

No. 877,142.

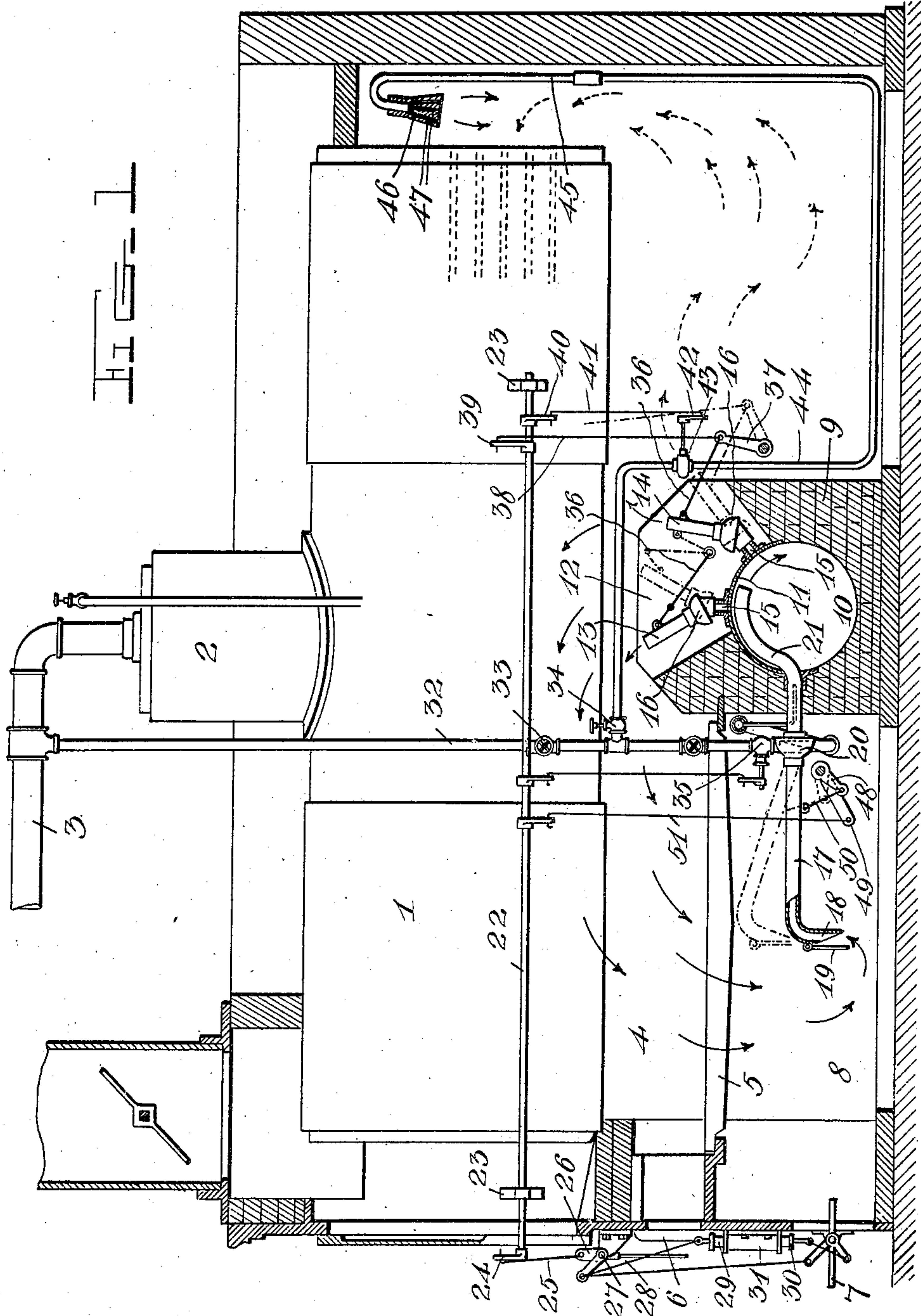
G. R. TORREY.

PATENTED JAN. 21, 1908.

MEANS FOR INCREASING AND PROMOTING THE COMBUSTION OF FUEL.

APPLICATION FILED JAN. 19, 1906. RENEWED JUNE 10, 1907.

2 SHEETS—SHEET 1.



Witnesses

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George R. Torrey

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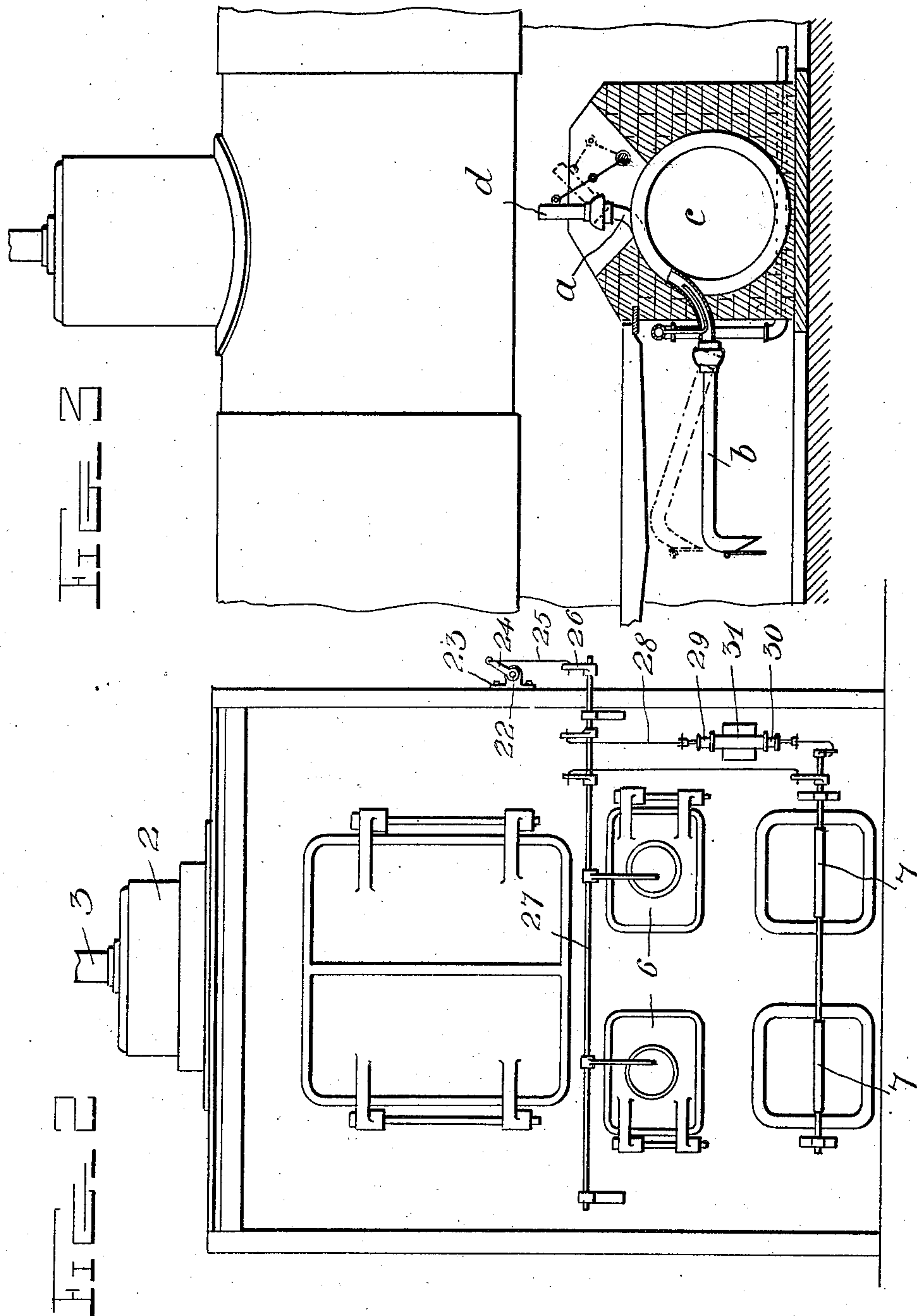
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UNITED STATES PATENT OFFICE.

GEORGE R. TORREY, OF WASHINGTON, DISTRICT OF COLUMBIA.

MEANS FOR INCREASING AND PROMOTING THE COMBUSTION OF FUEL.

No. 877,142.

Specification of Letters Patent.

Patented Jan. 21, 1908.

Application filed January 19, 1906, Serial No. 296,840. Renewed June 10, 1907. Serial No. 378,288.

To all whom it may concern:

Be it known that I, GEORGE R. TORREY, a citizen of the United States, residing at Washington, in the District of Columbia, have invented new and useful Improvements in Means for Increasing and Promoting the Combustion of Fuel, of which the following is a specification.

This invention relates to means for increasing or promoting the combustion of fuel; and one of the principal objects of the same is to provide means for creating a vortex draft of combined air and dry steam through the burning fuel.

Another object is to provide automatic means whereby when firing-up, the vortex draft is utilized until the period of firing-up is over and the fire doors are closed.

Another object is to provide means for automatically injecting combined air and steam into a vortex chamber, giving said steam and air a circular centrifugal motion and conveying it from the vortex chamber into and around the burning fuel to consume the smoke and other combustible particles.

Still another object is to provide in a furnace of a steam boiler a circular vortex chamber for giving to admitted air and steam a circular centrifugal action to force the draft in and through the bed of fuel, and to force a jet of dry steam into and around the chamber at the back of the bridge wall and around the top of the burning fuel.

A further object is to convert all the gases and combustible matter contained in soft coal and similar fuel, into flames and heat, thus saving a large percentage of fuel by my improved construction and arrangement hereinafter referred to.

My invention contemplates the use of a bridge wall having a circular vortex chamber therein and providing means for forcing combined steam and air into said vortex chamber in a circular path, to create a vortex or centrifugal action of the combined steam and air in said chamber and forcing said steam and air out around the burning fuel to increase the draft and consume all the products of combustion.

These and other objects are attained by means of the construction illustrated in the accompanying drawings, in which—

Figure 1 is a diagrammatic and partial sectional view of a steam boiler and furnace provided with my improved means for increasing combustion and consuming smoke. Fig.

2 is a front elevation of the boiler and furnace; Fig. 3 is a detail section of a modified construction of the bridge wall, vortex chamber, and connections.

Referring to the drawings for a more particular description of my invention, the numeral 1 designates a steam boiler which may be of any suitable style; 2 is the steam dome; 3 is the crown pipe thereof; 4 is the furnace; 5 are the grate bars; 6 are the fire doors; 7 is the ash-pit door and 8 the ash-pit. These parts may be of the usual or any suitable construction.

A bridge wall 9 extending transversely of the boiler and made of suitable checker work is provided with a central vortex chamber 10 of circular construction, said chamber having a semi-circular plate 11 covering the upper portion thereof and extending over an opening 12 in which opening circulating tubes 13, 14 are located. The circulating tubes each consists of a base tube 15 secured to the plate 11 and provided with a ball-and-socket connection 16, one member of which is connected to the circulating tubes 13, 14, while the other member is connected to the base tube 15.

Located in the ashpit is an injector tube 17 having a downwardly extending terminal end 18, at the lower end of which a door or bonnet 19 is connected by a hinge, said door or bonnet being adapted to close by gravity when the injector tube is raised to the position shown in dotted lines in Fig. 1, and to open when lowered to the full line position in said figure. This injector tube is provided with a ball-and socket connection 20, and extends from this point through the checker work into the vortex chamber 10, and is provided with a curved terminal portion 21 within said vortex chamber, said curved terminal portion being designed to give a rotary centrifugal action to the air and steam passing through said injector tube into the vortex chamber before it is passed out through the circulating tubes 13, 14, back over and through the fire grate to consume the products of combustion.

To operate the injector tube automatically from the fire doors, I have provided a shaft 22 extending at the side of the boiler and journaled in suitable bearings 23, said shaft extending to the front of the boiler and provided with a suitable lever 24 connected by a rod 25 to a lever 26 mounted upon a shaft 27 and connected by a lever 28 to the pistons 29 and 30 of a governor valve 31 suitably mount-

ed at the front of the boiler and adapted to open and close the steam and air circulating tubes when the fire door is opened or closed, as will be understood upon reference to the drawings.

A steam pipe 32 extending downwardly from the steam pipe 3, is provided with suitable valves 33, 34 and 35, said pipe leading into the injector 18, and the valve 35 being actuated by the movement of the shaft 22 when the fire door is opened or closed to force dry steam into the injector pipe to create the vortex in the chamber 10. The circulating pipes 13 and 14 are connected by suitable connecting rods 36 to a lever 37 connected by a rod 38 to a lever 39 on the shaft 22. Also connected to said shaft is a lever 40 connected by a rod 41 to a lever 42 for opening and closing a valve 43 connected to a dry steam pipe 44, said steam pipe leading to a gas sprayer 45 provided with a nozzle 46, said nozzle having a series of jet openings 47 therein. This nozzle is located substantially in line with the upper tubes of the boiler, and is adapted to force the burnt ash, soot, dust and other products of combustion downward and backward into the fire chamber to be reburned and recirculated before the products of combustion are permitted to pass into the boiler tubes.

To operate the injector tube, a lever 48 is provided, said lever having connected thereto an extension 49, and connections 50 and 51 extend respectively to the two members of the injector tube to raise the same to the dotted line position when the shaft 22 is actuated by the opening and closing of the fire door, as will be understood.

The governor valve may be of the rotary or slide valve type to open and close the ports leading to the injector pipe and to the gas spray, but any suitable valve may be resorted to for this governor.

The operation of my invention may be described as follows:—When the fire doors are opened the valves are opened and the injector tube is moved to the full line position in Fig. 1, thus permitting the hot air and burning gases to enter the inlet end of said injector tube and dry steam to be admitted through the pipe 32 and to force a vortex circular action to the combined steam and air in the chamber 10, from whence it is forced outwardly through the pipe 13 over and through the grate bars, increasing the combustion thereof and consuming all the flying particles. The gas spray nozzle forcing a series of jets of steam into the chamber back of the bridge wall, will throw the flying particles downwardly and into the fire chamber, where they will be consumed and will assist in a more complete combustion of the fuel. As soon as the fire-doors are closed the injector tube 17 will gradually assume the position shown by dotted lines in Fig. 1, depending upon the

predetermined action of the governor valve; the valves 35 and 43 will be gradually closed and the ash pit will be opened. The furnace will then work under natural draft until the fire-doors are opened for coaling or breaking up the fire.

It will be understood that any suitable number of injector pipes, circulating tubes and spray pipes may be arranged in series extending across from end to end of the bridge wall, the number depending upon the size and character of the boiler and furnace.

The modified form illustrated in detail in Fig. 3, comprises a coil or pipe forming the terminal end *a* of the injector tube *b* within the vortex chamber *c* said pipe serving to insure a circular or centrifugal action to the burning products within the vortex chamber prior to its exit into the fire box. The circulating tube *d* is mounted in a similar manner to that shown in Fig. 1 and operated by the means already described with reference to Fig. 1.

My invention is of a comparatively simple character, is efficient in operation, and can be installed without great expense.

Various changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention, as defined by the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters-Patent, is:—

1. In an apparatus of the character described, a furnace, a fire-chamber, a bridge-wall, a vortex chamber within the bridge-wall for giving a circular, centrifugal action to steam and air, and means for forcing said steam and air into and through the fire chamber of the furnace.

2. In an apparatus of the character described, a furnace, a fire-chamber, a bridge wall, provided with a circular vortex chamber, means for forcing air and steam into said vortex chamber, and means for circulating said air and steam around the fire chamber to consume the productions of combustion, substantially as described.

3. A furnace, a fire-chamber, and a bridge wall provided with a vortex chamber, in combination with an injector pipe having a curved inlet end within said vortex chamber, means for forcing combined air and steam into said vortex chamber, and means for discharging said air and steam into and around the fire chamber of the furnace.

4. In an apparatus for increasing combustion and consuming smoke, a furnace, a fire-chamber, a fire-door and ash-pit, the combination of a bridge wall having a circular vortex chamber therein, of an injector pipe extending from the ash pit into said vortex chamber and provided with a curved inlet

end, a governor valve connected to the fire door, connections between the steam pipe and injector pipe, and means whereby when the fire door is opened the injector pipe and steam connections are put in full operation, and remain so for a period of time after the fire-door has been closed, substantially as described.

5. In an apparatus for increasing combustion, a furnace, a fire-chamber, a fire-door, a bridge-wall having a vortex chamber therein, a spray pipe having a nozzle provided with a series of jet openings, a valve in said spray pipe, and means for simultaneously operating the fire-door and said valve in the spray pipe, substantially as described.

6. In an apparatus for increasing combustion, a furnace, a fire-chamber, a fire-door, an injector tube having a downwardly extending inlet end, a door hinged to said end, said tube being provided with ball-and-socket connections and extending into a bridge wall, said bridge wall having a circular vortex

chamber, circulating tubes leading from said chamber into the fire chamber, a governor valve and connections between the governor valve, the injector tube and the circulating tube for opening and closing the steam connections to said injector tube when the fire door is opened or closed.

7. A furnace, a fire-chamber, a fire-door, and a bridge wall provided with a vortex chamber, in combination with an injector tube terminating therein, circulating pipes leading therefrom and communicating with the fire chamber, a steam pipe leading to said injector tube, a governor valve and means connecting said valve to the fire door and to the valve on the injector tube, and the valve in the steam pipe, thereby closing communication between said vortex chamber and fire chamber, substantially as described.

GEORGE R. TORREY.

In presence of—

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MAY M. PLYER.