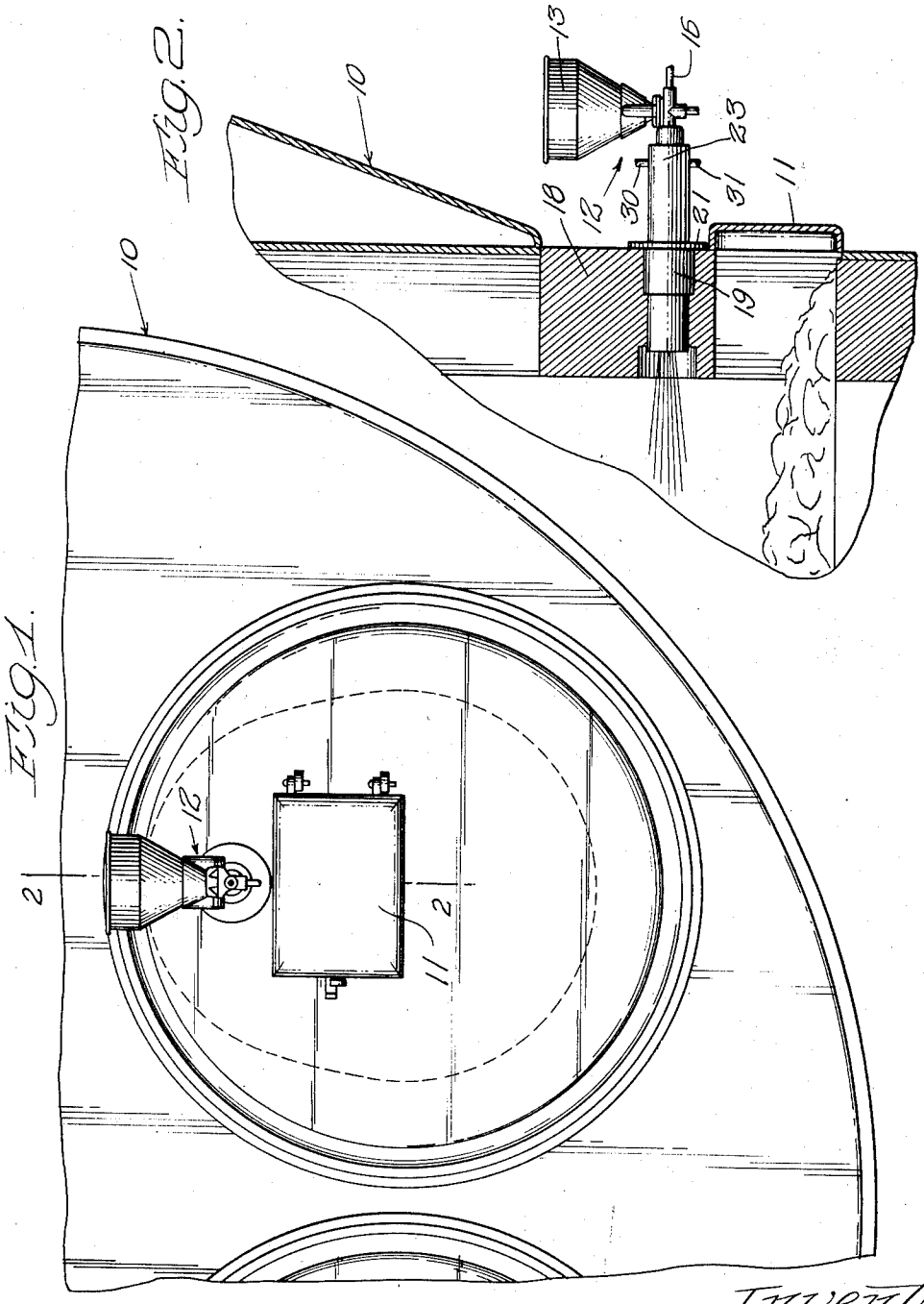
Sept. 4, 1951 H. E. DE ROQUE 2,566,320

JET DEVICE FOR FEEDING AIR, STEAM, AND CHEMICALS TO BOILER FURNACES

Filed Sept. 8, 1948

2 Sheets-Sheet 1

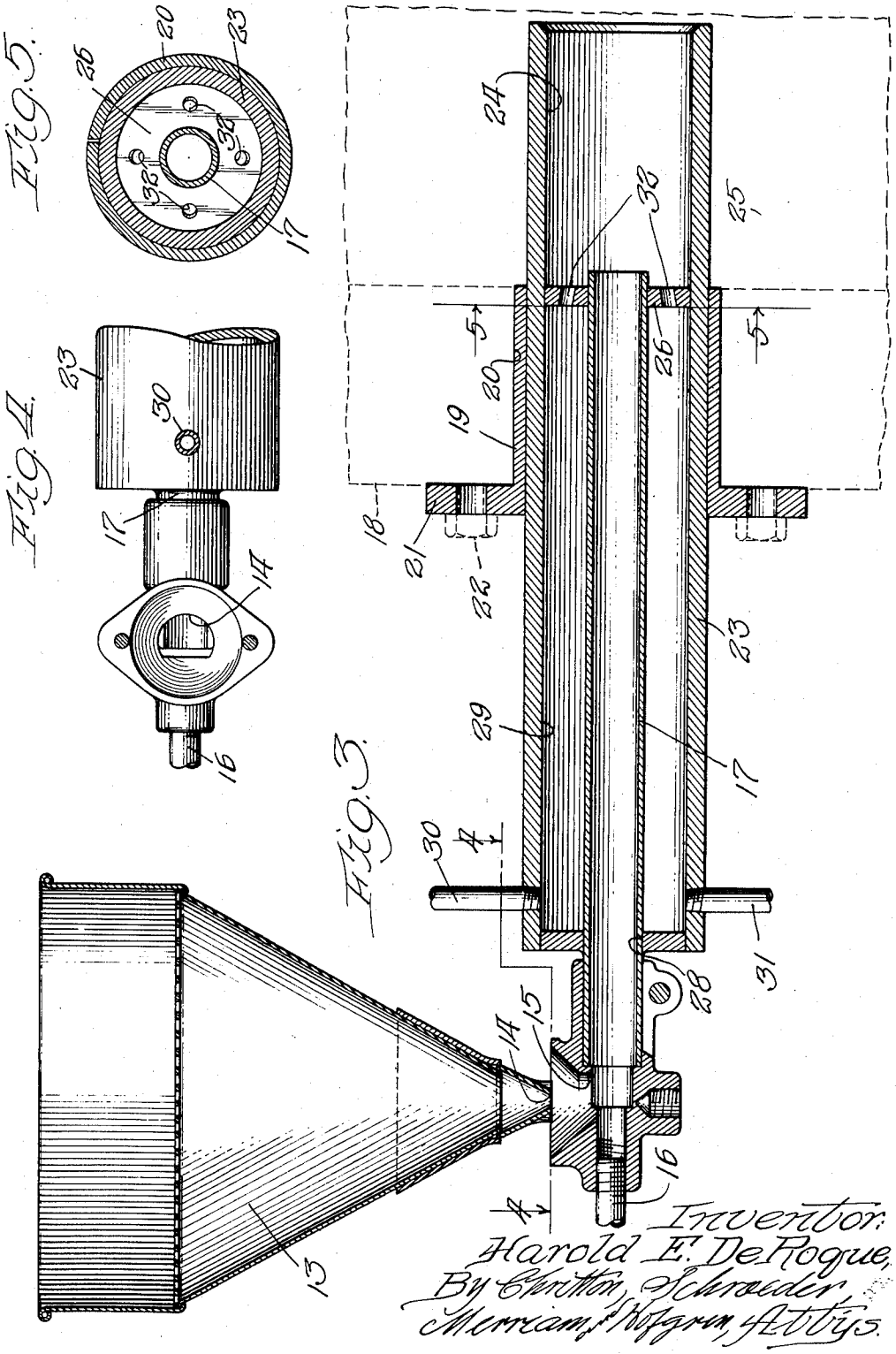


Inventor:
Harold E. De Roque,
By Chittick, Schroeder,
Merriam & Hagney, Attys.

Sept. 4, 1951 H. E. DE ROQUE 2,566,320

JET DEVICE FOR FEEDING AIR, STEAM, AND CHEMICALS TO BOILER FURNACES

Filed Sept. 8, 1948 2 Sheets-Sheet 2



Patented Sept. 4, 1951

2,566,320

UNITED STATES PATENT OFFICE

2,566,320

JET DEVICE FOR FEEDING AIR, STEAM, AND CHEMICALS TO BOILER FURNACES

Harold E. De Roque, Chicago, Ill.

Application September 8, 1948, Serial No. 48,294

7 Claims. (Cl. 110—53)

1

This invention relates to smoke elimination and improved combustion in a furnace, and more particularly to a jet device for injecting a mixture of steam, air and chemical into a boiler furnace for elimination of smoke, the disintegration of slag and cinder and the cleaning of metal heating surfaces.

It is an object of this invention to provide a unit for the injection of a combustion improving chemical into a furnace. It is a further object of this invention to provide a device wherein a mixture of fluid and chemical are introduced into a turbulent stream of fluid and carried by that stream into the interior of a boiler.

Another object of the invention is to provide a device in which a mixture of air and chemical are introduced into a swirling stream of steam emanating from jet nozzles and carried thereby into the combustion chamber of a furnace.

Yet another object of the invention is to provide a device of the type described in the previous paragraphs which is sturdily constructed and is readily attachable to a furnace as well as to a boiler.

Other and further objects of the invention will be apparent from the following description and drawings in which Fig. 1 is a plan view of a portion of a furnace showing my device attached thereto; Fig. 2 is a sectional view along lines 2—2 of Fig. 1. Fig. 3 is a vertical cross-section through the chemical supply unit and jet unit of the invention. Fig. 4 is a sectional view along lines 4—4 of Fig. 3; and Fig. 5 is a section along lines 5—5 of Fig. 3.

Referring now to the drawings, I show a ship's boiler which is provided with the usual fire door 11. Located just above the fire door is my jet injection unit generally designated as 12. The unit comprises a chemical hopper 13 adapted to contain a combustion improving chemical such as "Oxi." "Oxi" is a dry powder, bluish in color, having a grain size about the same as granulated sugar and consisting of approximately 65% sodium chloride and 31% sodium chlorate, the balance of 4% being made up of dyes, a trace of moisture, and other minor additives. The injection of such a chemical into the combustion chamber of a boiler has the effect of minimizing smoke emanating from the boiler, of cleaning all metal heating surfaces of fire scale which forms thereon and of disintegrating slag and cinder that fill up back heads and plug up boiler tubes, economizers, super-heaters, air heaters and breachings. The hopper is provided with an opening 14 at the bottom leading into

2

a chamber 15. Also connected to the chamber is a pipe 17 having its outer end 16 open to the atmosphere. The action of the jets hereinafter described serves to draw air into the pipe 17 through the end 16 to move the chemical therethrough. If desired, however, the end 16 may be connected to a source of compressed air to force the chemical through the pipe 17.

Connected to the sidewall 18 of the boiler is a collar 19 extending through hole 20 in the boiler, the collar having a flange 21 abutting the exterior surface of the boiler and secured thereto by nuts 22. Firmly held within the collar 19 is a tube 23 having an open end 24 located within the combustion chamber 25. A diaphragm 26 is positioned transverse of the tube 23 and located some distance inward of the annular end 24 of the tube. The outer end 27 of the tube is closed by a plate having an opening 28 therein through which the pipe 17 extends, the pipe terminating a short distance beyond the diaphragm 26. It can be seen from the foregoing that a chamber 29 is formed in the tube between the closed end 27 and the diaphragm 26. Connected to the chamber 29 is a steam line 30 connected to a source of steam under pressure (not shown) and a return or drain line 31 leads away from the chamber. The diaphragm 26 is provided with a plurality of openings therein, identified as 32, which are in the form of jet units or nozzles inclined toward the axis of the tube 23.

As the tube 23 together with the diaphragm 26 and the pipe 17 are subjected to considerable heat, I constructed the unit of high pressure seamless tubing which is heat treated and copper welded to relieve all internal stresses in the metal. The jet units 32 are made of non-corrosive non-magnetic stainless steel. The tube itself is heavily copper plated and then chrome plated on all interior and exterior surfaces. Heat absorbed by the tube is rapidly dissipated by the copper and carried off by the chrome-plate. Heat from the combustion chamber is conducted by the walls of the tube to the chamber 29 and serves to superheat steam therein. Thus, clogging of the jets by wet steam is avoided.

In operation, with my device attached to the walls of a boiler as shown, chemical may be metered into the pipe 17 and ejected therefrom by the action of the air coming through the end 16. With the pipe 30 attached to a source of high pressure steam such steam is ejected through the jet orifices 32 in a spirally swirling stream of steam which travels to all parts of the boiler, carrying chemicals introduced thereto

from the pipe 17 and inducing an accompanying flow of air.

It is not necessary that chemical need constantly be metered into the boiler to prevent fire scale from forming on the tubes and to disintegrate slag and cinders. Introduction of chemicals into the boiler may be periodic as the occasion demands and such periodic injection of chemicals will maintain the boiler clean of fire scale and cinders practically indefinitely.

It is not necessary that smoke produced by the boiler be minimized except when the boiler is in a factory installation near a town or city or when the boiler is on a ship traveling in rivers and passing through cities. Smoke, however, may be minimized by introducing steam along with my device and may be almost completely eliminated by injecting the desired quantity of chemical into the combustion chamber along with the steam.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims.

I claim:

1. A jet unit comprising: a tube having an open end and a closed end and adapted to be secured to a combustion chamber with the open end extending into said chamber, a diaphragm intermediate the ends of the tube to form with the closed end a chamber section, said diaphragm being provided with an opening defining a jet connected to the chamber section and directed toward the open end of the tube, means for connecting the chamber section to a source of fluid pressure, a pipe having one end opening exteriorly of the tube and having an intermediate portion connected to the tube and extending through the diaphragm with the other end of the pipe terminating short of the open end of the tube, means for introducing chemical into the intermediate portion of the pipe, and means for inducing a flow of fluid through said pipe to carry chemical introduced therein to said other end of the pipe.

2. A jet unit comprising: a tube having an open end and a closed end and adapted to be secured to a combustion chamber with the open end extending into said chamber, a diaphragm intermediate the ends of the tube to form with the closed end a chamber section, said diaphragm being provided with an opening defining a jet connected to the chamber section and directed toward the open end of the tube, means for connecting the chamber section to a source of fluid pressure, a pipe connected to the tube and having one end open to the atmosphere exteriorly of the tube and having an intermediate portion extending through the diaphragm, with the other end of said pipe terminating short of the open end and means for introducing granular material to the intermediate portion of the pipe.

3. A jet unit comprising: a tube having an open end and a closed end and adapted to be secured to a combustion chamber with the open end extending into said chamber, a diaphragm intermediate the ends of the tube to form with the closed end a chamber section, said diaphragm being provided with a plurality of openings each defining a jet, with all of the jets being connected to the chamber section and being directed toward the open end of the tube and with the axis of

said jets being inclined toward the axis of the tube, means for connecting the chamber section to a source of steam pressure, a pipe having one end extending outwardly of the tube and having an intermediate portion extending coaxially through the closed end of the tube and through the diaphragm and said pipe having its other end terminating short of the open end of the tube, a source of chemical supply, means connecting the source to the intermediate portion of the pipe for introducing chemical thereto and means for inducing a flow of air through said pipe to pick up and carry chemical introduced therein to said other end of the pipe.

4. In combination with a combustion chamber, a jet unit comprising: a tube connected to the chamber having an open end within the chamber and a closed end exterior of the chamber, a diaphragm intermediate the ends of the tube to form with the closed end a chamber section, said diaphragm being provided with a plurality of openings each defining a jet, with all of the jets being connected to the chamber section and being directed toward the open end of the tube, a source of steam pressure, means for connecting the chamber section to said source, a pipe extending coaxially through the closed end of the tube and through the diaphragm and terminating short of the open end, a source of chemical supply, a metering device for delivering a metered quantity of chemical from said last mentioned source to said pipe and means for inducing a flow of air through said pipe for carrying chemical in said pipe toward the open end of said tube.

5. In combination with a combustion chamber, a jet unit comprising a tube of heat-conducting metal having an open end and a closed end, a diaphragm intermediate the ends of the tube to form with the closed end a chamber section, said tube extending through the walls of the combustion chamber with the open end of the tube within the combustion chamber and with at least a portion of the chamber section within said walls and with the closed end of the tube exterior of the chamber, said diaphragm being provided with a plurality of openings each defining a jet, with all of the jets being connected to the chamber section and being directed toward the open end of the tube, a source of steam pressure, means for connecting the chamber section to said source, a pipe extending coaxially through the closed end of the tube and through the diaphragm and terminating short of the open end, a source of chemical supply, a metering device for delivering a metered quantity of chemical from said last mentioned source to said pipe and fluid pressure means for carrying chemical in said pipe toward the open end of said tube.

6. A jet unit comprising: a tube having an open end and a closed end and adapted to be secured to a combustion chamber with the open end extending into said chamber, a pipe having one end extending outwardly of the tube and having an intermediate portion extending coaxially through the closed end of the tube with the other end of the pipe terminating short of the open end of the tube, means defining a plurality of jets each having an open discharge end located within and intermediate the ends of said tube, means for connecting the jets to a source of fluid pressure, means for introducing granular material to the intermediate portion of the pipe and means for inducing a flow of air through said pipe to carry the material introduced therein to said other end of the pipe.

7. A jet unit comprising: a tube having an open

end and a closed end and adapted to be secured to a combustion chamber with the open end extending into said chamber, a diaphragm intermediate the ends of the tubes to form with the closed end a chamber section, said diaphragm being provided with a plurality of openings each defining a jet, with all of the jets being connected to the chamber section and being directed toward the open end of the tube, means for connecting the chamber section to a source of steam under pressure, a pipe having one end extending outwardly of the tube and having an intermediate portion extending coaxially through the closed end of the tube and through the diaphragm and said pipe having its other end terminating short of the open end of the tube, a hopper adapted to contain a source of chemical, a metering device for delivering a metered supply of chemical to the intermediate portion of said pipe and means

for inducing a flow of air through said pipe to pick up and carry chemical in the pipe toward the open end of the tube.

HAROLD E. DE ROQUE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
814,550	Lewis	Mar. 6, 1906
1,020,612	Lawton	Mar. 19, 1912
2,231,244	Berthiaume	Feb. 11, 1941

FOREIGN PATENTS

Number	Country	Date
14,137	Great Britain	June 21, 1902