

No. 673,066.

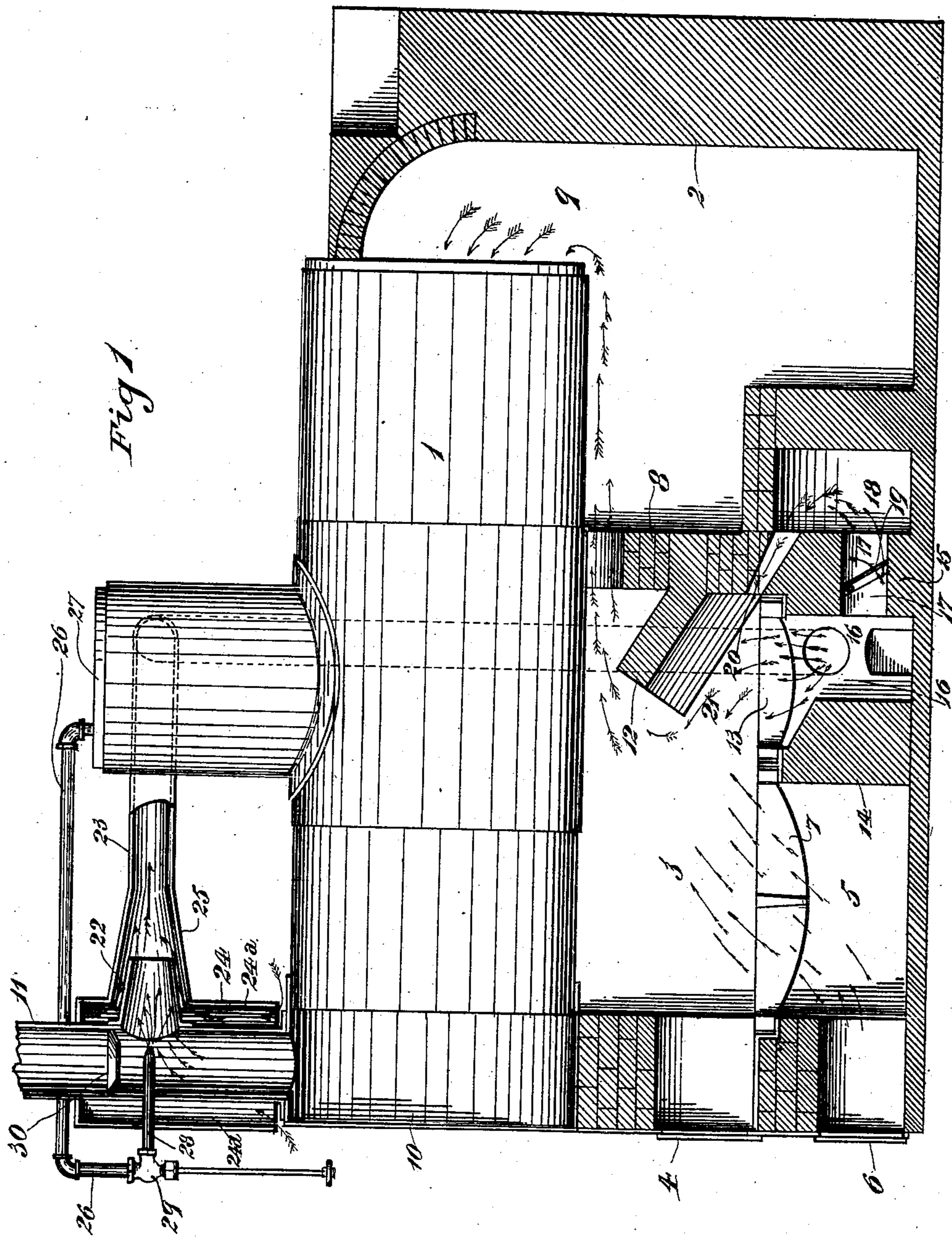
Patented Apr. 30, 1901.

C. J. SHOEMAKER.
SMOKE CONSUMING FURNACE.

(Application filed June 27, 1900.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

Geo. V. Bedell.

Collier E. J. Huley

INVENTOR

Charles J. Shoemaker

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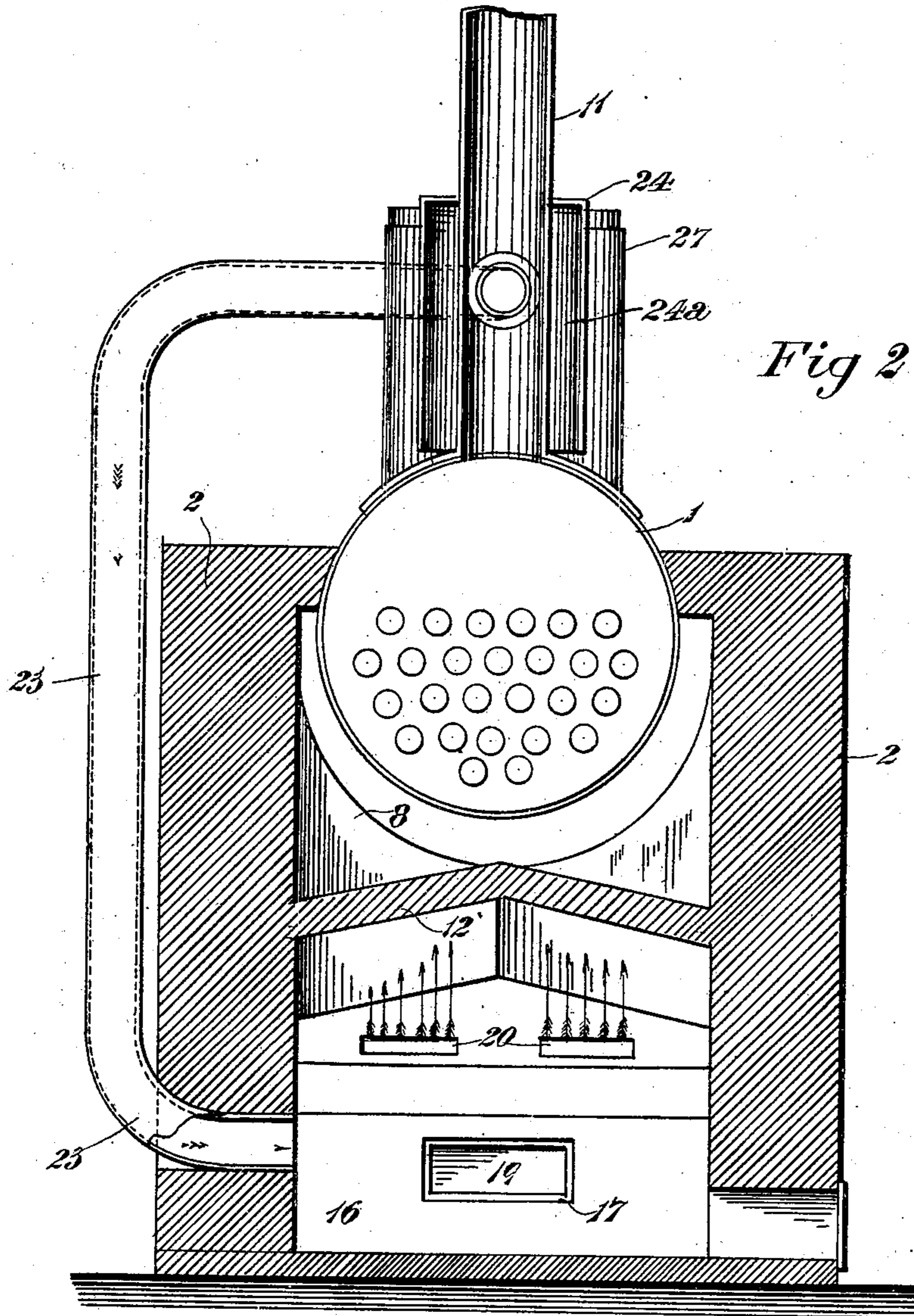
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UNITED STATES PATENT OFFICE.

CHARLES J. SHOEMAKER, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO HENRY F. SHOEMAKER, OF SAME PLACE.

SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 673,066, dated April 30, 1901.

Application filed June 27, 1900. Serial No. 21,846. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. SHOEMAKER, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented new and useful Improvements in Smoke-Consuming Furnaces, of which the following is a specification.

My invention relates to certain new and useful improvements in apparatus for the consumption of smoke from furnaces, and is particularly applicable to steam-boiler furnaces, and will be hereinafter more fully set forth, and particularly pointed out in the claims.

The object of my invention in the main is to consume the smoke and other unconsumed gases that escape from the furnace to the smoke-stack, which object I accomplish by removing said smoke and unconsumed gases from said smoke-stack at a point above the base thereof, charge and mix the same with dry steam and superheated air, and then conveying the gases thus compounded and superheated, to and into a mixing-chamber, wherein the said compounded gases are still further mixed and heated, and finally discharging said superheated and compounded gases into a combustion-chamber or reverberatory furnace situated to the rear of the main furnace and in advance of the bridge-wall thereof, in which furnace said gases and smoke are effectually and completely consumed and converted into heat; also, to provide means whereby the temperature of the main furnace and the gases passing therefrom and over the bridge-wall thereof is maintained at a maximum, as will be hereinafter more fully set forth. I attain these objects by means of the apparatus and the arrangement of the furnace illustrated in the accompanying drawings, in which similar numerals of reference designate like parts throughout both views.

Figure 1 is a sectional elevational view of a boiler-setting, showing my invention of a furnace and smoke-consuming apparatus applied thereto; and Fig. 2 is a transverse sectional elevational view of the same.

The boiler 1, which is of the tubular type, but any other form or type may be employed

with equal facility, is set in the brick setting 2 and is heated by means of the main furnace 3, having the furnace-door 4 and the usual ash-pit 5 beneath the furnace-grate 7, and the atmospheric air required to support the combustion of the fuel on the grate 7 is admitted through the ash-pit door 6 into the said ash-pit and under the grate 7 and is drawn through the bars of the latter by the force of the natural draft, as is usual with furnaces of this type. The smoke or unconsumed gases and the products of combustion pass or are carried over the bridge-wall 8 to the rear uptake 9, thence through the tubes of the boiler 1 into the front uptake or smoke-arch 10, and finally into and through the smoke-stack 11 into the atmosphere.

In front of the bridge-wall 8 is the deflecting-arch 12, which is constructed of fire-clay or other refractory and heat-retaining material, and said arch is inclined upwardly and directed forwardly toward the main furnace for the purpose of intercepting the unconsumed gases escaping therefrom. The said arch 12 is particularly designed for the purpose of forming a reverberatory furnace and superheating-chamber to the rear of the main furnace to insure the perfect combustion of the smoke and unconsumed gases that are discharged into it and reclaimed from the smoke-stack.

Between the bridge-wall 8 and the main furnace 3 and directly under the arch 12 is the grate 13, which is supported at its front end by the dividing-wall 14 of the main furnace and at its rear end by the base-wall 15 of the bridge-wall 8, and both of said walls 14 and 15 extend transversely across and connect the side walls of the setting 2 to form a gas-mixing chamber 16. The base-wall 15 is provided with a by way or pass 17, which connects said mixing-chamber 16 with the receiving-chamber 18, and a hinged or flap valve 19 is placed in said pass and is adapted to swing open as indicated by the direction of the arrow—that is, the valve 19 opens in the direction of the flow of the gases escaping from the chamber 16 into the chamber 18—and the said valve is provided for the purpose of permitting the gases confined in said mixing-

chamber 16, when they exceed a certain pressure or when they attain a pressure sufficient to open said valve 19, to flow into said receiving-chamber 18, and from thence through the vent-openings 20 into the reverberatory furnace or chamber 21, formed between the grates 13 and the said arch 12, in which chamber or furnace the gases are completely consumed, and by this means the incandescent fuel covering said grates 13 is not broken up or excessively disturbed.

A smoke-exhausting nozzle 22 is connected to the smoke-stack 11 at a point above the base thereof, with its enlarged end toward the said smoke-stack and its reduced or nozzle end directed toward the conveyer-pipe 23, which latter is connected at its discharging end to the mixing-chamber 16. A casing or hood 24, having its top end closed and its bottom-end open to the atmosphere, is connected to and surrounds the smoke-stack 11 to form an air-superheating chamber 24^a, and an exhaust-nozzle 25 has its enlarged end connected to said casing 24 and connects with the air-chamber 24^a. Said nozzle 25 is of a diameter sufficiently large to surround the inner or smoke-exhausting nozzle 22 and to form a free air-space and air-passage around the latter nozzle for the passage of the superheated air from the chamber 24^a to the receiving end of the conveyer-pipe 23, from whence said air is carried with the gases into and through said pipe to be discharged in the chamber 16. Said nozzle 25 is preferably connected at its smaller end to the conveyer-pipe 23 at its receiving end to form an air-tight joint. A steam-pipe 26 extends from the dome 27 of the boiler 1 to the jet-pipe 28, which latter has its nozzle or jet end directed toward and central with the enlarged end of the nozzle 22, and the said nozzle is provided for the purpose of creating a forced draft or current of the gases from the smoke-stack to exhaust said gases and smoke therefrom into and through the conveying-pipe 23 to and into the mixing-chamber 16.

A petticoat or baffling annulus 30 is fixed in the smoke-stack 11, above the nozzle 22, and said petticoat pipe or annulus is of a conical form and placed in inverted position in said stack and is provided for the purpose of intercepting a portion of the smoke and unconsumed gases in their upward passage within the stack 11 and to intensify the body of the gases at a point adjacent to the exhaust or ejecting nozzle 22 to insure a denser volume of the combustible gases being carried back into the mixing-chamber 16.

The operation of the apparatus I will now proceed to describe. The fuel is applied to the fire on the grate 7 in the usual manner, a portion of which gradually works or is worked over the surface of the grate 13, whereon it is soon reduced to the incandescent state by the draft of the gases and air escaping from the mixing-chamber 16. This fuel

having been thoroughly ignited, the mixed gases escaping therefrom contact with the deflecting-arch 12, which is soon highly heated and is also reduced to the incandescent state, and the radiated heat generated thereby and the heat deflected against the surface of the incandescent fuel over the grate 13 creates a zone of intense heat between said arch and said supplemental grates 13, and this zone is in the path of the smoke and unconsumed gases exhausted from the smoke-stack, which soon completely consumes said gases and deprives them of all their combustible and heat-producing elements, and thereby reducing the discharge of smoke through the smoke-stack to a minimum.

Having thus fully described this my invention, what I claim as new and useful, and desire to cover by Letters Patent of the United States therefor, is—

1. In a furnace for steam or other boilers, the combination with the main furnace and the smoke stack or duct thereof, of a supplemental furnace to the rear of said main furnace, an arch closed at its rear end and extending upwardly and over said supplemental furnace, and open toward said main furnace, and means for ejecting the unconsumed gases and the smoke from the smoke stack or duct and discharging the same beneath said supplemental furnace to be consumed therein.

2. In a furnace for steam or other boilers, the combination with the main furnace thereof and its smoke stack or duct, of a supplemental furnace to the rear of said main furnace, an arch closed at its rear end and extending upwardly and over said supplemental furnace to the rear of said main furnace, and open toward the latter, a mixing-chamber beneath said supplemental furnace and connecting with the latter, and means for exhausting the smoke and unconsumed gases from the said stack or duct and discharging the same into said mixing-chamber.

3. In a smoke-consuming furnace, the combination with a main furnace, and the smoke stack or duct thereof, of a supplemental furnace independent of said main furnace and to the rear thereof, a mixing-chamber beneath said supplemental furnace, and means whereby the said mixing-chamber is supplied with the smoke and the unconsumed gases escaping through the said smoke-stack, a receiving-chamber to the rear of said mixing-chamber, a valve-controlled pass connecting said mixing and receiving chambers, said receiving-chamber provided with upper vent or escape openings connecting the latter with the supplemental furnace.

4. In a smoke-consuming furnace the combination with a main furnace, and the smoke stack or duct thereof, of a supplemental furnace independent of said main furnace and to the rear thereof, a bridge-wall to the rear of said supplemental furnace, a deflecting-arch having its open end directed toward said

main furnace, said arch extending forwardly
from said bridge-wall, a mixing-chamber be-
neath said supplemental furnace and con-
necting with the latter, and means for ex-
5 hausting the smoke and the unconsumed
gases from the said stack or duct and dis-
charging the same into said chamber.

In testimony whereof I have hereunto set
my hand in the presence of two subscribing
witnesses.

CHARLES J. SHOEMAKER.

Witnesses:

THOMPSON R. BELL,
GEO. J. BEDELL.