May 4, 1926. 1,583,097

F. D. POTTER

APPARATUS FOR DETERMINING TEMPERATURES OF FURNACE GASES

Filed Jan. 11, 1921 2 Sheets-Sheet 1

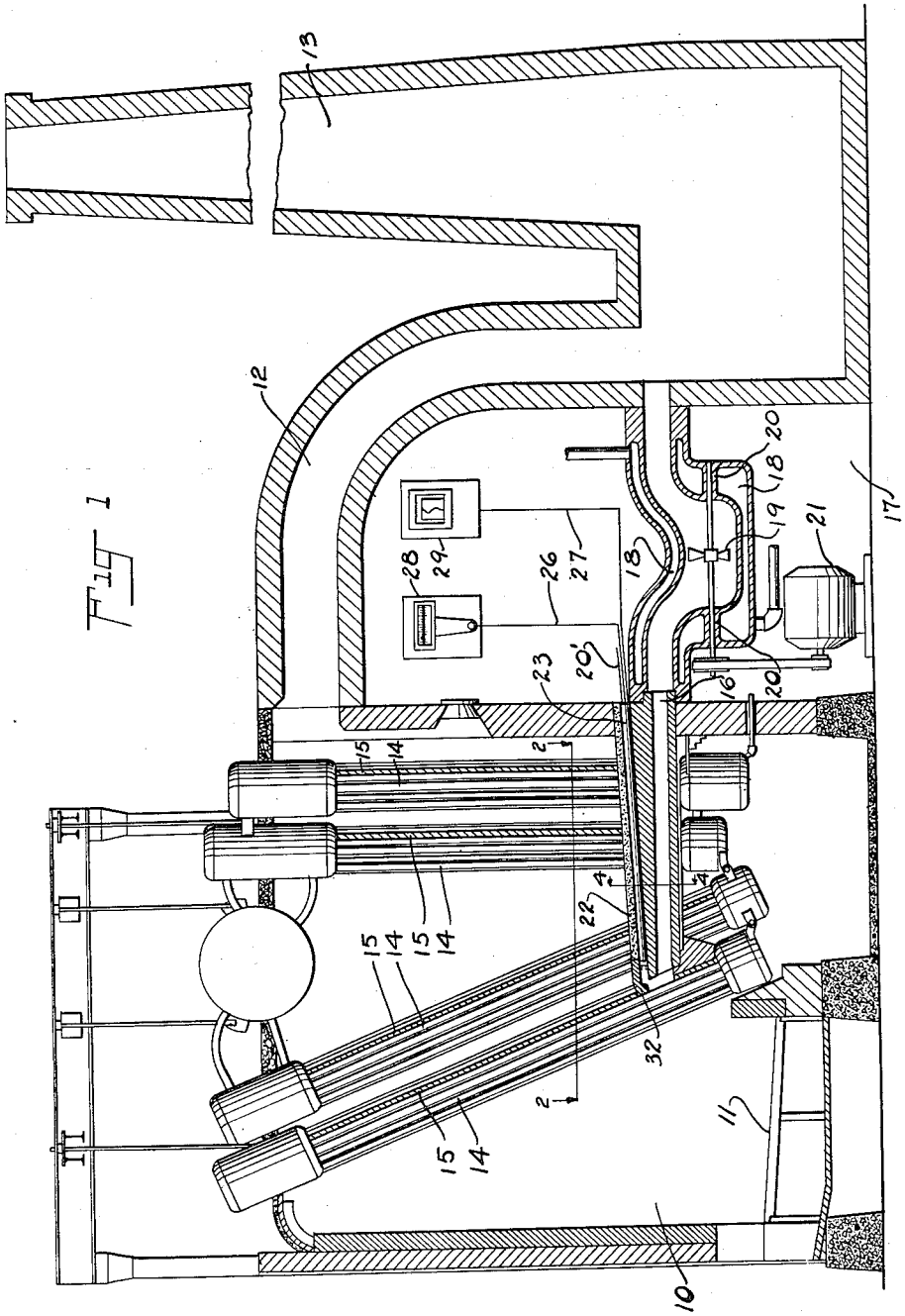


Fig. 1

Inventor
Frederick D. Potter

By His Attorney
N. H. Dyke

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Fig 2

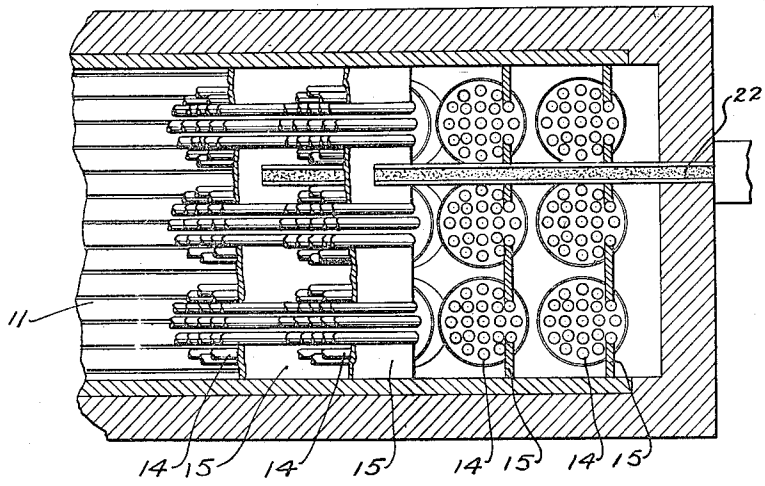


Fig 3

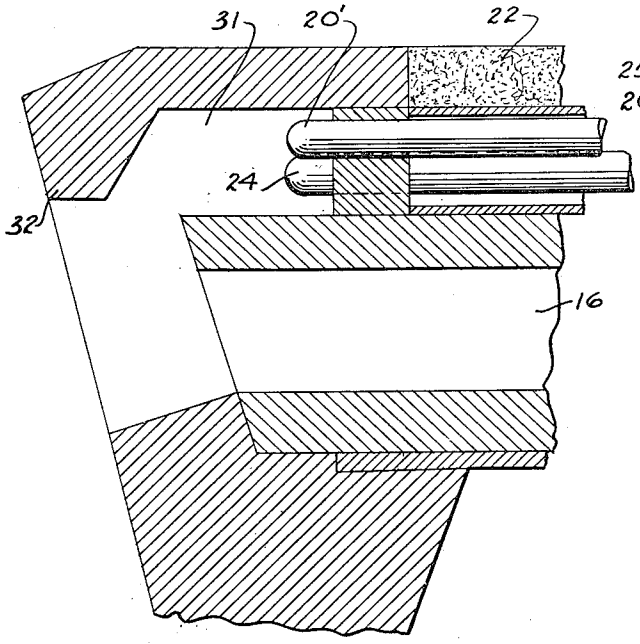
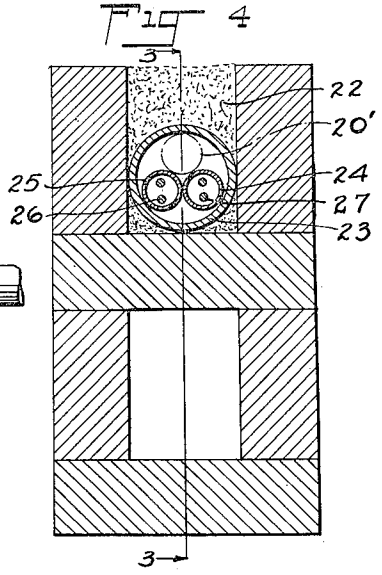


Fig 4



Inventor
Frederick D. Potter

By His Attorney N. N. Dyke

Patented May 4, 1926. 1,583,097

UNITED STATES PATENT OFFICE.

FREDERICK D. POTTER, OF LINDEN, NEW JERSEY, ASSIGNOR TO COMBUSTION CONTROL COMPANY, INC., A CORPORATION OF NEW YORK.

APPARATUS FOR DETERMINING TEMPERATURES OF FURNACE GASES.

Application filed January 11, 1921. Serial No. 436,622.

To all whom it may concern:

Be it known that I, FREDERICK D. POTTER, a citizen of the United States, and a resident of Linden, county of Union, and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Determining Temperatures of Furnace Gases, of which the following is a specification.

My invention relates to a process of and apparatus for control of combustion in accordance with temperatures of representative portions of furnace gases. The present invention is more especially concerned with furnaces in which the furnace gases pass substantially directly to an outlet passage so that it is not practicable to rely, or at least to rely entirely, for obtaining continuous flow of representative portions of furnace gases for temperature determination, upon the provision of a short-circuit conduit from the combustion chamber to a passage to which the furnace gases pass indirectly, with a resulting difference in pressure, as disclosed and claimed in my Patent No. 1,246,656, granted Nov. 13th, 1917.

According to the present invention a conduit is provided between the combustion chamber and an outlet passage for furnace gases, as for example the stack or flue of the furnace, and means are provided for obtaining a forced draft or accelerating the passage of furnace gases through said conduit, as for example, a fan may be suitably located in the conduit and in this way a continuous flow of furnace gases is obtained through the conduit of relatively small volume as compared to the volume of the furnace gases which do not pass through said conduit. Temperature taking means are provided for taking temperatures corresponding to the temperatures of the gases passing through said conduit which may comprise one or more pyrometer couples connected to an indicating or recording device or devices. For example, an ordinary form of indicating or recording pyrometer may be used, and a pyrometer indicator may be located where the person charged with the operation of the furnace is stationed, and a recording pyrometer or pyrometers may be located elsewhere, as for example, in the office of the plant superintendent. In such case, the furnace operator is concerned more especially with the minor variations of temperature indications and operates the furnace in accordance with the indications obtained. If for example, the temperature falls somewhat the fuel supply may be increased, the supply of air properly increased or decreased, the damper opened up or closed or such other changes in operation resorted to as will result in bringing the temperature up to the desired point. If the temperature should get unduly high, so as to endanger the furnace refractories reverse changes in control can be resorted to, as will be readily understood. The plant superintendent is ordinarily not concerned with minor variations which should be taken care of by the furnace operator but, if the variations are considerable and show poor control of the furnace by the operator, this fact is immediately brought to the attention of the plant superintendent as by inspection of the temperature line made on the pyrometer chart, the sounding of an alarm bell, or in other suitable ways.

As the pyrometer couple or couples used for obtaining continuous indications in the manner indicated above are substantially in continuous use with their indicating or recording instruments, I find it desirable to make provision for the insertion from time to time of an additional pyrometer couple which may be used to check up the couples in continuous use, and in this way any variations or deteriorations in use of the pyrometer couples can be readily detected and compensated for, or new couples put in.

In the drawings I have shown, for the purpose of illustration and affording an understanding of my invention, the application thereof to the furnace of a boiler of the Biglow type in which the furnace gases pass substantially directly from the combustion chamber through the boiler to the stack, and have illustrated a coal burning furnace, but it is to be understood that the same is intended only for affording an understanding of one way in which my invention may be carried out and is not for limitation of the invention, and the invention may be applied to furnaces burning various sorts of fuels and for supplying heat, not only for boilers,

but for various other devices heated by furnaces.

In said drawings Fig. 1 is a longitudinal sectional view of a Biglow boiler in its setting and equipped with combustion control apparatus in accordance with my invention. Fig. 2 is a cross-sectional view on line 2—2, Fig. 1. Fig. 3 is a detail sectional view showing the preferred relation of the pyrometer couples to the conduit, and Fig. 4 is a sectional view on the line 4—4, Fig. 1. In the Biglow boiler setting illustrated the passage of the furnace gases is from the combustion chamber 10 located over the grate-bars 11 substantially direct to the outlet passage 12 leading to the stack 13, the gases passing between the water tubes 14. In this type of boiler the baffles 15 serve simply to direct the heated gases into contact with the water tubes 14, and do not otherwise interfere with the substantially direct flow of the gases from the combustion chamber 10 to the outlet passage 12 and stack 13.

With a boiler so constructed, while reliance may be placed to some extent for obtaining a flow of representative portions of the furnace gases from the combustion chamber to the stack by the provision of a short-circuit passage, I have found it desirable to make use of mechanical means such as a fan or the like for creating a forced draft, or accelerating the passage of the gases through the conduit, so that a flow of a representative portion of gases is assured at all times. In the form shown, a gas conduit 16 is provided by inserting a tube made of hollow tile, hollow fire brick, or the like, through the baffles 15 and leading from the combustion chamber 10 to the base of the stack 13.

In passing from the combustion chamber to the stack the conduit 16 preferably passes through a portion of the boiler room, as in the region 17, and this portion of the conduit is preferably water-cooled, as for example it may be made of cast iron and provided with a water jacket 18. In this portion of the conduit a fan 19 is provided for inducing a draft or accelerating the passage of gases through the conduit and same is journaled in the water jacketed portion of the conduit, as indicated at 20, 20, and is operated from any suitable source of power, such as the electric motor 21.

Temperatures are taken corresponding to the temperatures of the gases passing through the conduit, and the temperature taking device or devices may be arranged in the conduit itself or in a chamber or recess in communication therewith. In the form shown, a trough 22 open at its top is provided adjacent to the conduit 16 in the brick or tile member in which such conduit 16 is formed, and a pipe 23 of heat resistant material is placed therein, and through the pipe 23 the pyrometer tubes 24 and 25 are inserted. The pyrometer couples in their protecting tubes and indicated by the reference numerals 26 and 27 extend into a recess 31 formed in a tile or fire brick member 32 adjacent to the conduit 16. In this way the pyrometer couples are sufficiently protected so as not to be readily burned out or destroyed by the furnace heat and flames, but at the same time are in a space in communication with the conduit 16 and are exposed to temperatures corresponding to the temperatures of the gases passing through the conduit 16 and any changes in temperature in the combustion chamber 10 immediately communicate a correspondingly changed temperature to the pyrometer couples and thence to the indicating or recording device provided therefor. With the arrangement shown, pyrometer couple 26 is connected to an indicator 28 which may be placed at any convenient position where it will come under the observation of the employee who is charged with the control and operation of the furnace. The pyrometer couple 27 is shown connected to a recording machine 29, which may be located at any desired point, as in the plant superintendent's office. Room is left for the insertion of a third pyrometer couple 20′. This couple is ordinarily not in place, but provision is made therefor so that the same may be inserted from time to time, in order that a check may be obtained upon the other pyrometer couples which are left in place, and exposed to the comparatively high temperatures of the gases passing through the conduit. Provision of such third pyrometer couple and of means whereby same can be readily inserted and removed at any time, is a feature of great practical importance, since any deviation in accuracy of the pyrometer couples permanently left in place can be readily detected and compensation made therefor, or the defective couple replaced by a new one. Instead of a trough 22 opened at the top, a closed passage may be provided for the pyrometer tubes if desired, but ordinarily this is unnecessary since the open trough speedily becomes filled with particles of dust, cinders, etc., which affords a very efficient heat insulation, but can readily be blown out or otherwise removed if it should become desirable to renew or repair the pyrometer tubes or the pipe 23 in which same are contained.

It should be noted that for the purpose of clearness of showing, the conduit and its related parts are illustrated on an exaggerated scale as compared with the boiler and its setting.

The embodiment of the invention shown herein is not to be taken as limiting the scope of the invention since same is shown and described merely for affording an understanding of one mode in which the invention

may be carried out and the invention is as broad as my claims.

I claim:

1. A combustion chamber, a device heated by the gases of combustion through which the said gases pass substantially directly, an outlet flue for the gases, a short circuit conduit extending through the heated device and connecting the combustion chamber to the outlet flue, means in addition to natural draft for inducing flow of gases through said conduit, and means exposed to the heated gases passing through said conduit for taking and indicating temperatures corresponding to the temperatures of the gases passing through said conduit.

2. The combination of a furnace having an outlet passage for furnace gases to which furnace gases pass substantially directly, a short circuit conduit of refractory material between the furnace and the discharge end of the outlet passage, means for accelerating the flow of furnace gases through said conduit, and means exposed to the heated gases passing through said conduit for taking temperatures corresponding to the temperatures of such gases.

3. The combination of a furnace having an outlet passage for furnace gases, and to which the gases pass substantially direct from the furnace, a short circuit conduit between the furnace and the discharge portion of the outlet passage, mechanical means for causing flow of furnace gases through the conduit, and means for taking temperatures of the gases passing through said conduit.

4. The combination with a furnace having an outlet passage for furnace gases, of a boiler through which the furnace gases pass substantially direct to the outlet passage, a short circuit conduit between the furnace and the discharge portion of the outlet passage, a fan in said conduit, and means comprising an indicator for taking temperatures of the gases passing through said conduit.

5. The combination of a furnace having an outlet passage for furnace gases, a short circuit conduit extending from the furnace to the discharge portion of the outlet passage, means for cooling a portion of said conduit, means in said cooled portion for inducing a flow of furnace gases through said conduit, and means for taking temperatures of furnace gases passing through said conduit prior to their reaching the cooled portion of the conduit.

6. The combination with a furnace having a combustion chamber, a passage for outlet of combustion gases, a short circuit conduit from combustion chamber to outlet passage, a pocket communicating with said conduit, and a seat adjacent to said pocket, of a pyrometer having a couple arranged in said pocket, the seat adjacent to the pocket being arranged for the insertion from time to time of an additional pyrometer couple, whereby the pyrometer whose couple is left in place may be checked up by means of the additional pyrometer couple inserted from time to time.

7. The combination of a furnace having an outlet for furnace gases to which such gases pass substantially directly, a short-circuit conduit leading from the furnace to the outlet passage and comprising a portion extending outside the furnace and furnace gas passage, a fan in communication with the part of the conduit outside the furnace and furnace gas passage, means exteriorly of the short circuit conduit for driving the fan to force furnace gases through the short circuit conduit, and means for taking temperatures of gases passing through said short circuit conduit.

In testimony that I claim the foregoing, I have signed my name hereto.

FREDERICK D. POTTER.