K. H. V. VON PORAT.

FURNACE WITH MIXING CHAMBER FOR PULVEROUS FUEL.

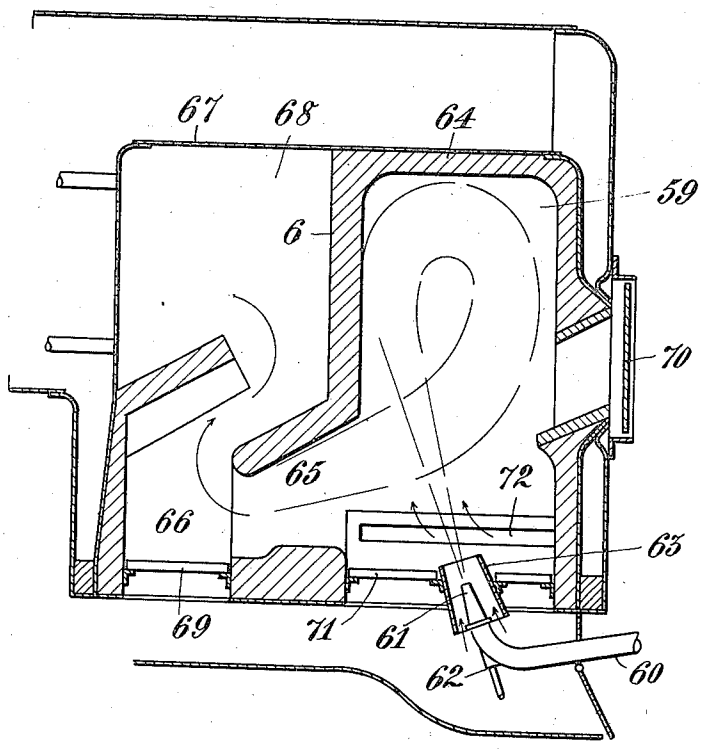
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6 SHEETS—SHEET 1.

Fig. 1



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6 SHEETS—SHEET 2.

Fig. 2.

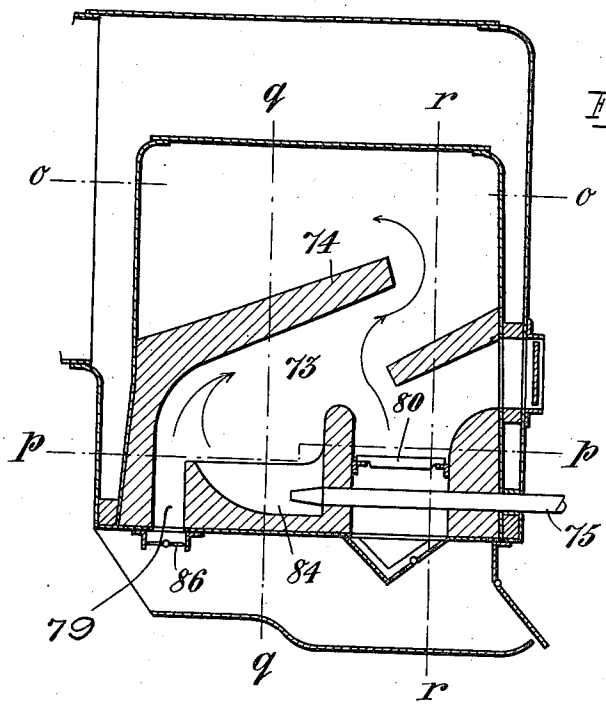


Fig. 3.

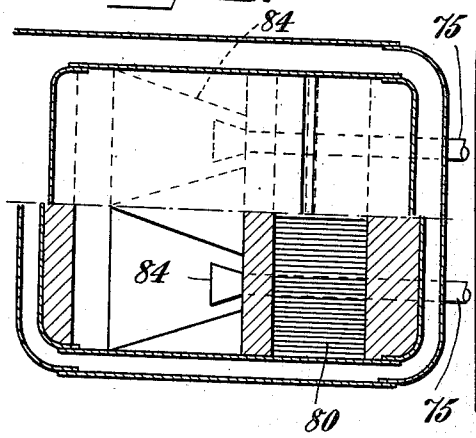
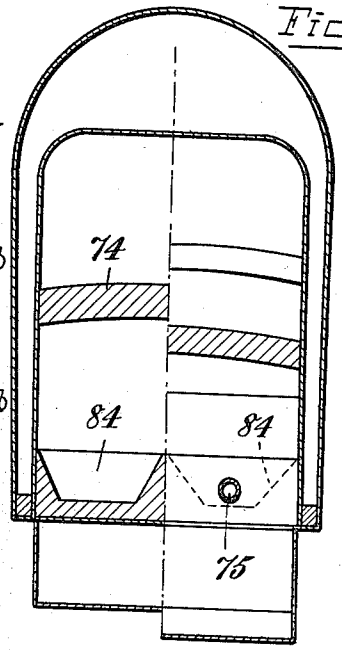


Fig. 4



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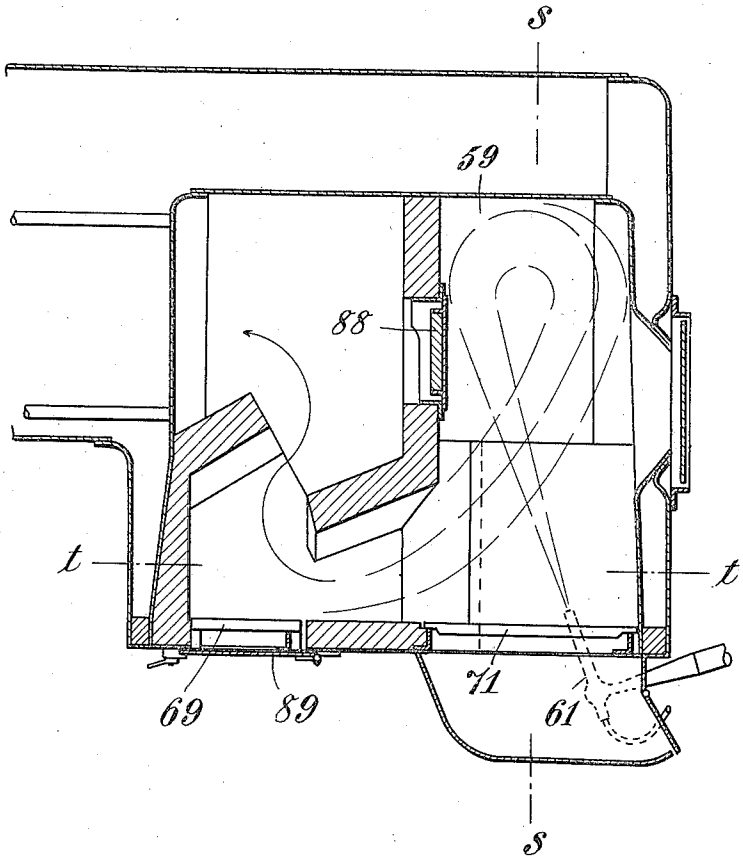
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6 SHEETS—SHEET 3.

Fig. 5.



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6 SHEETS—SHEET 4.

Fig. 6.

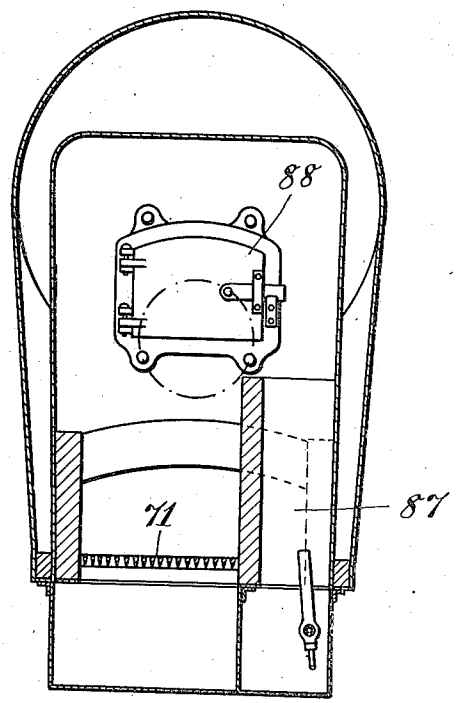
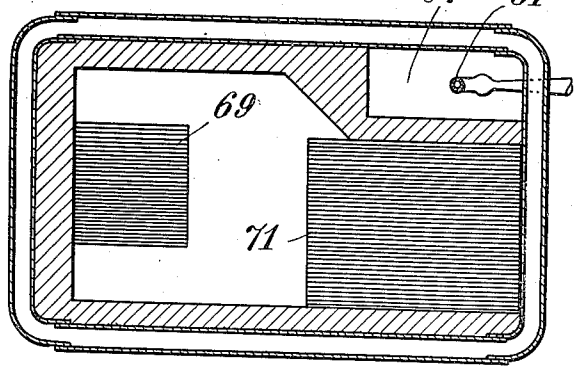


Fig. 7 - 87 61



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6 SHEETS—SHEET 5.

Fig. 8.

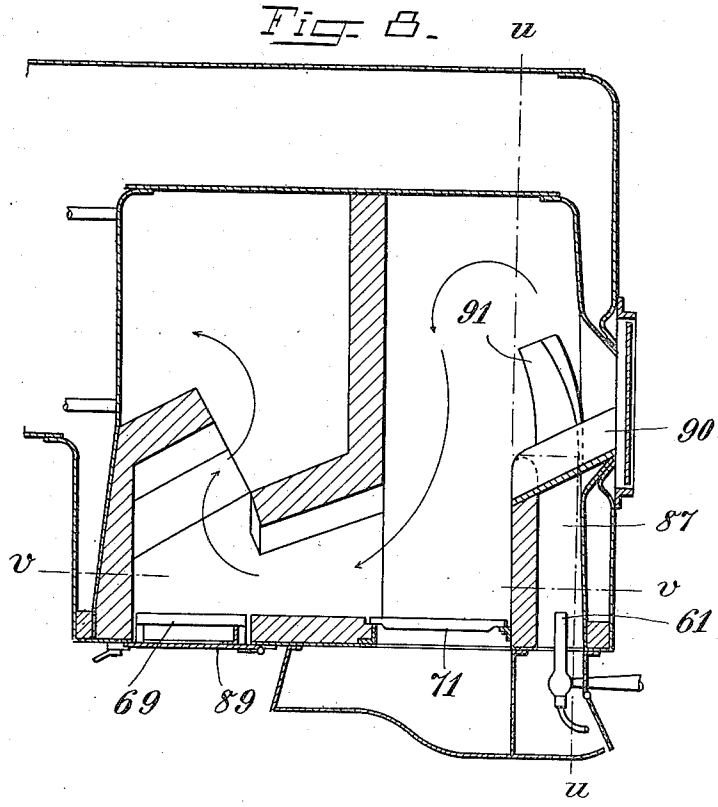
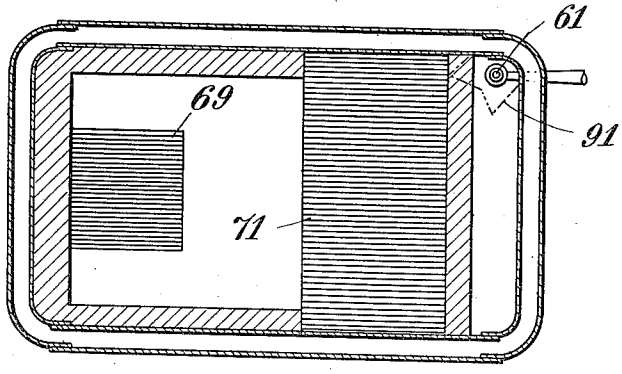


Fig. 9.



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6 SHEETS—SHEET 6.

Fig. 10.

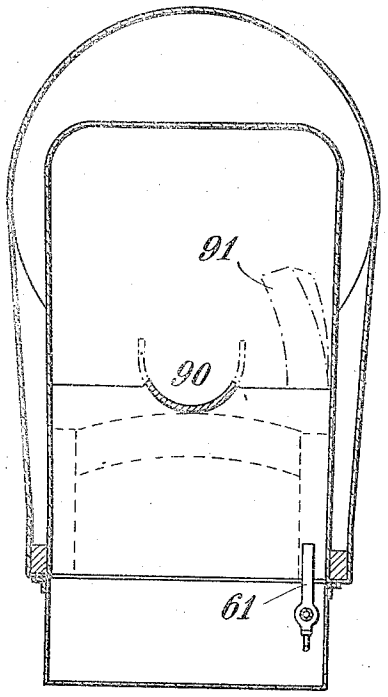
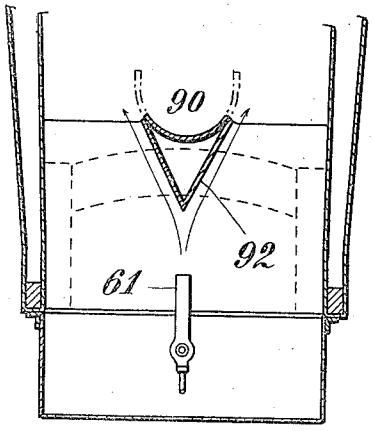


Fig. 11.



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UNITED STATES PATENT OFFICE.

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FURNACE WITH MIXING-CHAMBER FOR PULVEROUS FUEL.

1,294,730. Specification of Letters Patent. Patented Feb. 18, 1919.

Application filed December 21, 1915. Serial No. 68,099.

To all whom it may concern:

Be it known that I, KARL HJALMAR VILHELM von PORAT, engineer, a subject of the King of Sweden, residing at Stocksund, Sweden, have invented certain new and useful Improvements in Furnaces with Mixing-Chambers for Pulverous Fuel, of which the following is a specification.

In order to obtain an effective mixing of the pulverulent fuel and air or other combustion medium in the mixing chamber, into which the air and fuel are blown, experience has shown, that it is of the greatest importance, that the powder in the greatest possible extent maintains the living force obtained when blown in, as else it may happen, that a greater or less quantity of the powder falls down to the bottom of the chamber and thus is not brought to the combustion chamber. On account hereof the mixing chamber with its inlets and outlets is arranged in such a way, that the powder and air jets, which are eventually parallel or about parallel at the introduction, are broken against one or more of the walls limiting the chamber or against other obstacles, in such a manner, that the direction of movement of the mixture jet of powder and air will be reversed more or less and at the same time only a small part of the periphery of the said jet will engage the said surface or obstacle, while the greatest part of the jet will pass freely through the chamber. Hereby the mixture jet only will meet a slight friction resistance, so that it maintains a great speed and no precipitation of powder can take place. The mixture jet further will obtain a long path of movement through the chamber, so that the mixing, caused by whirls in the mixture jet, will be complete.

Some embodiments of the invention are shown in the accompanying drawing.

According to one embodiment the igniting fire is located at or near the outlet of the mixing chamber, in order that an ignition of the mixture may take place when the mixture is first escaping from the chamber or when the mixture has left the chamber, that is, when the mixing is entirely completed.

In order to surely prevent the fuel jet from being ignited before it has reached the igniting fire, means is provided, whereby the powder is blown into the mixing chamber through a chamber located laterally or in rear of the mixing chamber.

According to one embodiment of the invention there is arranged a heated device in the furnace, said device causing the powder, sucked or blown in, to circulate or move in another way, whereby a part of the powder is gasified and burnt, while the other part is muddled together to form clumps or balls, which fall down upon a grate, where they are burnt. Thereby a continuous gasification and cooking of the powder is obtained.

The invention is shown in the accompanying drawings.

Figure 1 shows a vertical section of a construction, as specially adapted for a locomotive or locomobile boiler. Fig. 2 shows a vertical section of another embodiment. Figs. 3 and 4 are sections on the lines *o—o*, *p—p*, and *q—q*, *r—r*, respectively in Fig. 2. Figs. 5–11 show two embodiments of the construction shown in Fig. 1. In these embodiments channels are provided through which the powder is blown before it reaches the mixing chamber for preventing the fuel jet from being ignited before it has reached the igniting fire. Fig. 5 shows a vertical longitudinal section of the one of these embodiments. Fig. 6 is section on the line *s—s* in Fig. 5, and Fig. 7 is a section on the line *t—t* in Fig. 5. Fig. 8 is a vertical longitudinal section of the other of the said embodiments. Fig. 9 is a section of the line *u—u* in Fig. 8, and Fig. 10 is a section of the line *v—v* in Fig. 8. Fig. 11 is a cross section of a furnace similar to the embodiment last mentioned except the injecting mouth-piece is differently placed.

In Fig. 1 the mixing chamber is indicated with 59. Said chamber is built together with the other part of the furnace or with the boiler; it may, however, especially in stationary furnaces, be made separately from the other part of the furnace. A tube 60 extends from a fuel receptacle to the bottom of the chamber. The mouth piece 61 of the tube 60 and a steam mouth piece 62 within the same forms in usual manner a blower for introducing the powder into the mixing chamber. The said blower is surrounded by a wider tube 63, which is open both at its lower and upper ends and through which the flow of powder sucks air along with it into the mixing chamber. According to the drawing the blower 61, 62

and the tube 63 have such an inclined position, that the powder and air mixture jet is refracted firstly against the vertical or about vertical inner or front wall 6 of the chamber and then against the roof 64 and finally against the rear or outer wall of the chamber, so that the mixture jet turns and obtains a circular movement against the outlet 65, which leads to the furnace proper and also is placed at the bottom of the chamber.

During its path through the chamber the jet of mixture sucks air with it, said air having come into the mixing chamber through openings, more clearly indicated below. In view of the whirls arising within the jet on account of its refraction, powder and air will be mixed together. As will be understood from the drawing, only a slight part of the periphery of the jet of mixture comes into frictional engagement with the walls and roof of the mixing chamber. The greatest part of the jet passes, on the contrary, freely through the chamber. In view hereof the resistance against the flow of the fuel powder through the chamber will be as slight as possible, so that the powder maintains its initial speed obtained during the injection. Any precipitation of powder thus will not take place and in view of the arising powerful whirls during the whole passing through the chamber, powder and air will be effectively mixed together. By tests it has been ascertained, that the mixture in the form of a cloud of dust escapes from the chamber through the outlet 65. The mixture contains a quantity of air entirely sufficient to cause the combustion, so that the mixture escaping from the chamber 59 can be compared with a combustible gas mixture.

On account of the chimney draft during operation the said mixture flows through the curved channel 66 to an upper chamber 68, surrounded by the watercooled plates 67 of the boiler, and from this chamber 68 the mixture flows into the tubes of the boiler.

For the purpose of igniting the mixture there is arranged, at the bottom of the channel 66, either a grate 69 for a solid fuel, introduced through a door 70, or a firing device for a liquid or gaseous fuel. Said igniting fire is located at or near the outlet of the mixing chamber, in order that the ignition may occur, when the mixture is first escaping from the chamber or when the mixture has escaped therefrom, that is when a complete mixing has been obtained. After the channel has been heated, it can cause itself the ignition of certain kinds of pulverulent fuels, so that the fire at 69 no longer needs to be in action. At a casual interruption of work the firing at 69 is again started. Before the firing of the pulverous fuel is started, a firing with usual liquid or solid fuel may take place. To this end a grate 71 is arranged in the bottom of the mixing chamber, said grate being charged through the door 70. For admitting air to the fuel on the grate and even to the mixing chamber inlet channels 72 are arranged at the sides of the chamber. The said air will be heated by the engagement with the walls of the channel. When the powder firing has been started, the fire on the grate 71 may not be maintained further. For the starting even the grate 69 may be used.

For the purpose of enabling the device last mentioned to be employed in locomotive boilers and the like already in use, where the space is very limited, and where, as to inlets for combustion air, the mounting of the igniting fire, etc., regard must be taken to the positions of the shafts of the locomotive, the mixing chamber may be constructed as shown in Figs. 2–10.

In the embodiment shown in Figs. 2–4, the tubes 75 for the powder feeding are placed below the grate of the igniting fire 80 and extend through the fire bridge belonging to the fire. In order that the powder may not collect on the bottom of the mixing chamber 73 there are arranged channels 84, having the same or about the same diverging form as the fuel jets. The air from the channels 79 will mix with the powder, and the combustion gases from the fire 80 will then combine with the powder and air mixture, which passes below the arch 74.

In the embodiment according to Figs. 2–4 there is only one channel 79, which is provided with a regulating damper 86. In all the embodiments now described the channel 79 is placed in such a way, that the air sucked in by the draft of the chimney facilitates the movement of the powder and prevents the same from collecting at any places in the mixing chamber.

As will be found all the mixing and combustion chambers shown, are of comparatively simple construction. These simple embodiments are most suitable to use for easily burnable fuels. In furnaces of the present kind, where the fire, required for igniting the fuel mixture, is located at or near the outlet of the mixing chamber care is taken to prevent the fuel jet from being ignited before it has reached the igniting fire.

According to Figs. 5–7 the injecting mouth-piece 61 is placed in an air channel 87 arranged laterally of the grate 71. The powder is thus blown through the air channel 87 into the mixing chamber 59, from which the mass of well mixed powder and air passes beyond the igniting fire 69 and after the ignition the mass passes through a relatively short channel, limited by brickwork. The combustion takes place substantially into a combustion chamber, limited by such plates of the furnace, which are in contact with water and where thus the gases are

cooled, that is, the temperature in the furnace is maintained relatively low, so that the slag will not melt. The mixing chamber is provided with a door 88, through which the tubes could be observed. Below the igniting fire a slag door 89 is provided.

In the embodiments shown in Figs. 8–10 the air channel 87 is arranged behind the grate and the injecting mouth-piece 61 is placed at the one end of the air channel 87, so that the powder current will flow laterally of the furnace opening 90 and will refract against a screen 91, arranged at the inlet of the mixing chamber.

According to Fig. 11 the injecting mouthpiece 61 is placed just below the firing opening 90, where the jet is split by a deflector 92 and passes on both sides of the firing opening.

Claims:

1. In furnaces for pulverous fuel, the combination of a chamber, divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber, for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, an igniting fire so located that it ignites the mixture of air and fuel, when it first is escaping from the mixing chamber, means for causing the fuel to pass in the form of a jet into the mixing chamber, and means for deflecting the fuel in the mixing chamber so as to cause it in some part of its path within the said chamber to pass in a direction opposite that in which it is introduced.

2. In furnaces for pulverous fuel, the combination of a chamber, divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, an igniting grate for a solid fuel so located that said solid fuel ignites the mixture of air and fuel when it first is escaping from the mixing chamber, means for causing the fuel to pass in the form of a jet into the mixing chamber, and means for causing one part of the powder jet to flow in contact with another part of the jet.

3. In furnaces for pulverous fuel, the combination of a chamber, divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, an igniting fire, consisting of a grate for a solid fuel so located that it ignites the mixture of air and fuel, when it first is escaping from the mixing chamber, means for causing the fuel to pass in the form of a jet into the mixing chamber, and means for reversing the fuel in the chamber so as to cause it on some part of its path within the mixing chamber to pass in a direction opposite that in which it is introduced, the air inlet lying at a point located at some distance from the point of the chamber wall where the pulverous fuel is injected.

4. In furnaces for pulverous fuel, the combination of a chamber, divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, an igniting fire located in the said passage, and means for causing the fuel to pass in the form of a jet into the mixing chamber, and means to cause the fuel jet to pass first upwardly and then downwardly within the mixing chamber.

5. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, an igniting fire located so that it ignites the mixture of air and fuel when it is first escaping from the mixing chamber, and means for causing the fuel to pass in the form of a jet into the mixing chamber, and means for causing the fuel jet to pass rearwardly at some part of its path in the mixing chamber.

6. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, an igniting fire located so that it ignites the mixture of air and fuel when it is first escaping from the mixing chamber, and means for causing the fuel to pass in the form of a jet into the mixing chamber, and means for causing the fuel to pass first forwardly, then backwardly and then forwardly again before leaving the mixing chamber.

7. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage be-

tween said mixing chamber and said combustion chamber, an igniting fire located so as to ignite the mixture when the latter is first escaping from the mixing chamber into the combustion chamber, and means for blowing the fuel into the mixing chamber directly against one of the walls limiting the said chamber.

8. In furnaces for pulverous fuel, the combination of a chamber, divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, an igniting fire consisting of a grate for a solid fuel and located so that it ignites the mixture of air and fuel, when it is first escaping from the mixing chamber, a door in the inner front wall of the mixing chamber adapted to enable the inspecting and cleaning of the tubes of a tube boiler associated with the furnace.

9. In furnaces for pulverous fuel, the combination of a chamber, divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, an igniting grate for a solid fuel located so that it ignites the mixture of air and fuel when it is first escaping from the mixing chamber, a starting grate adapted to be used before the firing with the pulverous fuel is started.

10. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber, for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, said passage being in the form of a channel located at the front end of the mixing chamber, the said channel extending first forwardly, then upwardly and finally backwardly, and an igniting device located in said channel.

11. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, said passage being in the form of a channel located near the bottom of the mixing chamber and an igniting device in the bottom of said channel.

12. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, said passage being in the form of a curved outlet channel, and an igniting fire in said channel.

13. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, a channel arranged laterally of a part of the said mixing chamber and communicating therewith at its upper end, means for causing the pulverous fuel in the form of a jet to pass through the said channel in a straight path before entering into the mixing chamber, and an igniting fire located so that it ignites the mixture of air and fuel when it is first escaping from the mixing chamber.

14. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, a channel arranged laterally of a part of said mixing chamber and communicating therewith, means for causing the pulverous fuel in the form of a jet to pass the said channel before entering into the mixing chamber, an igniting fire located so that it ignites the mixture of air and fuel when it is first escaping from the mixing chamber, and means for causing the fuel jet to change its direction within the mixing chamber before passing the igniting fire.

15. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of a mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, a channel, arranged laterally of a part of said mixing chamber and communicating therewith, means for causing the pulverous fuel in the form of a jet to pass through the said channel in a straight path before entering into the mixing chamber, an igniting fire located so that it ignites the mixture of air and fuel when it is first escaping from the mixing chamber, means for causing the fuel jet to change its

direction within the mixing chamber before passing the igniting fire, and a starting fire at the bottom of said mixing chamber.

16. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, an igniting fire located so that it ignites the mixture of air and fuel when it is first escaping from the mixing chamber, means for causing the fuel to pass in the form of a jet into the mixing chamber, means to cause the fuel jet to first strike at an oblique angle against one of the walls, limiting the mixing chamber.

17. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, an igniting fire located so that it ignites the mixture of air and fuel when it is first escaping from the mixing chamber, and means for causing the fuel to pass in the form of a jet into the mixing chamber, and means for causing the fuel to pass first upwardly in an inclined direction into the mixing chamber.

18. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, is which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, an igniting fire located so that it ignites the mixture of air and fuel when it is first escaping from the mixing chamber, a starting fire adapted to be used before the firing with the pulverous fuel is started, and means for causing the jet to change its direction before pasing over the igniting fire.

19. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, a third chamber arranged laterally of a part of said mixing chamber and communicating therewith, means for causing the pulverous fuel in the form of a jet to pass through the said third chamber before entering into the mixing chamber, an outlet for the mixing chamber, an igniting fire located so that it ignites the mixture of air and fuel when it is first escaping from the mixing chamber, means for causing the fuel jet to change its direction within the mixing chamber, before passing the igniting fire, and a starting fire in the mixing chamber adapted to be used before the firing with the pulverous fuel.

20. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, said passage being in the form of a channel, the bottom of said channel lying in the same horizontal plane as the bottom of the mixing chamber, and an igniting fire in said channel.

21. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, said passage being in the form of a channel the bottom of said channel lying in the same horizontal plane as the bottom of the mixing chamber, an igniting fire in the bottom of said channel, and a starting fire in the bottom of the mixing chamber.

22. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, an igniting fire, means for preventing the fuel from being ignited before reaching the end of its path in the mixing chamber, means for causing the fuel to pass in the form of a jet into the mixing chamber, and means for reversing the fuel in the chamber so as to cause it to pass on some part of its path in a direction opposite that in which it is introduced.

23. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a passage between said mixing chamber and said combustion chamber, a fuel supplying pipe projecting into the said mixing chamber and adapted to deliver the fuel in the form of a fine jet into the mixing chamber, means for deflecting the fuel jet so as to cause it in some

part of its path within the mixing chamber to pass in a direction opposite that in which it is introduced, an unobstructed space in the mixing chamber directly between the said passage, and the point, where the fuel jet is first deflected, and a fire grate for a solid fuel, located so as to ignite the mixture, when it is first escaping from the mixing chamber.

24. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber for the combustion of the mixture, a passage between said mixing chamber and said combustion chamber, a fuel supplying pipe projecting into the said mixing chamber and adapted to deliver the fuel in the form of a fine jet into the mixing chamber, an unobstructed space in the mixing chamber directly between the said passage and the point where the fuel jet is first deflected, means for causing the fuel to pass rearwardly at some part of its path in the mixing chamber, and a fire grate for a solid fuel, located so as to ignite the mixture when it is first escaping from the mixing chamber.

25. In boiler furnaces for pulverous fuel, the combination of a chamber divided by walls of refractory materials partly into a mixing chamber, where the air and fuel are mixed, partly into a combustion chamber for the combustion of the mixture, and partly into a relatively small chamber, containing a fire grate for a solid fuel and arranged in such a way that the mixture is ignited, when it is first escaping from the mixing chamber, a fuel supplying pipe projecting into the mixing chamber and adapted to deliver the fuel in the form of a jet, and means for reversing the fuel jet so as to cause it on some part of its path within the mixing chamber to pass in a direction opposite that in which it is introduced.

26. In boiler furnaces for pulverous fuel, the combination of a chamber divided by walls of refractory materials partly into a mixing chamber, where the air and fuel are mixed, partly into a combustion chamber for the combustion of the mixture, and partly into a relatively small chamber, containing a fire grate for a solid fuel and arranged in such a way that the mixture is ignited when it is first escaping from the mixing chamber, a fuel supplying pipe projecting into the mixing chamber and adapted to deliver the fuel in the form of a jet, and means for causing the fuel to pass rearwardly at some part of its path in the mixing chamber.

27. In furnaces for pulverous fuel, the combination of a chamber divided by a wall of refractory material into a mixing chamber, in which the air and fuel are mixed, and a combustion chamber, for the combustion of the mixture, a fuel inlet and an air inlet for the said mixing chamber, a passage between said mixing chamber and said combustion chamber, an igniting fire so located that it ignites the mixture of air and fuel, when it first is escaping from the mixing chamber, means for causing the fuel to pass in the form of a jet into the mixing chamber, and means for deflecting the fuel in the mixing chamber so as to cause it in some part of its path within the said chamber to pass in a direction opposite that in which it is introduced, said dividing wall projecting from the roof of the first named chamber leaving a free space between its lower end and the bottom of the chamber, said space forming the outlet of the mixing chamber.

In testimony whereof I affixed my signature in presence of two witnesses.

KARL HJALMAR VILHELM VON PORAT.

Witnesses:

META PRIEN,

OLIN WAHMAN.