

No. 877,610,

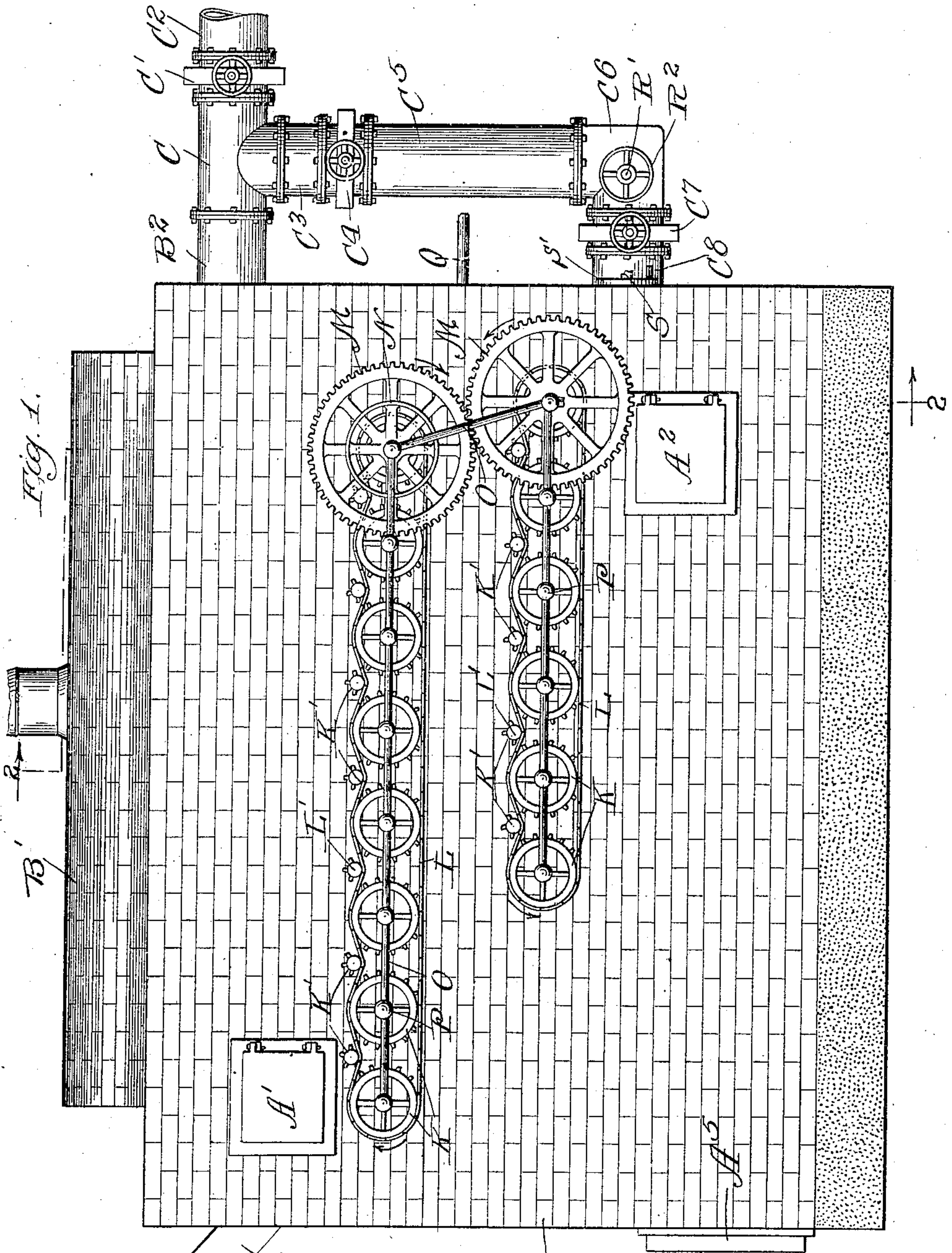
PATENTED JAN. 28, 1908.

G. STEINL.

FURNACE FOR THE PRODUCTION OF GAS.

APPLICATION FILED APR. 15, 1907.

4 SHEETS—SHEET 1.



Witnesses
Ray White
Harry L. White

Inventor
George Steindl.
By Morgan & Rubinstein
Attys

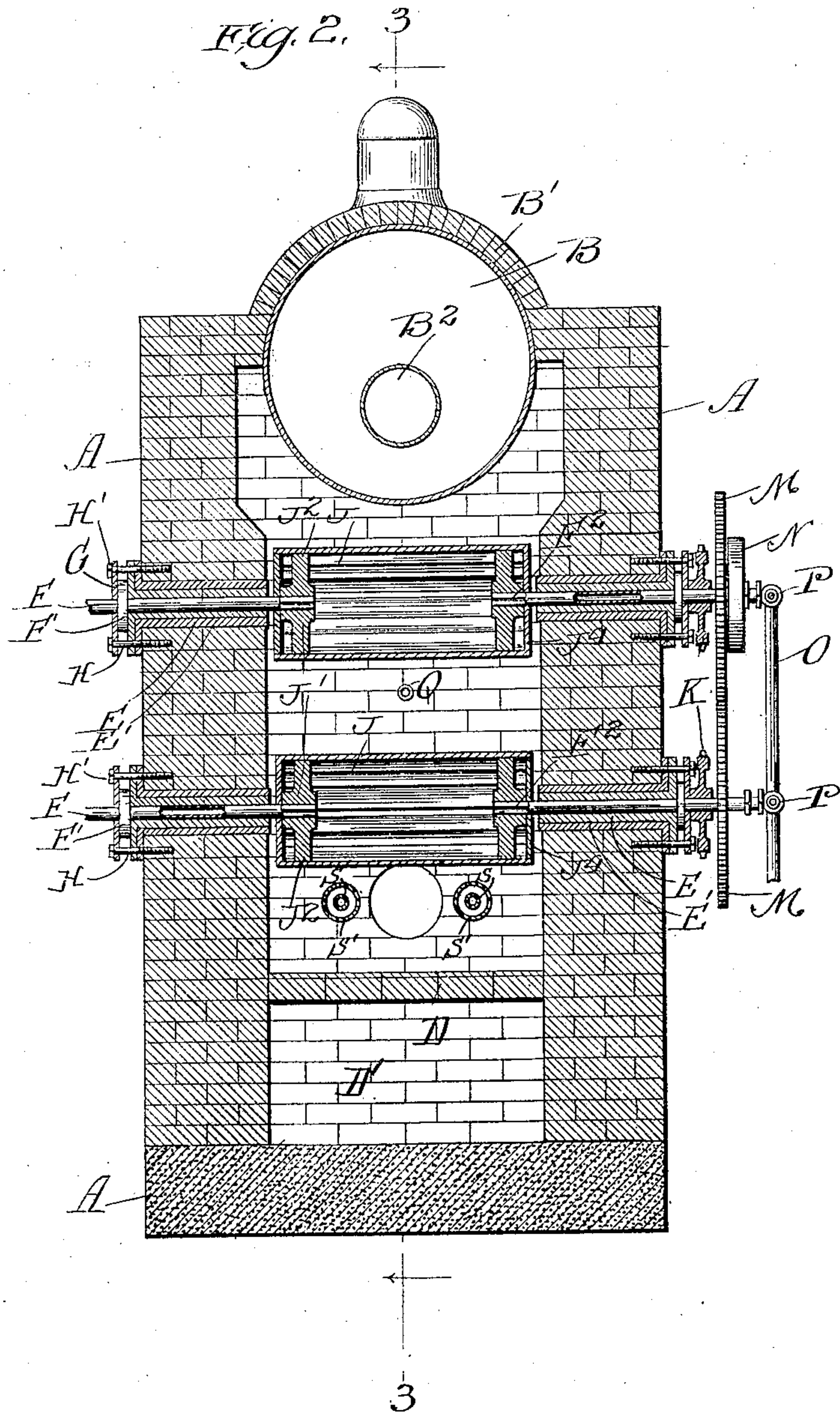
No. 877,610.

PATENTED JAN. 28, 1908.

G. STEINL.
FURNACE FOR THE PRODUCTION OF GAS.

APPLICATION FILED APR. 15, 1907.

4 SHEETS—SHEET 2.



Witnesses
Ray White,
Harry R. Lewhite

Inventor
George Steinl.
By Morgan V. Rubinstein
Att'y

No. 877,610.

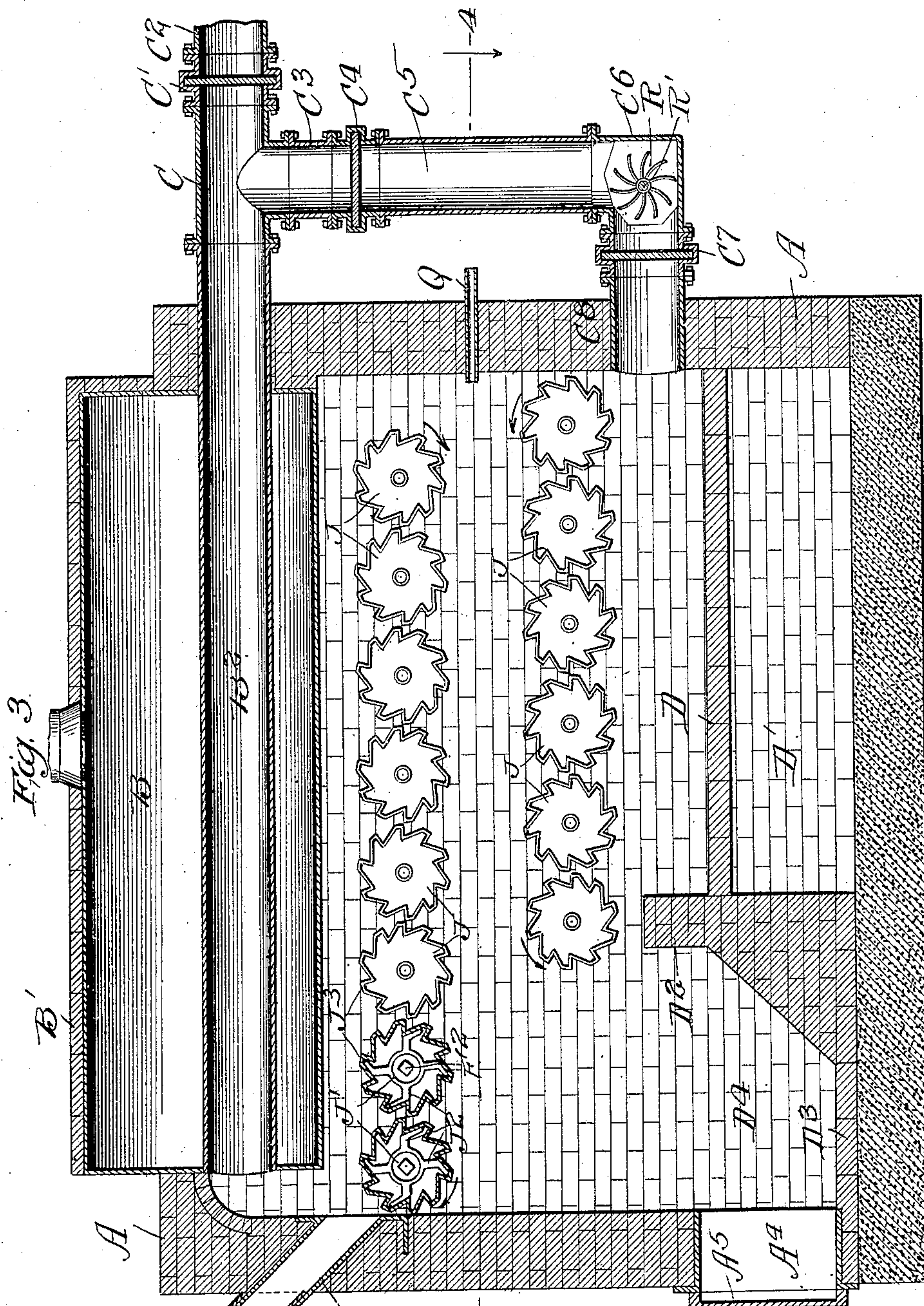
PATENTED JAN. 28, 1908.

G. STEINL.

FURNACE FOR THE PRODUCTION OF GAS.

APPLICATION FILED APR. 15, 1907.

4 SHEETS—SHEET 3.



Witnesses
Ray White.
Harry R. White.

Inventor
George Steinl.
By Margaret & Rubinstein
Attys

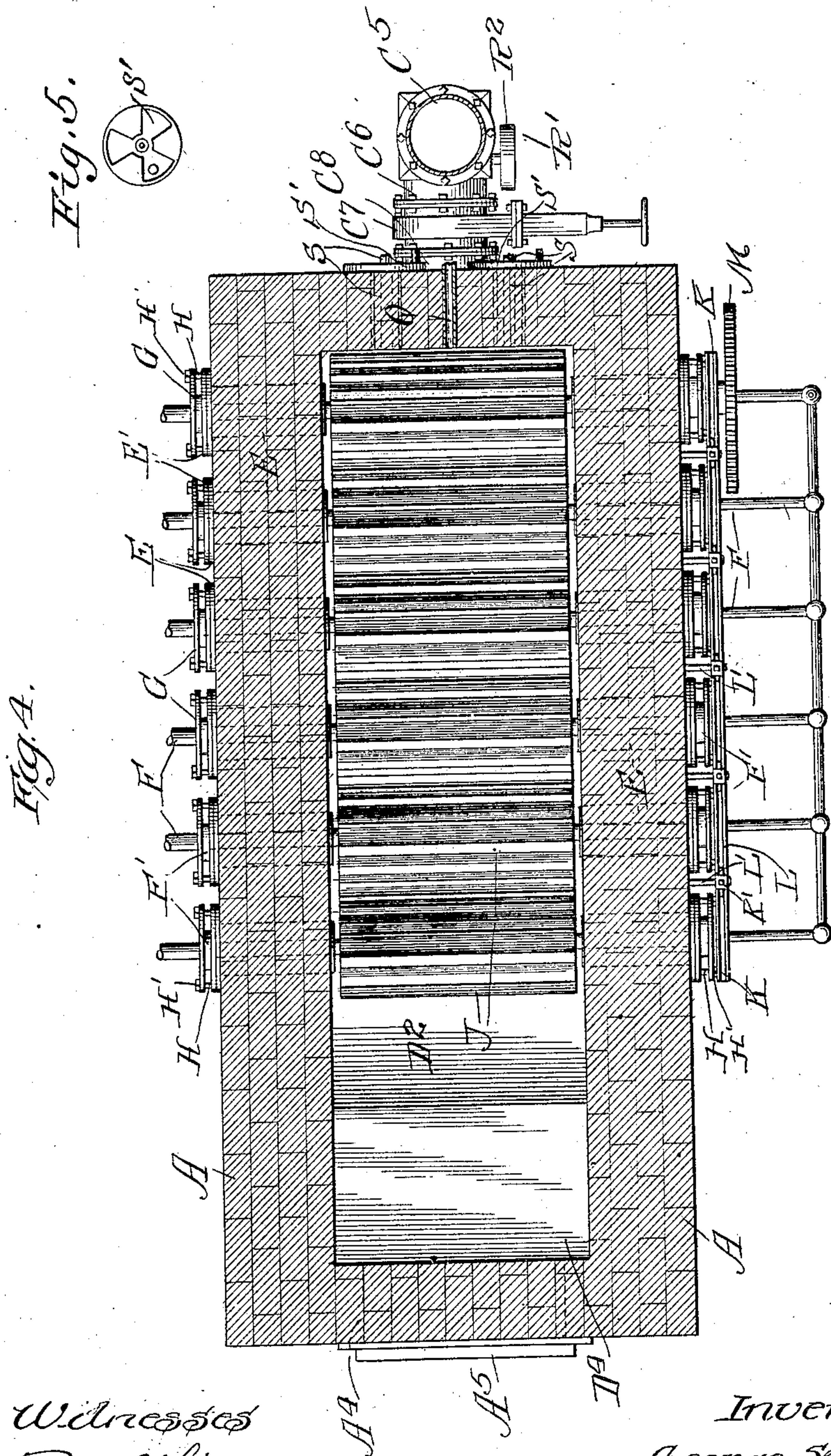
No. 877,610.

PATENTED JAN. 28, 1908.

G. STEINL.
FURNACE FOR THE PRODUCTION OF GAS.

APPLICATION FILED APR. 15, 1907.

4 SHEETS—SHEET 4.



Witnesses
Ray White,
Harry R. L. White

Inventor
George Steinl.
By Morgan & Rubinstein Attys

UNITED STATES PATENT OFFICE.

GEORGE STEINL, OF CHICAGO, ILLINOIS.

FURNACE FOR THE PRODUCTION OF GAS.

No. 877,610.

Specification of Letters Patent.

Patented Jan. 28, 1908.

Application filed April 15, 1907. Serial No. 368,403.

To all whom it may concern:

Be it known that I, GEORGE STEINL, a citizen of the United States, residing at 1 Washington Place, in the city of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Furnaces for the Production of Gas, Hot Water, and Steam, of which the following is a specification.

My invention relates particularly to that class of furnaces used in gas works for the production of gas from the combustion of coal, but is not restricted to that class as it is adapted for steam and hot water plants.

The primary object of my invention is the production of illuminating gas from the burning of coal; to secure the perfect combustion of the coal in the furnace; and to utilize the heat generated in making the gas for heating water; and when required, to use the furnace for generating steam.

The manner in which I accomplish my object is described in the following specification and illustrated in the accompanying drawings of which:

Figure 1 is a side elevation. Fig. 2 is a vertical cross section on the line 2—2 Fig. 1. Fig. 3 is a vertical longitudinal central section on the line 3—3 Fig. 2. Fig. 4 is a horizontal section in the line 4—4 Fig. 3. Fig. 5 is a face view of a closable thimble which extends through the front wall of the furnace and is adapted to admit air to the interior thereof.

In the drawings A designates the inclosing walls of the furnace, these walls may be brick, concrete or other suitable material, supported on suitable foundations. In one side of the inclosing wall are two man holes indicated by the doors A¹ and A² by which they are closed. These holes are adapted in size and location to permit workmen to enter the upper and lower parts of the furnace to make repairs. Through the upper rear wall of the furnace is coal chute A³. In horizontal width this chute equals the width of the interior of the furnace, and vertically it is adapted to the size and quantity of coal required to pass through it into the furnace. In the lower part of the rear wall is an ash hole A⁴ closed by a door A⁵. The bottom of this hole is on a level with the floor of the ash pit and its size is adapted to facilitate the removal of the ashes from the furnace. Supported in the top of the walls A is a boiler B.

The lower half of this boiler projects into the interior of the furnace, and the upper part projects above the top of the walls and is covered with a suitable covering B¹. Extending through the lower part of this boiler, and through the front wall is a gas pipe B². This pipe can be either an integral part of the boiler or be insertible through the wall and through the boiler when said boiler is so constructed to receive it. Secured to the exterior end of this pipe is a tee C. Connected to the horizontal end of this tee is a valve C¹, and pipe C². Connected with the vertical end of the tee C is a flanged joint C³, supporting a valve C⁴, and pipe C⁵. Connected with the lower end of the pipe C⁵ is an elbow joint C⁶. Connected with this elbow and forming a right angle to the pipe C⁵ is a valve C⁷ and pipe C⁸. This pipe extends through the front wall into the furnace.

Just below the bottom line of the end of the pipe C⁸ is the floor D of the furnace. This floor is constructed of fire brick or other suitable material supported preferably on a bed of cinders D¹. This floor extends from the front wall about two thirds of the length and the full width of the interior of the furnace. At the rear end of this floor is a transverse wall D² this wall reaches from the foundations vertically some distance above the level of the floor. The rear face of the wall D² extends down partly on an incline to the ash pit floor D³. This wall and floor may be of one solid construction and with the rear wall of the furnace and aperture A⁴ forms the ash pit D⁴. Affixed in alinement transversely in both side walls of the furnace and extending therethrough, are a series of boxes E. These boxes are arranged on two horizontal lines one above the other, the upper line is slightly below the bottom line of the coal chute A³. The lower line is some distance above the top line of the pipe C⁸. Each of these boxes is flanged and pierced through the flange with bolt holes. Insertible in each of these boxes is a bearing box E¹ flanged and pierced with bolt holes to correspond with the holes in the flange of the box E. In each of these bearing boxes is a hollow shaft F provided with a collar F¹. This collar may be an integral part of said shaft or be adjustably secured thereon. Adapted to slip over the outer end of each of these shafts is a plate G having bolt holes corresponding with the bolt holes in the

flanges of the boxes E and E¹. These plates are adapted to be secured in position by the bolts H secured in the wall and by nuts H¹ adjustable on said bolts. The ends F² of each of the shafts F, are squared and tapering towards the point.

Supported in the tapering ends F² of each pair of shafts F, is a roll J. These rolls are hollow and may be made of sheet metal as shown, or of cast metal. When made of sheet metal the hubs J¹ are of cast metal affixed in the interior of the roll, the spokes J² of these hubs are light and adapted to make the least practical contact with the interior of the roll. The center hole in each of the hubs is square and tapering to form a water tight fit on the ends of the shafts. The surface of each roll is corrugated longitudinally and in cross section the surface of the roll has the shape of a series of ratchet teeth J³, as shown in Fig. 3. In the upper row of rolls the vertical faces of the corrugations are towards the front wall of the furnace, and in the bottom row they are the reverse. The diameter of the rolls is adapted to permit the teeth of each roll to just clear the teeth of the other. The ends J⁴ of the rolls are flanged and affixed in the rolls. These ends are pierced to fit the shaft F. On each shaft on one side of the furnace a sprocket wheel K is attached. Supported on each line of these sprocket wheels is a sprocket chain L. Supported on studs L¹ affixed in the wall of the furnace above the shaft line and between the sprocket wheels are a series of small wheels K¹. These wheels are adapted to hold the sprocket chain K in contact with each of the sprocket wheels in the line. On the shafts at the front end of each line are a pair of gears M adapted in diameter to mesh into each other the lower gear being somewhat larger than the upper gear. On one of the shafts supporting one of said gears a driving pulley N is secured. Connecting with the ends of all the shafts on one side of the furnace are water supply pipes O having revoluble joints P, these pipes are adapted to be connected with any suitable water supply. Extending through the front wall into the furnace is an oil pipe Q connected with an oil supply not shown. In the elbow C⁶ is a fan R supported on a shaft R¹ on which a driving pulley R² is secured. Through the front wall are two steam pipes S adapted to be connected with a steam supply. Around each of these is a thimble S¹ shown in Fig. 5, and by the dotted lines in Fig. 4. These thimbles are adapted to be opened and closed for the admission of air to the furnace.

When my improved furnace is constructed as described and shown, its operation is as follows. An entrance into the furnace is made through the door A¹ and a supply of fuel placed on the upper rolls, close to the chute full of coal; a fire is started and a draft

created by the fan R in the elbow C⁶ which while the valve C¹ is closed draws the smoke and gas through the pipes B² and C⁵, and forces it back into the furnace mixed with the air entering through the door A². The smoke and gas created by lighting the furnace is thus consumed in the furnace. The oil introduced through the pipe Q enriches the gas, and together with the steam admitted through the pipes S and air admitted through the thimbles S¹ increases the heat of the furnace when lighted and when the furnace is used particularly for heating purposes, and not for making gas. When the requisite combustion and heat has been developed the door A² is closed and the rolls are slowly set in motion the top row revolving in the direction of the arrows, a continuous supply of coal is delivered down the chute through the aperture A³, on to the rolls. The motion of the rolls carries the coal slowly forward into the furnace and over the end roll down on to the lower rolls. As the coal is carried from roll to roll it is raised over the rolls, and falls between them and into the corrugations and thus all the parts of coal are separated from each other and exposed in every direction to the heat from below which ascends between the rolls from the clear fire on the lower rolls. When the burning coal reaches the end of the upper line of rolls, it falls on to the first of the lower line of rolls. The lower line of rolls revolving in the opposite direction to that of the upper rolls carries it back to the rear, moving every part continuously till nothing combustible remains. The ashes and other residuum falling over the last roll into the ash pit. While the first coal from the chute is on the lower rolls, the doors A¹, A², A⁵, the valves C⁴, and C⁷, are closed and the fan is stopped. The products of the combustion of the coal is allowed to pass through the valve C¹, and pipe C². At the time the fire is started the water is admitted through the pipe O, and shafts F into and through the rolls J for the purpose of preventing the rolls from burning out. The heat of the furnace when used for making gas is sufficient to heat the water in the boiler, and for making steam when the furnace is run for that purpose.

When for repairs or any other purpose the rolls are required to be removed, the nuts H¹ are removed from the bolts H, the plate G removed and the shaft thus released can be withdrawn through the box E¹. The tapering end of the shaft makes the separation of the shaft and roll easy. All the shafts may be removed in this way and any one or all the rolls be removed and replaced.

It is obvious that the adjustment of the ends of the shafts in the taper holes in the hubs of the roll may be accomplished by the adjustment of the collar on the shaft or by packing between the flanges of the boxes E and E¹.

What I claim as new and desire to secure by Letters Patent is:

1. In a furnace of the kind described, the combination with the inclosing walls; of a boiler supported therein; a pipe through said boiler; the connections and valves adapted to direct the fluids passing through said pipe; means in said connections adapted to force said fluids from said pipe into the lower part of said furnace; the chute in the rear wall of said furnace; the double series of rolls arranged in two parallel horizontal lines adapted to be rotated and to carry fuel from said chute the length of said furnace and back to the ash pit in the rear; means for supporting and rotating said rolls; means adapted to cause a flow of water through each of said rolls; means for injecting steam and oil into said furnace beneath said rolls.

2. In a furnace of the kind described, the combination with the inclosing walls, the boiler supported therein, the pipe through said boiler and its connections and valves; of the double series of hollow parallel rolls adapted to support and carry fuel from the rear to the front of said furnace and back to the ash pit in the rear of the interior of said furnace; means for supporting and rotating said rolls; means for causing a flow of water through said rolls.

3. In a furnace of the kind described, the combination with the inclosing walls, the chute therein, the boiler supported therein, the pipe, pipe connection and valves adapted for the passage of fluid from and into said furnace; of an upper and lower line of hollow corrugated rolls, each of said rolls being supported on hollow shafts extending through the side walls of said furnace; the hollow shafts supporting said rolls; the bearings in said walls supporting said shafts; means for causing water to flow through said shafts and rolls; and means for rotating said shafts and rolls.

4. In a furnace of the kind described, the combination with the inclosing walls, the chute therein, the boiler, the pipe, connections, and valves adapted to control the

passage of fluid from and into said furnace, and the upper and lower line of hollow corrugated rolls in said furnace; of the hollow shafts extending through said walls, said shafts being adapted to be inserted into the ends of said rolls and to thereby support said rolls; the bearings in said walls adapted to support said shafts; means adapted to rotate said shafts; and means for causing a flow of water through said shafts and rolls.

5. In a furnace of the kind described, the upper and lower line of hollow corrugated rolls, the hollow supporting shafts and bearings whereby said shafts and rolls are adjustably supported in said furnace; the gear wheels by which the upper and lower end shafts and rolls are connected, the sprocket wheels on said shafts and the sprocket chains by which said shafts and rolls are rotated; and means whereby water is caused to flow through said shafts and rolls.

6. In a furnace of the kind described, the upper and lower line of hollow rolls, the hollow shafts and supporting bearings, the sprocket wheels, gears, and sprocket chains by which said upper and lower line of shafts and rolls are connected together and are adapted to be rotated in opposite directions in said furnace; the means for holding said chains in contact with each of said sprocket-wheels; and means for causing a flow of water through said shafts and rolls.

7. In a furnace of the kind described, having a rear chute for the admission of coal, a double line of hollow rolls, said rolls being arranged transversely to the length of said furnace and in two horizontal lines one above the other, the surface of each of said rolls being corrugated longitudinally and thereby adapted to carry the fuel from said chute through said furnace in the direction of the rotation of said rolls; means for supporting and rotating of said rolls in said furnace.

GEORGE STEINL.

Witnesses:

JOSEPH STAAB.

THOMAS J. MORGAN.