C. A. ORR.

HOT BLAST STOVE APPLIANCE.

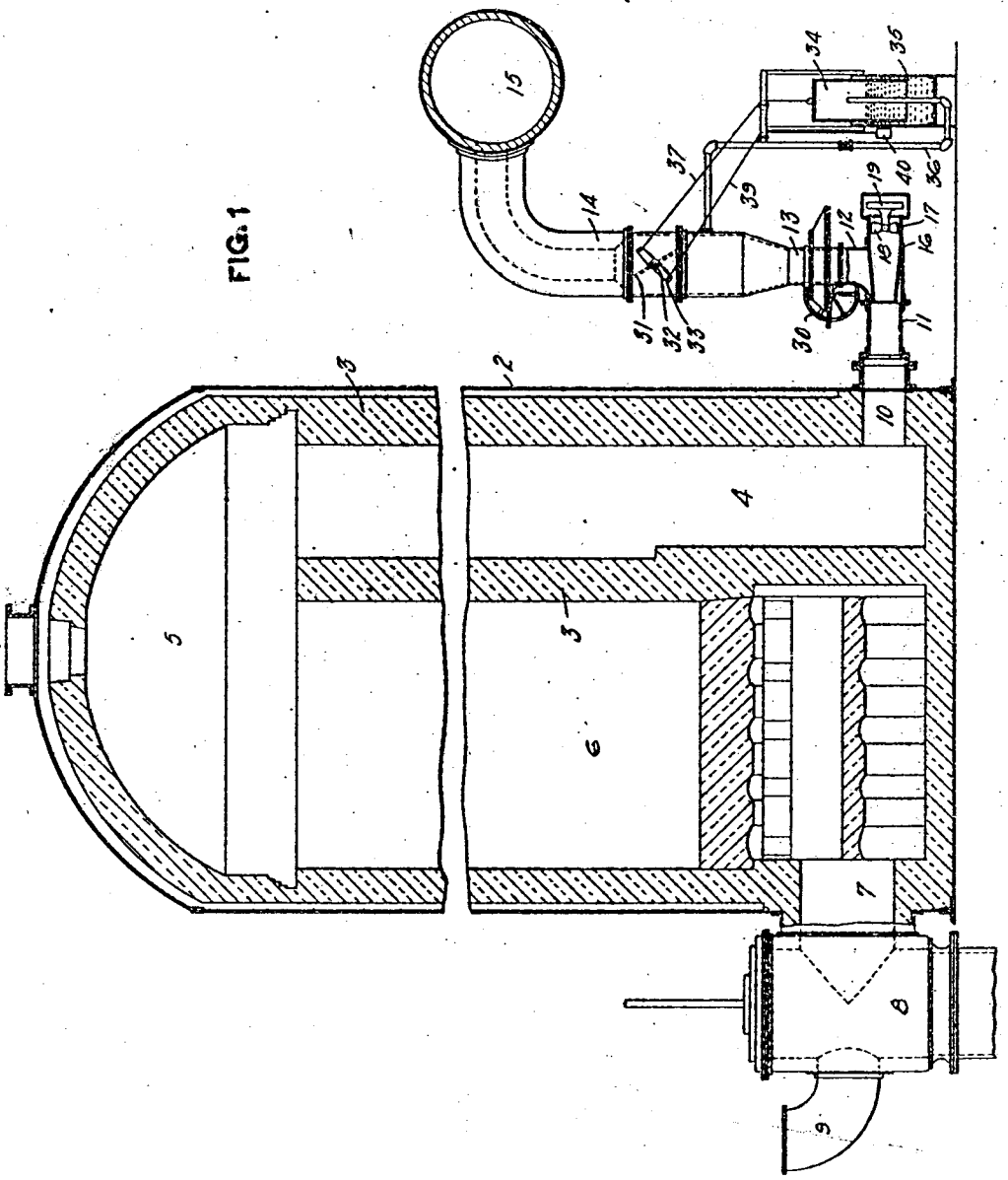
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2 SHEETS—SHEET 1.

FIG. 1



WITNESSES.

R. D. Little

W. F. Hohmann

INVENTOR

C. A. Orr

by C. C. Linthicum

his Attorney

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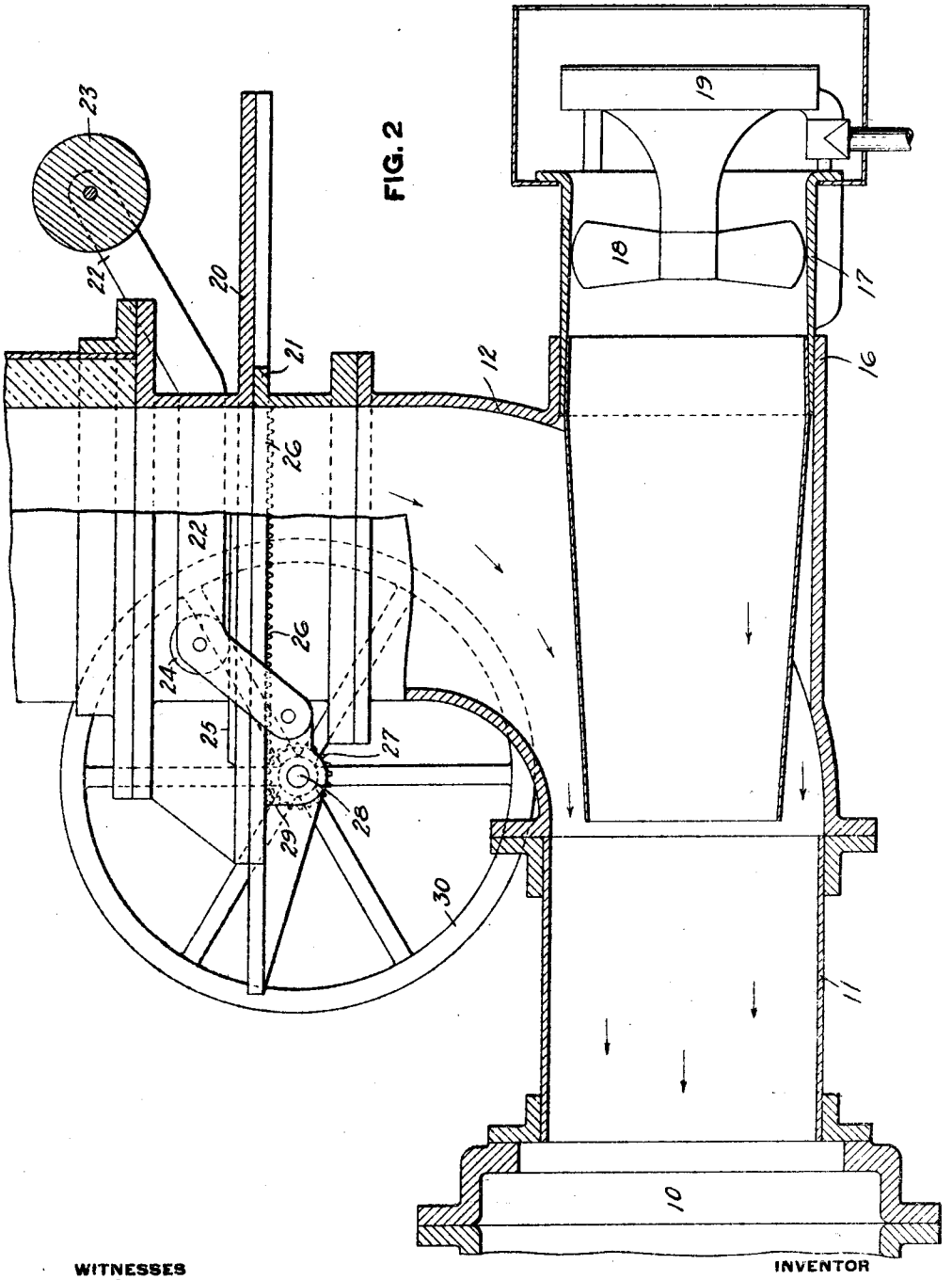
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2 SHEETS—SHEET 2.

FIG. 2



WITNESSES

A. D. Little

W. J. Hohman

INVENTOR

C. A. Orr

by C. C. Linthicum

his Attorney

UNITED STATES PATENT OFFICE.

CHESTER A. ORR, OF CLEVELAND, OHIO.

HOT-BLAST-STOVE APPLIANCE.

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Application filed August 3, 1915. Serial No. 43,452.

To all whom it may concern:

Be it known that I, CHESTER A. ORR, a citizen of the United States, and resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Hot-Blast-Stove Appliances, of which the following is a specification.

My invention relates to appliances used in mixing and supplying blast furnace gases and air to be burned in the combustion chamber of hot blast stoves in heating the checker work of such hot blast stoves.

Heretofore, in so far as I am aware, in burning the blast furnace gases to heat the checker work of hot blast stoves, the air supply has been induced by the draft created by the stack of the hot blast stove and the blast furnace gases have been supplied to the hot blast stove combustion chamber under slight pressure which varies from time to time. The result has been that the volume of air available has been insufficient and the volume of gas has fluctuated.

Blast furnace gases, which are low in heating value, mix very poorly with air when used in the large quantities necessary in heating hot blast stoves, and as a result, with the appliances used heretofore, a long flame is produced in the combustion chamber instead of the desired short flame by which concentration of the heat of combustion is effected.

One object of my invention is to provide a hot blast stove appliance which will thoroughly mix the gas and air necessary for combustion, prior to the entrance thereof into the stove combustion chamber.

Another object of the invention is to provide a hot blast stove appliance having novel means whereby the air mixed with the blast furnace gas is forced into the combustion chamber under pressure to the end that the quantity of air available for use is materially increased, the stream of air induces a flow of gas into the combustion chamber, and the air and gas are thoroughly mixed before entering the stove combustion chamber.

A still further object of the invention is to provide a hot blast stove appliance having improved means whereby sufficient quantities of gas and air are supplied to lessen the time required in transferring a given amount of heat from the burning gases to the hot blast stove checker work.

Referring now to the drawings forming part of this specification, Figure 1 is an elevation partly in section, showing my improved stove appliance as applied to the combustion chamber of a hot blast stove in accordance with my invention. Fig. 2 is an elevation, partly in section, showing the mixing pipe of my improved stove appliance on a larger scale.

In the accompanying drawings, the numeral 2 designates the metal shell of a hot blast stove, having a refractory lining 3. The stove shown, which is of the two-pass side combustion chamber type, is provided with a vertical combustion chamber 4 which opens into the top 5 of the stove. The space 6 of the stove is filled with checker work (not shown) in the usual known manner, and the outlet opening 7 at the lower end of the checker work connects with a chimney valve 8, this connection 7 also serving as an inlet for the cold blast heated by the stove, the cold blast entering through the chimney valve 8 from the cold blast pipe which is connected to the end of the elbow 9 on the body of the valve 8.

The combustion chamber 4 is provided at its lower end with an inlet 10 for the mixed gas and air, and connected to the outer end of the inlet 10 is a mixing pipe 11. The mixing pipe 11 extends horizontally and has an upwardly extending elbow 12 on its outer end connected to the lower contracted end 13 of the branch gas main 14 which is connected at its inlet end to the horizontally extending overhead gas main 15.

The elbow 12 has a side outlet 16, with an extension 17 thereon. The outer end of the extension 17 is provided with a rotary fan 18 driven by means of a turbine 19 which supplies to the mixing pipe 11 the air necessary to support combustion of the blast furnace gases. The extension 17 within which the blades of the fan 18 are located, has a discharge end which extends forwardly within the elbow 12 on the mixing pipe 11 to the inlet end of the mixing pipe 11. As shown, the mixing pipe 11 is suspended from the contracted end 13 of the branch main 14, and is movable relative thereto to shut off the gas supply to the mixing pipe. The lower end 13 of the branch gas main 14

is provided with a horizontal, stationary slide 20, and connected to the upper end of the elbow 12 on the mixing pipe 11 is a similar slide 21. Counterweighted levers 22 on opposite sides of the vertical center of the branch main 14 provide means for holding the flat faces of the guide plate 20 and valve 21, in yielding engagement, and the bent levers 22 are pivoted at one end to the slide valve 21. The opposite ends of the levers 22 are connected by the bolt or rod by which the counterweight 23 is secured between the levers 22. Antifriction rollers 24 pivoted to an intermediate point in the length of the levers 22 are arranged to travel on the tracks 25 formed on the upper surfaces of the slide 20. The teeth of the racks 26 on the lower face at the sides of the slide 20 mesh with the teeth of the pinions 27 on the shaft 28 which is secured in bearings 29 on the slide 21 on the lower end of the branch pipe 14. A hand wheel 30 on one end of this shaft provides means for rotating the shaft to slide the suspended mixing pipe 11 into and out of open position (that shown in Figs. 1 and 2) on the lower end of the branch pipe 14. Positioned within the branch pipe 14 between the gas main 15 and mixer pipe is a butterfly valve 31 and on the outer end of the shaft 32 by which the valve is pivoted within the branch pipe is a lever arm 33. At one side of the branch pipe is a gasometer, the bell 34 of which is arranged to be raised and lowered within the stationary lower section forming the water chamber 35, with variations in the pressure of the gas within the gasometer. Extending upwardly within the water chamber 35 of the gasometer, with its upper end opening into the bell 34, is a gas pipe 36 which is connected to the branch pipe 14 between the butterfly valve 31 and the mixing pipe 11 on the lower end of the branch pipe. The bell 34 is connected by a cable or similar flexible connection 37 to one end of the lever arm 33 on the valve shaft 32 and the other end of this lever is connected by a similar flexible connection 39 to the counterweight 40, this counterweight counterbalancing somewhat and acting to assist in lifting the bell 34.

It will be seen by reference to Fig. 1 that with the bell 34 of the gasometer connected to the butterfly valve 31, and with the interior of the bell connected by the pipe 36 to the branch pipe 14 between the butterfly valve and the mixing pipe of the stove appliance, an increase in the gas pressure within the branch pipe 14 below the butterfly valve will raise the bell 34. It also will be readily seen that in such case the counterweight 40 will operate to close the valve 31 and lessen or shut off the gas supply so as to reduce the volume and pressure of the gas within the pipe 14 below the valve 31. When the pressure in the branch pipe below the valve 31 falls below a predetermined limit, determined by the weight of the counterweight 40, the bell 34 of the gasometer will fall and downward movement of the bell will move the lever arm 32 and cause the valve 31 to open, so as to increase the gas supply. Instead of attaching the mixing pipe to the branch pipe as shown in Figs. 1 and 2, the mixing pipe may be permanently secured to the lower end of the branch pipe so as to not be movable relative thereto, as will be readily understood.

In the use of my improved stove appliance, the inlet opening 10 into the combustion chamber 4 is opened and the hand wheel 30 is turned to move the forward end of the mixing pipe 11 into position relative to the inlet 10 shown in the drawings. This movement of the mixing pipe will admit gas into the mixing pipe from the branch main 14.

The turbine 19 on the end of the extension 17 is started so as to operate the fan 18 and force a current of air through the extension 17 into the mixing pipe 11. The air and gas, which become thoroughly mixed in the mixing pipe 11, pass into the combustion chamber 4 of the stove and are burned therein. The products of combustion pass upwardly within the combustion chamber 4 and then pass downwardly through the checker work in the space 6 and out of the branch opening 7 through the chimney valve 8 of the branch pipe which connects at its bottom end to a flue leading to the stove stack or chimney. By varying the speed of the turbine 19 driving the fan 18 the volume and pressure of the air supplied to the mixing pipe 11 of my stove appliance is regulated and controlled, and by varying the volume and pressure of the entering air, the volume of gas induced to flow into the mixing pipe from the branch gas pipe is regulated and controlled. The gas supply from the gas main will vary both in pressure and in volume, and fluctuations in pressure or volume of the gas supply will be reflected in the gasometer so that by the regulation of the butterfly valve 31 through the medium of the bell 34 of the gasometer, a constant supply of gas to the mixing pipe 11, with a variable gas supply from the gas main 15 is insured.

The advantages of my invention, which will be appreciated by those skilled in the art, arise from the increased volume of air supplied through the stove appliance to the stove combustion chamber and from inducing a flow of gases by means of the air supply instead of inducing the flow of air by means of a gas supply. The provision of an automatically operated butterfly valve enables the constant supply of gas to be maintained.

Modifications in the construction and arrangement of the apparatus forming my improved stove appliance may be made without departing from my invention as defined in the appended claims.

I claim:—

1. A hot blast stove appliance comprising in combination a mixing pipe for supplying gas and air to the stove combustion chamber, a gas supply main, a gas inlet pipe connecting the mixing pipe and gas supply main, an air inlet pipe having an extension projecting forwardly within the mixing pipe, and a turbine driven fan at the inlet end of said extension for supplying air under pressure to said mixing pipe.

2. A hot blast stove appliance comprising in combination a mixing pipe for supplying gas and air to the stove combustion chamber, a gas supply main, a gas inlet pipe connecting the mixing pipe and gas supply main, an air inlet pipe having an extension projecting forwardly within the mixing pipe, a turbine driven fan on said extension for supplying air under pressure to said mixing pipe, and means for regulating the gas supply to said mixing pipe.

3. A hot blast stove appliance comprising in combination a mixing pipe movable into and out of position to supply gas and air to the stove combustion chamber, means for moving said mixing pipe into and out of operative position relative to the stove combustion chamber, a gas supply main, a gas inlet pipe connecting the mixing pipe and gas supply main, an air inlet thereon having an extension for supplying air to said mixing pipe, a fan mounted in said extension, and a variable speed turbine for driving said fan to supply air under pressure to said mixing pipe.

4. A hot blast stove appliance comprising in combination a mixing pipe movable into and out of position to supply gas and air to the stove combustion chamber, means for moving said mixing pipe into and out of operative position relative to the stove combustion chamber, a gas supply main, a gas inlet pipe connecting the mixing pipe and branch pipe on the gas supply main, an air inlet pipe having an extension for supplying air to said mixing pipe, a fan mounted in said extension, a variable speed turbine for driving said fan to supply air under pressure to said mixing pipe, and means on the gas supply main for regulating the gas supply to said mixing pipe.

5. A hot blast stove appliance comprising in combination a mixing pipe movable into and out of position for supplying gas and air to the stove combustion chamber, a gas supply main, means for moving said mixing pipe into and out of operative position, a gas inlet pipe on said mixing pipe connecting the mixing pipe and gas supply main, an air inlet pipe on the mixing pipe having an extension for supplying air to said mixing pipe, a fan mounted in said extension to supply air under pressure to said mixing pipe, a variable speed turbine for driving said fan, a valve in said gas supply main, and a gasometer operatively connected to said valve for actuating the valve to automatically regulate the gas supply to said mixing pipe.

6. A hot blast stove appliance comprising in combination a mixing pipe having an outlet leading to the stove combustion chamber, a gas supply main, an inlet pipe on said mixing pipe connected to the gas supply main, an air inlet pipe on the mixing pipe having an extension projecting forwardly within the mixing pipe, and a motor driven fan on the inlet end of said extension to supply air under pressure to said mixing pipe.

In testimony whereof I have hereunto set my hand.

CHESTER A. ORR.

Witnesses:
M. R. NELSON,
W. H. ZIMMERMAN.