and fuel in the magazine, means for breaking fused fuel on the grate, and a fixed bottom under the moving grate and fuel to retain and support comminuted fuel and ashes and to retain hot air under the grate and to aid in promoting combustion, as hereinafter set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal view of the front portion of a furnace, showing the fuel-magazine and fuel mechanism and grate and their relative positions to each other and to a boiler. Fig. 2 is a sectional view looking rearward from the line *xx* in Fig. 1. Fig. 3 is a side view of a portion of the endless grate combined with a supporting and operating shaft. Fig. 4 is a longitudinal sectional view of Fig. 3. Fig. 5 is a bottom view of an end portion of one of the endless-grate sections.

A represents the side wall; A², the bridge-wall, and A³ an arched wall under the front end of the horizontal boiler A⁴. The arch A³ is made of fire-brick built inside of an iron plate and fire-front B at the front end or head of the boiler A⁴. The plate B is plain on its outside surface, and fitted to the front thereof and held thereto by stud-bolts B², fixed to the plate B, is a plate B³, that has vertical slots through which the stud-bolts project. The plate B³ is thus adjustably connected with the plate B in such a manner that it can be

raised and lowered to contract or enlarge the space between its bottom edge and the top surface of the grate. The plate B corresponds in shape with the opening under the arch of the front wall A³.

B⁴ is a roller supported in brackets fixed to the outside of the plate B³ in such a manner that the roller will rest upon the fuel on the grate and aid in supporting the plate B³ and preventing it from sinking into the fuel as it is advanced under the roller. The plate and roller move jointly up and down, as required, to accommodate themselves to the quantity of fuel advanced thereto on the grate from the fuel-magazine and to prevent fire from advancing from the combustion-chamber toward the fuel-magazine by serving as a cut-off between fire on the rear side and solid and gaseous fuel in front of the same plate.

C are the parallel metal inner side walls, and C² the front wall, of an auxiliary chamber fixed to the front plate B at the ends of the side walls A of the furnace to serve as a fuel-magazine and an ash-pit.

C³ is a metal plate fitted between the parallel walls C in such a manner that it can be raised and lowered. At its rear end it is hinged to the plate B³ to move up and down therewith. Its front end has a flange that is bolted fast to a movable plate C⁴, that extends vertically in an inclined position, as clearly shown in Fig. 1, to serve as the rear wall of a hopper and fuel-magazine.

C⁵ is the front wall of the hopper fixed to the walls C and C².

D is a rock-shaft in bearings formed in or fixed to the parallel walls C. Eccentrics D² or suitable cams or projections are fixed to the rock-shaft to engage a projection D³, extending rearward from the top portion of the plate C⁴ in such a manner that the plate C⁴ can be elevated thereby to enlarge the opening between its lower edge and the endless grate underneath, as required, to regulate the passage of fuel from the hopper to the grate and under the covering-plate C³.

D⁴ is an arm fixed to one end of the rock-shaft to operate it, as required, to raise and lower the plate C⁴. A rack fixed to the outside of the plate C, but not shown, serves to retain the arm and plate C⁴ stationary at any

point of elevation desired. The plates C^4 and C^3 are thus jointly suspended by means of the eccentrics D^2 and projections D^3 , so that they can be jointly raised and lowered while the hinged end of the plate C^3 and the plate B^3 remain stationary, and the plate B^3 can be elevated or lowered with the hinged end of the plate C^3 , while the plate C^4 and the end of the plate C^3 fixed thereto move horizontally, as required, to accommodate themselves to the angle assumed by the plate C^3 , but do not move vertically relative to the supports upon which the plate C^4 is pivotally suspended.

F is a forked lever pivoted to a post F^2 , that is supported upon a cross-piece F^3 , fixed to the walls C .

F^4 is a forked link pivotally connected with the rear end of the lever and the rear portion of the plate C^3 in such a manner that the rear end of said plate and the plate B^3 , carrying the roller B^4 , can be jointly lifted by means of the lever F .

F^5 is an adjustable weight on the long arm of the lever F , by means of which the pressure of the roller upon the fuel on the endless grate can be regulated as required.

1 2 3 4 are pipes extended horizontally between the side walls C and within the hopper, and 5 6 7 8 are corresponding pipes extended under the plate C^3 , and all of them are designed to be connected with the exhaust-pipes or other source of supply to convey and distribute heat and moisture to the fuel to prepare the fuel, as required, to facilitate combustion. No. 8 of these pipes is provided with fine perforations in its lower and inner sides to discharge steam and hot water into the fuel before it passes under the roller B^2 and into the combustion-chamber.

H is an endless grate upon wheels H^2 , that are adapted in shape to serve as gear-wheels in moving the endless grate. The wheels are fixed on rotating shafts H^3 , that are mounted in bearings formed in or fixed to the walls A and C in such a manner that they will support the grate extended horizontally below the fuel-magazine and the boiler.

J is a stationary plate and fixed bottom that extends under the fuel-magazine to the rear end of the grate in close proximity to the top portion of the movable endless grate in such a manner that it will support comminuted fuel, fire, and ashes that may drop through the grate and also retain heated air on the under side of the grate and exclude cold air in the ash-pit from direct communication with the heated air that envelops that part of the grate upon which the fuel is burned. This bottom J is supported upon braces J^2 , that are fixed to the side walls of the furnace.

J^3 represents stiffening-flanges extending longitudinally on the under side of the bottom J . Each section of the endless grate has a downward projection H^4 , that engages matter on the top of the bottom J and scrapes some of it along the line of advance, as re-

quired, to prevent accumulation and clogging.

K is a rotating shaft in parallel position with the grate supporting and operating shafts H^3 . It is located under the roller B^4 at the rear end of the fuel-magazine and has fixed wheels K^2 , that engage the grate and bend it upward slightly off the ways as it passes under the self-adjusting cut-off plate B^3 to reduce the friction on the ways in feeding fuel from the magazine to the combustion-chamber.

L is a rotatable shaft provided with cams L^2 and located underneath the central portion of the combustion-chamber, and is connected with the shaft K and the shafts H^3 by means of suitable gearing, so that these shafts will operate in concert. The wheels or cams L^2 correspond in shape with the wheels H^2 and bend the grate upward at each joint as the grate is advanced over them. The fuel on the grate H becomes fused, and the action of the wheels L^2 , in conjunction with the flanges H^5 on top of the grate-section, causes the mass to be broken and stirred to liberate gases and shake off ashes, and thereby aid in promoting combustion and economizing fuel, and also economizing labor in the operation of a furnace by automatically breaking and separating and stirring the fuel, so that the work of stoking by hand is dispensed with.

The returning side of the grate is supported by one or more pairs of rollers M , mounted on shafts so placed as to vary the distance between the roller-shafts H^3 and end carriers, increasing the length of each space N , N^2 , and N^3 from the rear end to the front, so that by the difference in weight in the grate portions between the supports M and H^3 it is drawn tight at all spaces except the front space N^3 , from whence it is drawn up by the front end carrying-wheels H^2 . As the flanges H^5 on the rear edges of the grate-sections are now reaching down, they carry or scrape the ashes forward over the platform P until the ashes fall below their reach.

From the foregoing description of the construction and function of each element and sub-combination of my invention its practical operation and utility will be readily understood by persons familiar with furnaces.

I claim as my invention—

1. In a furnace, an adjustable metal plate B^3 , in combination with an arched metal plate B , fixed to an arched wall A^3 , a plate C^3 , extending forward from the plate B^3 to a hopper, and an endless grate adapted to move horizontally and rearwardly relative to the adjustable plate, for the purposes stated.

2. The roller B^4 , in combination with the vertically-adjustable plate and cut-off B^3 , and an endless fuel-carrying grate, and a fuel-magazine, to operate in the manner set forth, for the purposes stated.

3. The plate C^3 , fitted between the inner side walls C and hinged to the adjustable plate B^3 and fixed to the vertically-adjustable plate C^4 to produce a hopper and feed device, and

an adjustable fuel-cover, and means for raising and lowering the plate C^4 , arranged and combined in a furnace relative to an endless fuel-carrying grate, to operate in the manner set forth, for the purposes stated.

4. A fuel-magazine having a hopper consisting of an adjustable plate C^4 , a fixed plate C^5 , a plate C^3 , fixed to the plate C^4 to extend horizontally, means for raising and lowering the plates C^3 and C^4 , arranged and combined in a furnace with tubes extended through the magazine to heat and moisten fuel, and an endless grate under the magazine to carry fuel, substantially as shown and described.

5. In a furnace, the fuel and ash chamber composed of parallel walls C and a front wall C^2 and a wall B , fixed to an arched front wall under a boiler, a vertically-adjustable plate and cut-off B^3 , connected with the wall B and the plate C^3 , the plate C^4 , fixed to the front end of the plate C^3 , the fixed plate C^5 , the pipes 1 2 3 4 5 6 7 8, and means for raising and lowering the plates B^3 , C^3 , and C^4 , and an endless grate extended under the plate C^3 to carry fuel to a combustion-chamber, all arranged and combined to operate in the manner set forth, for the purposes stated.

6. A lever F , fulcrumed to a suitable support and provided with an adjustable weight on its free end portion, in combination with the plates B^3 and C^3 , for the purposes stated.

7. The shaft D , having cams or projections D^2 and an arm D^4 , in combination with the plate C^4 , having a fixed flange D^3 and a hopper, to operate in the manner set forth, for the purposes stated.

8. In a furnace, an endless grate having projections on the under side of its sections extending downward and adapted to engage and move coal-dust and fine ashes on a plate, and a plate in a plane close to the said projections to receive and support coal-dust and fine ashes to be engaged and moved by the said projections on the under side of the grate-sections, arranged and combined relative to a fuel-chamber and a combustion-chamber, for the purposes stated.

9. The shaft K , having fixed wheels K^2 , in combination with an endless grate and a vertically-adjustable plate and cut-off B^3 , to operate in the manner set forth, for the purposes stated.

10. The shaft L , having fixed wheels L^2 , arranged as shown, in combination with a jointed endless grate to break and stir fuel on the grate in the manner set forth, for the purposes stated.

11. In a furnace, an endless grate composed of bars or sections having hinged connections at their ends, supports at the doubled end portions of the grate, adapted to be rotated to move the grate, rollers K^2 and L^2 , and a pair of rollers M , arranged and combined relative to each other and the grate and the end supports of the grate, substantially as shown and described, to operate in the manner set forth, for the purposes stated.

STEPHEN JOHN LOUGHRAN.

Witnesses:

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THOMAS G. ORWIG.