

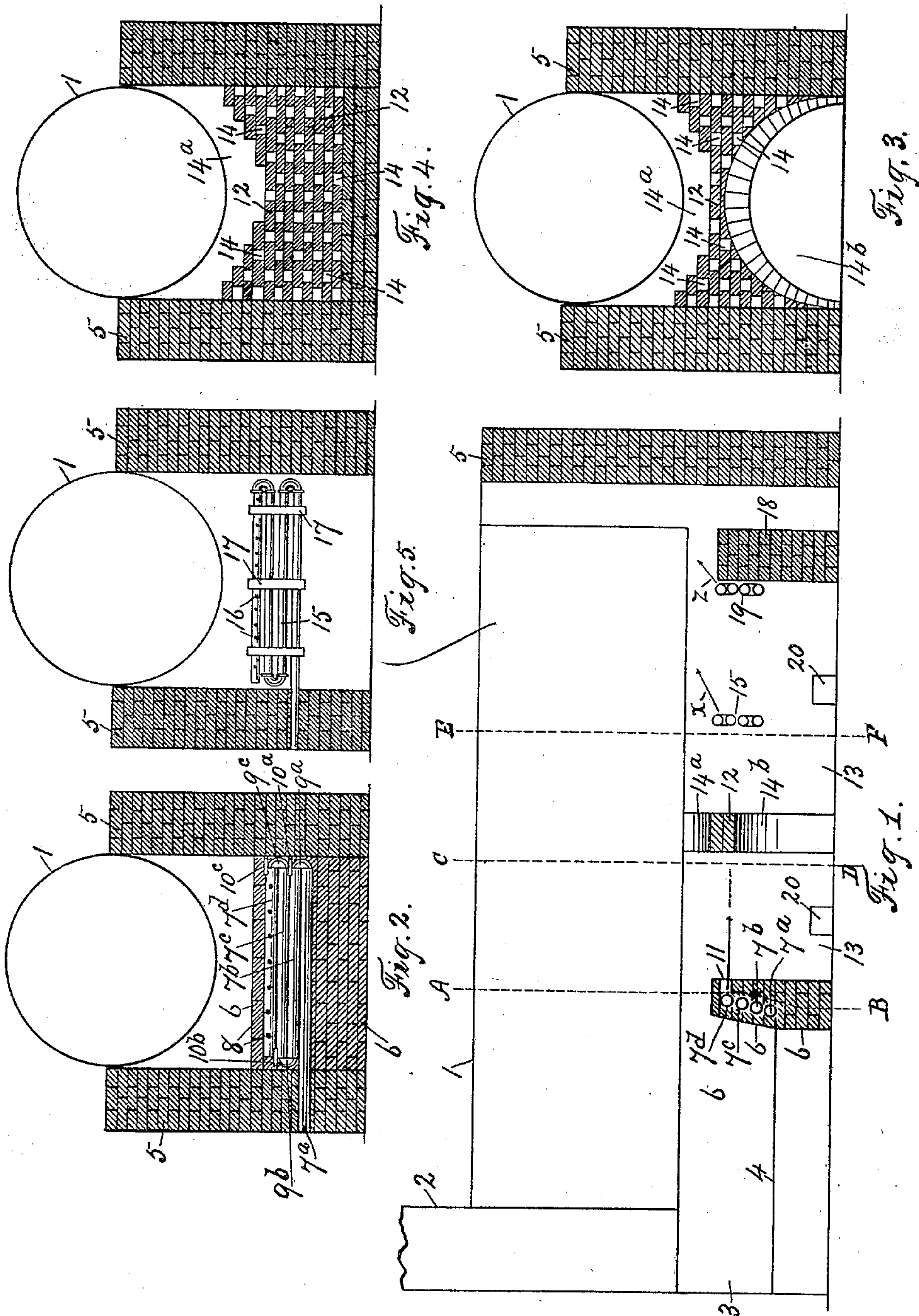
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C. W. FRANCISCO.
FUEL SAVER AND SMOKE CONSUMER.

(Application filed Nov. 27, 1901.)

(No Model.)



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UNITED STATES PATENT OFFICE.

CHARLES W. FRANCISCO, OF BRANTFORD, CANADA.

FUEL-SAVER AND SMOKE-CONSUMER.

SPECIFICATION forming part of Letters Patent No. 706,229, dated August 5, 1902.

Application filed November 27, 1901. Serial No. 83,852. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. FRANCISCO, a citizen of the United States, and a resident of the city of Brantford, in the county of Brant, in the Province of Ontario, Canada, have invented a certain new and useful Fuel-Saver and Smoke-Consumer, of which the following is a specification.

This invention relates to the economizing and saving of fuel and the consuming of smoke, particularly in the furnaces of stationary return-flue steam-boilers; and it consists of the improved construction and novel combination of parts, as will be hereinafter first fully set forth and described and then pointed out in the claims.

Reference being had to the accompanying drawings, Figure 1 is a central longitudinal sectional view of a steam-boiler furnace. In this view a side elevation of the boiler is shown. Fig. 2 is a transverse vertical sectional view on the line A B of Fig. 1. Fig. 3 is a transverse vertical sectional view on the line C D of Fig. 1. Fig. 4 is a transverse vertical sectional view of a modification of the construction shown on the line C D of Fig. 1. Fig. 5 is a transverse vertical sectional view on the line E F of Fig. 1.

In the accompanying drawings the numeral 1 designates a stationary return-flue steam-boiler; 2, the smoke-stack; 3, the furnace; 4, the grate-bars, and 5 the side boiler-walls.

6 designates the furnace bridge-wall, in which the air-pipes 7^a, 7^b, 7^c, and 7^d, open at both ends, are placed, and one of said pipes, 7^a, opens into the air outside of the side boiler-wall, and said pipes are arranged one above the other, and in the upper pipe, 7^d, the openings 8 are formed.

9^a, 9^b, and 9^c designate recesses or pockets formed in said furnace bridge-wall 6 at the ends of the pipes 7^a, 7^b, 7^c, and 7^d, as shown in Fig. 2 of the accompanying drawings, and immediately above said recesses the metal plates 10^a, 10^b, and 10^c, respectively, are secured in place to form an abutment for and to conduct the air from one pipe to the other and for separating the recesses or pockets 9^a and 9^c.

11 designates hot-air ports formed in the furnace bridge-wall 6, and said ports extend from said hot-air pipe 7^d to the back of said

furnace bridge-wall 6, and one of the openings 8 opens into one of each of said ports 11.

12 designates a baffle-wall in the combustion-chamber 13, and in said wall the openings 14 and arch draft-opening 14^a are formed, and said wall 12 extends to the floor, as shown in Fig. 4, or, if preferred, said baffle-wall may be formed with an arched opening 14^b, as shown in Fig. 3.

15 designates a series of pipes folded and connected together and communicating with one another, as shown in Fig. 5, the lower one of which opens into the air outside of the side boiler-wall 5, and in the upper pipe perforations 16 are formed, and said pipes are held together, supported by, and held the proper distance apart by the clasps 17, (shown particularly in Fig. 5,) and said pipes 15 are located about midway between the baffle-wall 12 and the back bridge-wall 18, and 19 designates another series of pipes constructed, arranged, and supported similar to the series of pipes 15, but placed adjacent to the back bridge-wall 18, as shown particularly in Fig. 1.

20 designates doors through which the ashes and other refuse which might collect in the combustion-chamber 13 is removed.

The operation is as follows: The combustion of the fuel takes place in the ordinary manner on the grate-bars 4, and the flame, smoke, and valuable heat-producing inflammable gases evolved by the combustion of the fuel flow over the furnace bridge-wall 6 and strike against the baffle-wall 12. At the same time the fresh air passing into the pipe 7^a from the outside of the boiler-wall passes into and through the pipes 7^b, 7^c, and 7^d, where it is superheated by its close proximity to the fire on the grate-bars 4. This superheated air passes out of the pipe 7^d through the openings 8 and into and through the ports 11 in the back of the furnace bridge-wall with sufficient momentum to strike against the baffle-wall 12, and this superheated air, together with the flame, smoke, and heat-producing inflammable gases, striking against said baffle-wall and being split up to pass through the openings 14 in said baffle-wall become thoroughly incorporated and mingled together. As a result a complete and perfect combustion of the whole or the greater part

of said flame, smoke, and gases takes place; but the volume of flame, smoke, and heat-producing inflammable gases passing from the furnace to the combustion-chamber varies. Sometimes there is an excess of smoke or an excess of the finely-divided particles of carbon suspended in the inflammable gases. In this case if the excess of any products of combustion should pass the baffle-wall 12 this product, as well as the flame caused by the combustion at the baffle-wall, is acted upon by finer sprays or streams of fresh air which have been superheated by passing through the pipes 15, and said air passes out of said pipes 15 through the perforations 16 in the direction of the arrow x with sufficient momentum to penetrate and again split up the flame and smoke, if any, passing through said baffle-wall 12. The result is that a further and more complete and perfect combustion takes place. If the excess of smoke or an excess of the finely-divided particles of carbon should be such as to pass the pipes 15, they would come in contact with still finer sprays of superheated air passing out of the pipes 19 in the direction of the arrow z . This will again split up said flame and smoke and form a perfect and complete combustion thereof. As a result a perfect and complete combustion takes place of all the smoke and heat-producing inflammable gases of any quantity and from any kinds of fuel within a reasonable limit at which it would be at all economical to run the boilers. The result of the construction and arrangement of the parts hereinbefore described is that the smoke and the valuable heat-producing inflammable gases evolved by the combustion of the fuel is intermingled with superheated fresh air before the temperature of the carbon contained in the gas, then in the state of flame, is reduced below that necessary for ignition. A further result is that fresh air is introduced to consume any carbonaceous particles which have escaped the action of the air at the furnace bridge-wall, and a further result is that said inflammable gases containing said finely-divided particles of carbon or any excess thereof has first to strike against the baffle-wall, as well as the superheated air from the pipe 7^a, and has to pass through the openings 14 in the baffle-wall 12, which splits it up, as well as the sprays of superheated air from the pipes 15 and 19, and thus permits the superheated air to become thoroughly incorporated and intermingled therewith to form a perfect and complete combustion of the whole. Thus a large percentage in the economizing and saving of fuel is accomplished and the smoke is consumed. Consequently the use of steam-boilers provided with this invention in thickly-populated localities is less prejudicial to the public health and comfort than those in ordinary use.

I have found by experiment that the construction herein shown and described gives

the best results. At the same time, while I prefer said construction, I do not wish to limit myself to the details thereof, as they may be modified in various ways without departing from the spirit of my invention.

Having thus described my invention, I claim—

1. In a device of the class described, a bridge-wall provided with hot-air ports and pockets or recesses, in combination with superheating air-conducting pipes open at both ends and located in said bridge-wall, the upper one of said pipes provided with openings leading into said hot-air ports, in said bridge-wall, and said pockets or recesses being formed in said bridge-wall at the ends of said pipes, so that the air will be conducted from one pipe to the other, and one of said pipes extending to the outside of the boiler-wall, substantially as and for the purpose set forth.

2. In a device of the class described, a bridge-wall provided with hot-air ports and pockets or recesses, in combination with superheating and air-conducting pipes, open at both ends, and located in said bridge-wall, the upper one of said pipes provided with openings leading into said hot-air ports in said bridge-wall, and said pockets formed in said bridge-wall, at the ends of said pipes, so that the superheated air will pass from one pipe to the other, and one of said pipes extending to the outside of the boiler-wall, and abutment-plates at the upper side of each of said pockets or recesses, substantially as and for the purpose set forth.

3. In a device of the class described, a bridge-wall provided with hot-air ports and pockets or recesses, superheating air-conducting pipes open at both ends and located in said bridge-wall, the upper one of said pipes provided with openings leading into said hot-air ports, in said bridge-wall, and said pockets or recesses formed in said bridge-wall, at the end of said pipes so that air will be conducted from one pipe to the other, and one of said pipes extending to the outside of the boiler-wall, in combination with a steam-boiler, a combustion-chamber, a baffle-wall located therein, openings in said baffle-wall, and a draft-opening between said boiler and said baffle-wall, substantially as and for the purpose set forth.

4. In a device of the class described, a bridge-wall provided with hot-air ports and pockets or recesses, superheating air-conducting pipes open at both ends and located in said bridge-wall, the upper one of said pipes provided with openings leading into said hot-air ports, in said bridge-wall, and said pockets or recesses formed in said bridge-wall, at the end of said pipes so that air will be conducted from one pipe to the other, plates at the upper side of each of said pockets or recesses, and one of said pipes extending to the outside of the boiler-wall, in combination with a steam-boiler, a combustion-chamber, a baffle-wall located therein, openings in said

baffle-wall, and a draft-opening between said boiler and said baffle-wall, substantially as and for the purpose set forth.

5 In a device of the class described, a bridge-wall provided with hot-air ports and pockets or recesses, superheating and air-conducting pipes, open at both ends, and located in said bridge-wall, the upper one of said pipes provided with openings leading into the
10 hot-air ports in said bridge-wall, and said pockets or recesses formed in said bridge-wall at the end of said pipes so that the air will be conducted from one pipe to the other, and one of said pipes extending to the outside of the
15 boiler-wall, in combination with a combustion-chamber, a baffle-wall located therein in which openings are formed, and a draft-opening between the boiler and said baffle-wall, and one or more series of superheating air-
20 conducting pipes located in said combustion-chamber, openings in each series of said pipes, and one of each of said series of said pipes extending to the outside of the boiler-wall, substantially as and for the purpose set forth.

25 6. In a device of the class described, a bridge-wall provided with hot-air ports and pockets or recesses, superheating air-conduct-

ing pipes open at both ends and located in said bridge-wall, the upper one of said pipes provided with openings leading into the hot- 30 air ports in said bridge-wall, and said pockets or recesses formed in said bridge-wall at the end of said pipes so that the air will be conducted from one pipe to the other, plates at the upper side of each of said pockets or re- 35 cesses, and one of said pipes extending to the outside of the boiler-wall, in combination with a combustion-chamber, a baffle-wall located therein in which openings are formed, and a draft-opening between the boiler and said 40 baffle-wall, and one or more series of superheating air-conducting pipes located in said combustion-chamber, openings in each series of said pipes, and one of each of said series of said pipes extending to the outside of the 45 boiler-wall, substantially as and for the purpose set forth.

In testimony whereof I have signed in the presence of the two undersigned witnesses.

CHARLES W. FRANCISCO.

Witnesses:

P. J. EDMUNDS,
M. E. KELLY.