

F. J. DOYLE.
FURNACE.

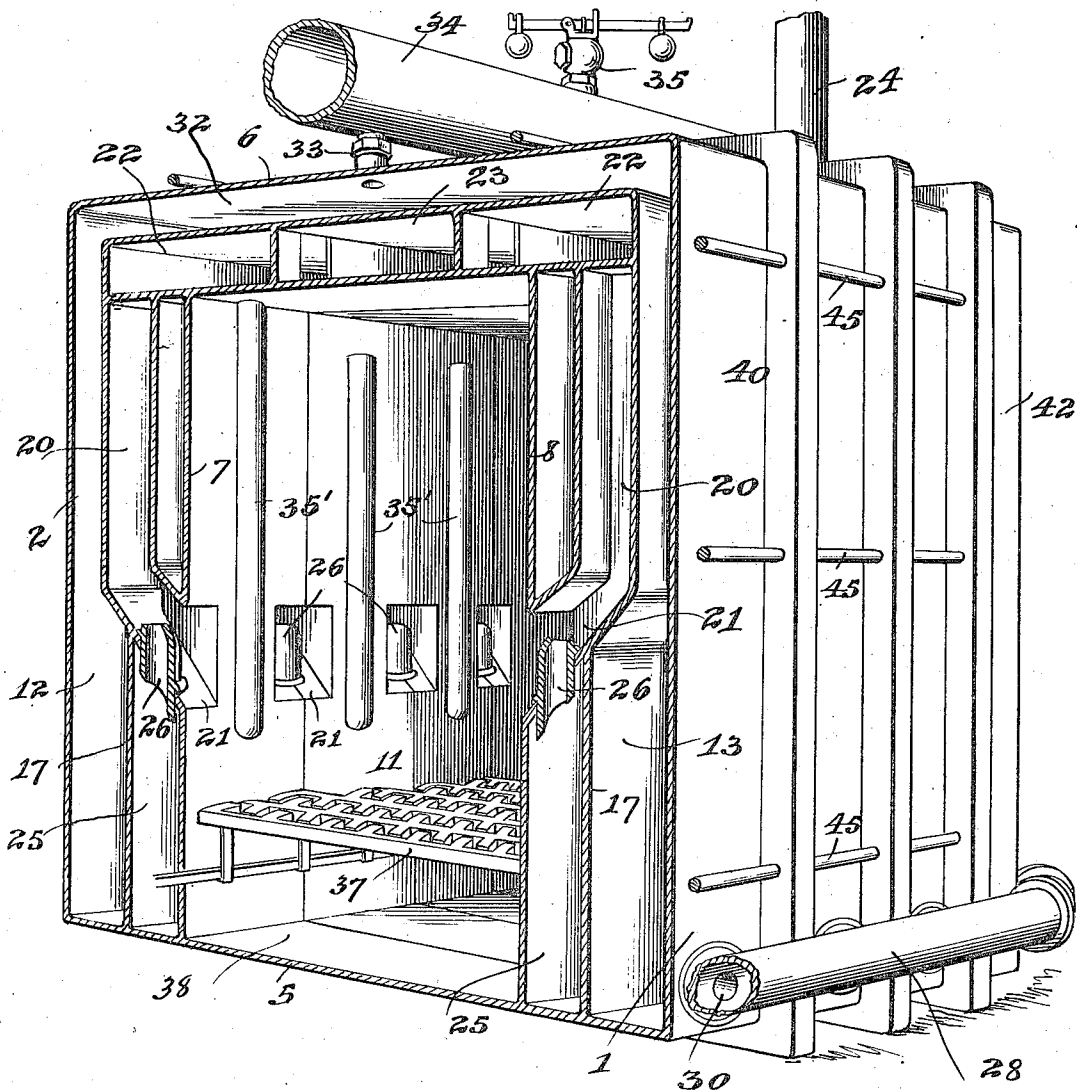
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1,062,147.

Patented May 20, 1913.

4 SHEETS—SHEET 1.

Fig. 1.



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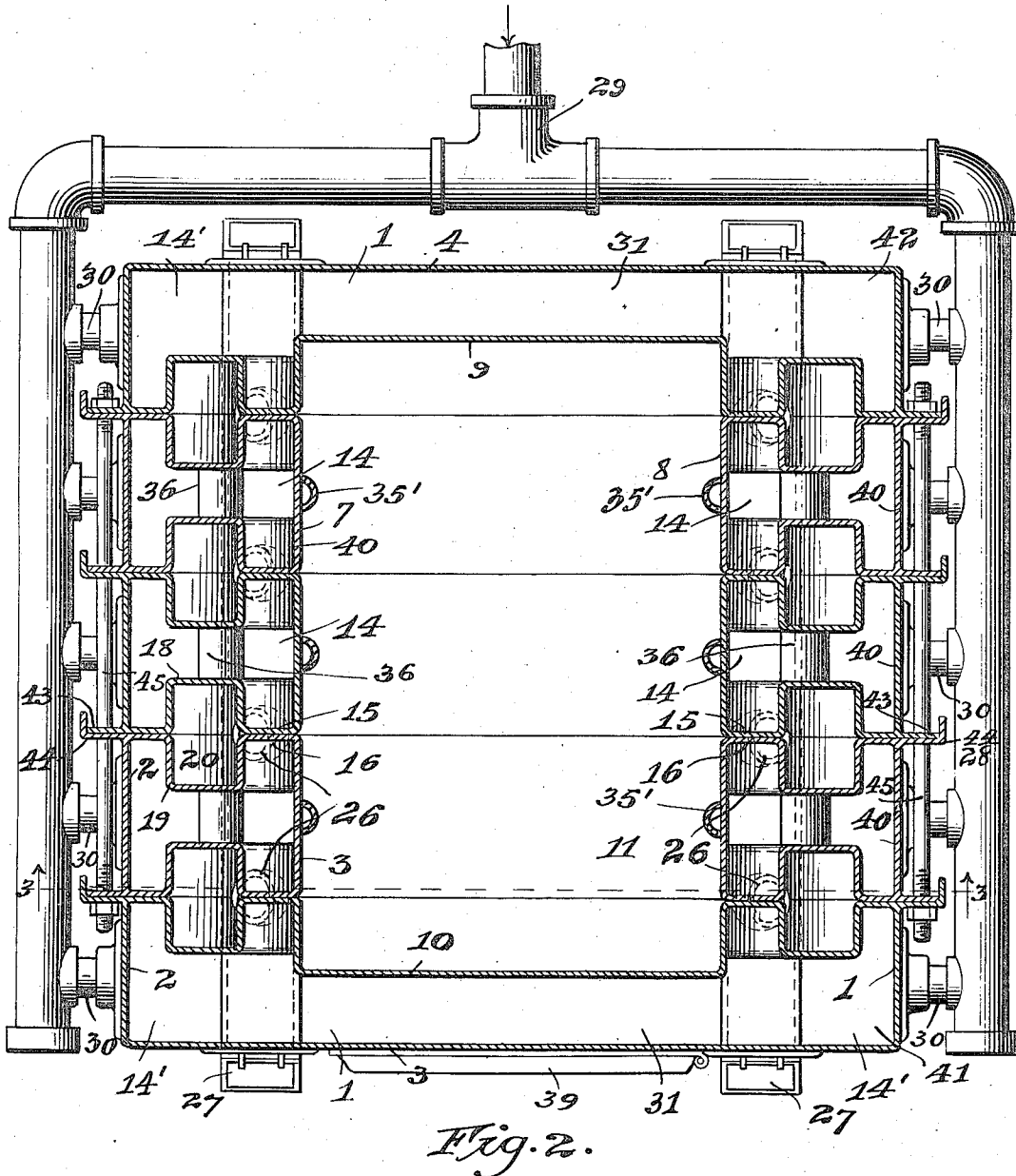
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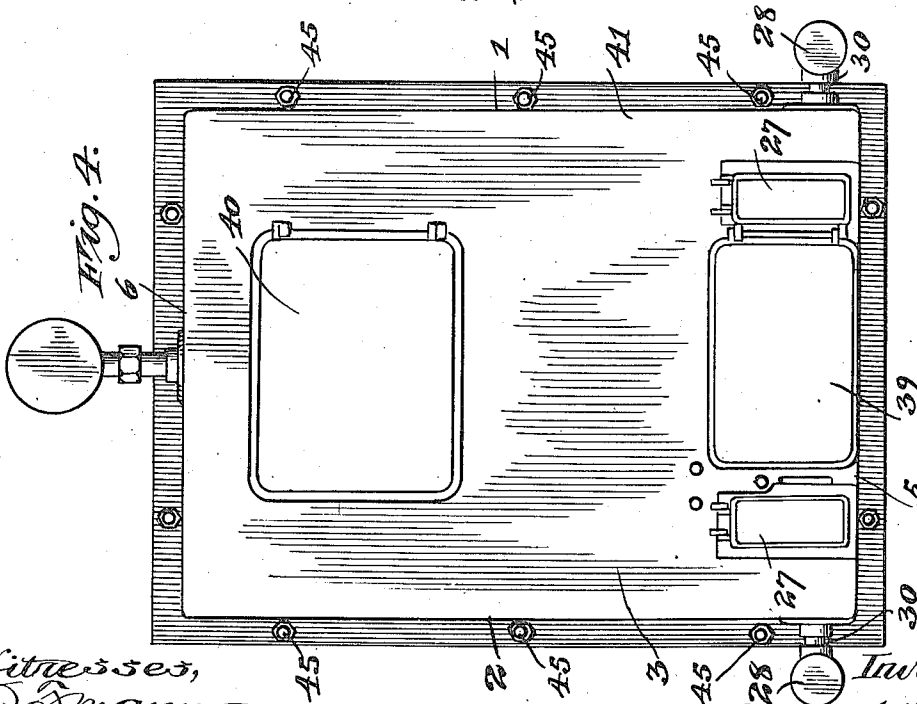
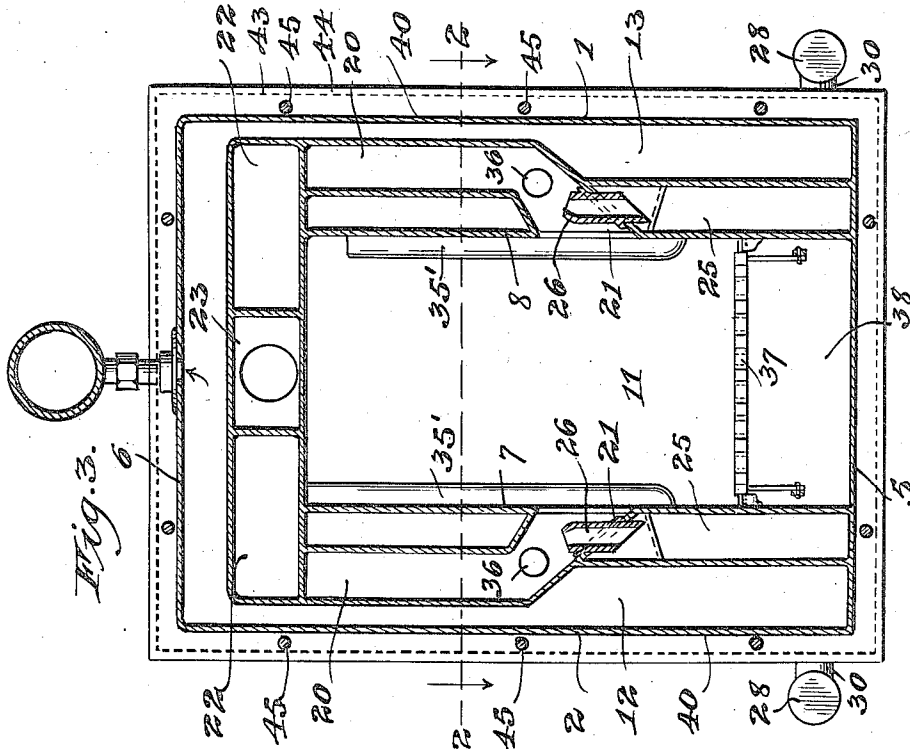
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4 SHEETS—SHEET 3.



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4 SHEETS—SHEET 4.

Fig. 6.

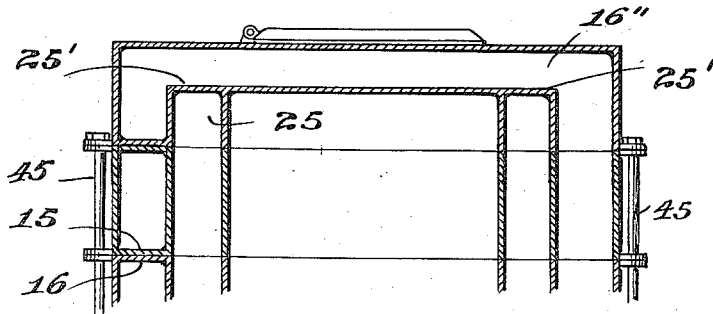
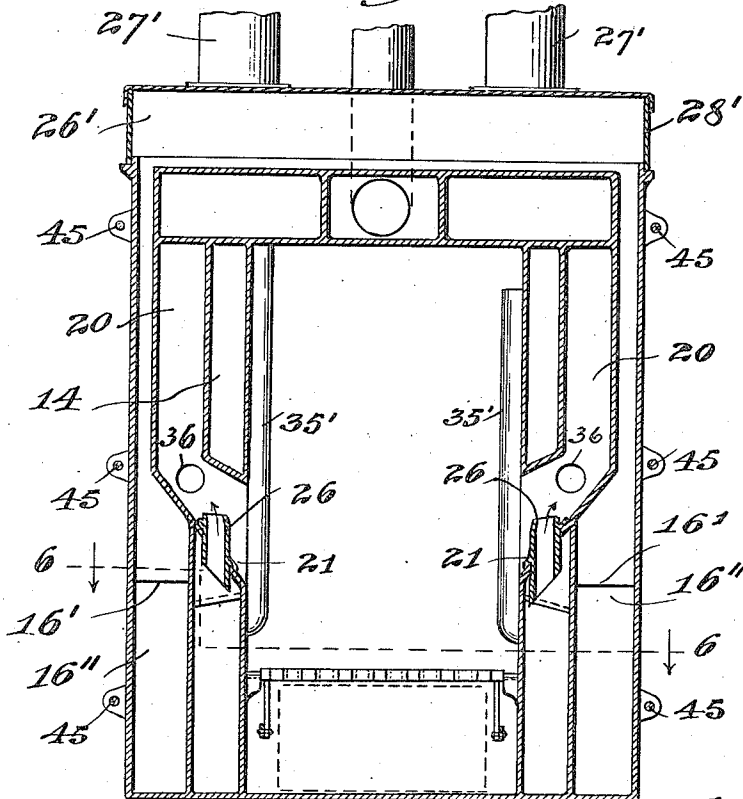


Fig. 5.



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UNITED STATES PATENT OFFICE.

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FURNACE.

1,062,147.

Specification of Letters Patent.

Patented May 20, 1913.

Application filed July 19, 1909. Serial No. 508,410.

To all whom it may concern:

Be it known that I, FRANCIS J. DOYLE, a citizen of the United States, residing in the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

This invention relates to improvements in furnaces and in the embodiment shown is adapted for heating boiler for the generation of steam, although capable of use with suitable modifications for hot air heating and the like.

Among the salient objects of the invention are to provide a construction in which the flames of combustion are carried directly into closed flues or combustion chambers seated in the boilers whereby the water and steam entirely surround the flames, thus securing a maximum heating surface for the boiler; to provide a construction in which the products of combustion pass laterally out of the fire chamber directly into the combustion chambers, traverse back and forth, and finally pass out through the chimneys; to provide such a construction that an effective and very perfect combustion is secured with the aid of only so much draft as will carry away the waste gases, and in which practically the entire heat from the products of combustion is carried directly into the boiler chambers; to provide a construction in which the proper supply of air to the combustion chambers is regulated by the heat of the flames of combustion themselves; to provide a construction which may be readily adapted for use with either steam, hot water, or hot air heating; to provide a furnace of the above character consisting of a plurality of sections of uniform construction, whereby the size of the furnace may be varied as desired by changing the number of sections; to provide a construction which may be readily assembled or disconnected and which is particularly adapted for use with portable furnaces and the like; to provide a simple and efficient construction which can be manufactured at a relatively low cost; and in general to provide a construction of the character referred to.

The invention consists in the matters hereinafter described and more particularly pointed out in the appended claim.

In the drawings—Figure 1 is a perspective view of my invention with the front part of a furnace shown in section in order

to bring out certain details of construction; Fig. 2 is a horizontal sectional view taken approximately on lines 2, 2 of Fig. 3 but shown on an enlarged scale. Fig. 3 is a vertical sectional view taken through one of the intermediate sections. Fig. 4 is a front end elevation of the furnace. Fig. 5 is a vertical sectional view of a modified construction. Fig. 6 is a fragmentary horizontal sectional view taken on lines 6—6 of Fig. 5.

Referring to the drawings, 1 and 2 designate as a whole the side walls of the furnace, 3 and 4 the vertical front and rear end walls respectively, 5 the bottom and 6 the top wall of the furnace. The interior of the furnace is provided with two longitudinally extending partition walls 7 and 8 and connecting transverse end walls 9 and 10 which together form the fire box 11. The space between the inner partition walls 7 and 8 and the outer walls of the furnace form the boiler spaces 12 and 13 of the furnace. As a feature of construction, however, each of these boiler spaces is divided into a plurality of boiler chambers 14 by means of cross-connecting vertical partitions 15 and 16 respectively. Each of the partitions is offset at its lower ends as shown at 17, and is provided with opposed vertically extending channels 18 and 19 respectively. Each pair of these channels forms a vertically extending combustion chamber 20, the lower end of which communicates with the fire box by means of ports 21.

At its upper end the furnace is provided at either side with a longitudinally extending flue 22 and an intermediate common exhaust flue 23, the rear end of which communicates with a chimney or stack 24. The common exhaust 23 communicates at its front end with the respective flues 22 and the latter are in turn provided with a series of ports, which permit the gases of combustion to pass out of the combustion chambers 20 into the flues. The lower ends of each series of combustion chambers 20 communicate with a common air chamber 25 by means of a series of air conduits 26; there being one for each of the combustion chambers. Each of these air chambers 25 is closed at its front end by means of any suitable door 27, as shown more clearly in Fig. 4. At either side of the furnace is suitably mounted a water supply pipe 28, the inlet ends of which communicate with common supply pipe 29.

Each of these pipes 28 are connected to the respective boiler chambers by means of branch pipes 30. Each opposed pair of boiler chambers 14 communicate at its upper ends with a horizontally extending steam passage 32 to each of which is connected a branch pipe 33 leading to the main steam pipe 34. The latter is, of course, provided with the usual safety valve 35. It is to be noted that the outermost boiler chambers 14 also communicate at their outer sides with each other by means of transversely extending passages 31 formed by the end walls 3 and 4 and the intermediate partitions 9 and 10. By means of these passages 31 the fire box is entirely surrounded by the boiler chambers and accordingly whatever heat would naturally pass through the end walls of the fire-box passes into the boiler or water box. In order to insure a uniform supply of air to each of the combustion chambers, the latter may communicate with each other by means of cross conduits or ports 36 as shown.

The fire-box is provided with the usual grate 37 which is spaced above the floor of the furnace a sufficient distance to form the usual ash-pit 38. The front end of the latter is closed by any suitable door structure 39. Fuel may be inserted into the fire-box by means of a door 40 and in order to insure a sufficient supply of oxygen to the upper port of the fire-box, I provide a series of pipes 35', the upper ends of which communicate with the fire-box and the lower ends with the air chambers 25. Preferably pipes 35' also conduct air from the chambers 25 into the flues.

As an important feature of the present invention the furnace is composed of a plurality of intermediate sections 40 and front and rear sections 41 and 42 respectively. Each of these sections forms a unitary structure, the walls and partitions of which together form the chambers in the manner heretofore described. It will be noted that the channeled cross partitions 15 and 16 are provided with flange like extensions 43 and 44 which are united by means of horizontally extended bolts 45, 45. The outer sections 41 and 42 are of a generally similar construction except that the offset portions 14' communicate with each other by means of the transversely extending passages 31 as heretofore described. It is apparent that any number of intermediate sections may be used without necessitating any change in the construction of the furnace.

The operation of the furnace may be briefly described as follows:—As the products of combustion pass through the various ports 21 they will mingle with the incoming air from the conduits 26 and will pass

up through the combustion chambers 20, passing thence into the transversely extending flues the flames will traverse back and forth as heretofore described and finally pass out through the chimney. Inasmuch as the boiler chambers substantially surround the combustion chambers, it will be seen that a maximum heating surface is secured. At the same time the construction of the furnace is such that practically all the heat is utilized in converting the water into steam instead of passing out directly through the chimney as is usually done. The sectional arrangement permits of the furnace being readily shipped and also decreases the cost of manufacture.

In Figs. 5 and 6 I have shown a somewhat modified construction in which the furnace is equipped for use with hot air heating. In this modification the cross connecting partitions 15 and 16 are each cut away intermediate their height as shown at 16' in order to form a continuous passage 16'' for the heated air. It is, of course, necessary that the cold air supply for the products of combustion does not intermingle with the heated air, and accordingly the rear end of the air chambers 25 are closed as shown at 25'. The upper ends of the various hot air chambers communicate with a delivery chamber 26' formed by a hood 28'. Suitable pipes 27' convey the heated air from the chamber 26' to the various rooms in the usual manner.

The invention is not limited to the details of construction shown except as set forth in the appended claim.

I claim as my invention:

In a furnace, the combination with a longitudinally extending fire box of substantially the same height as the furnace, a boiler extending around said fire box, a plurality of combustion chambers extending along either side of said fire box, between the latter and the boiler, said combustion chambers terminating at points above the base of the fire box, inlet conduits at the lower end of said combustion chambers, a common air chamber beneath each row of combustion chambers and communicating with the latter, a pair of flues extending longitudinally of the furnace above the combustion chambers, air conduits extending from said air chamber to the tops of said combustion chambers and to said flues, a common exhaust flue intermediate the other flues and a chimney connected with said latter flue, the inlet and outlet ports of said flues being at opposite ends.

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