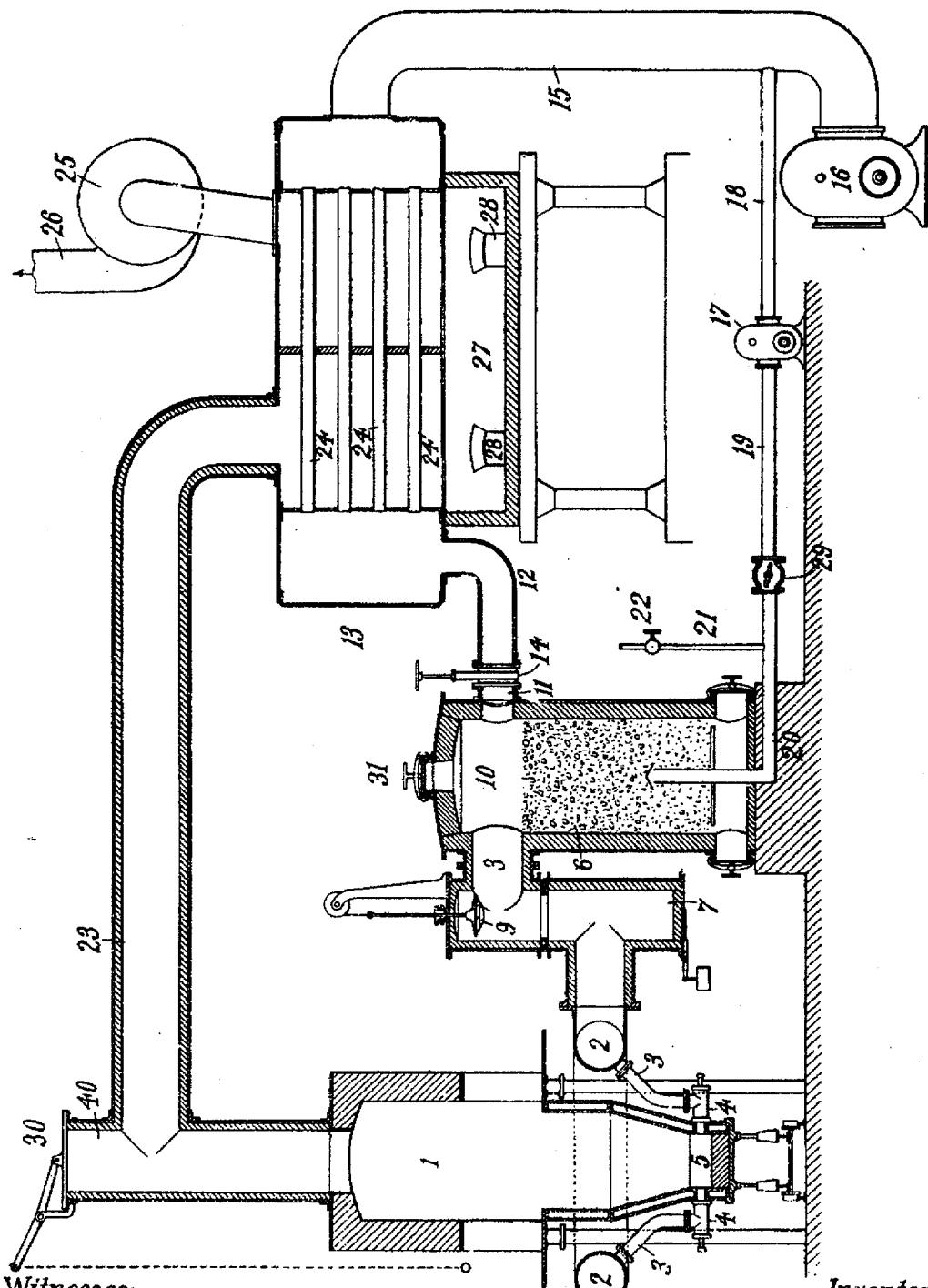


**G. WESTINGHOUSE & A. M. GOW.
METHOD OF HEATING AIR.
APPLICATION FILED MAY 2, 1903.**

976,966.

Patented Nov. 29, 1910.



Witnesses:

Thos. H. Brown, Jr.
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Inventors

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by Charles A. Terry. Atty.

UNITED STATES PATENT OFFICE.

GEORGE WESTINGHOUSE, OF PITTSBURG, AND ALEXANDER M. GOW, OF EDGEWOOD PARK, PENNSYLVANIA, ASSIGNORS TO SAID WESTINGHOUSE.

METHOD OF HEATING AIR.

976,966.

Specification of Letters Patent. Patented Nov. 29, 1910.

Application filed May 2, 1903. Serial No. 155,258.

To all whom it may concern:

Be it known that we, GEORGE WESTINGHOUSE and ALEXANDER M. Gow, citizens of the United States, and residents, respectively, of Pittsburg and Edgewood Park, in the county of Allegheny and State of Pennsylvania, have jointly invented certain new and useful Improvements in Methods of Heating Air, of which the following is a specification.

The object of our invention is to obtain heated air by the addition of the volume of air to be heated of the hot products produced in a combustion chamber, by the combustion of gas therein.

The invention is especially designed to obtain hot blast for use in a smelting furnace. We are aware that it has been heretofore proposed to burn oil and add the heated products of combustion to the air to be heated. We do not propose the use of oil, but any carbonaceous material which can be worked to advantage in a gas producer. Such material we propose to convert into producer gas and we also propose to consume this gas as fast as produced in a combustion chamber over the fuel bed, the resulting hot products of combustion mixing with the volume of air to be heated and raising its temperature to the desired degree.

We also provide means whereby the amount of gas made and the consequent temperature of blast attained shall be at all times under control and shall, if desired, be automatically controlled.

The drawing represents a vertical section of a system of apparatus designed to carry out our invention.

Referring now to the drawings, 1 is a smelting furnace of any well-known type, for convenience we have shown a familiar type of water jacketed furnace. 2 is the air supply pipe to this furnace, connected by branch pipes, 3, 3, to the tuyers, 4, 4, by means of which air is admitted to the furnace hearth, 5. The pipe 2 is connected to a gas producer, 6, by means of pipes, 7 and 8, and a water-cooled valve, 9, is provided by which the connection between pipes 7 and 8 may be closed. The gas producer 6 is of sufficient size to permit of a large combustion chamber, 10, above the fuel bed in which space we propose to burn the gases evolved in the producer. Pipes, 11 and 12,

connect the gas producer 6 to the tubular preheater, 13, and a valve, 14, is provided whereby pipe 11 may be cut off from pipe 12. The tubular preheater 13 is connected by pipe 15 to a blower or fan, 16, which supplies the air for conducting the smelting operation. A smaller blower, 17, receives air by a shunt line, 18, from the main air line, 15, and discharges this air through pipes, 19 and 20, into the bottom of the fuel bed in gas producer 6. Steam is admitted from any convenient source through pipe 21, the amount being regulated by a valve, 22. The top extension, 20, of the furnace is provided with a damper, 30, for permitting or preventing the exit of the waste gases therethrough. When this damper is closed, the waste gases from the furnace 1 pass through a pipe, 23, and around the tubes, 24, 24, 24, of the tubular preheater. The air to the furnace passes through these tubes and receives a preliminary heating from the waste gases of the furnace. An exhaust fan, 25, assists the discharge of the waste gases from the preheater 13 through the stack 26. Below the preheater 13 is provided a chamber 27 for the catching of dust blown over from the smelting furnace. Doors, 28, 28, are provided for the removal of this dust. Between pipes 20 and 19 there is located a suitable valve, 29, by which the amount of air discharged by blower 17 is controlled. The gas producer is provided with the usual removable cover, 31.

The operation is as follows: Valves 9 and 14 on either side of the gas producer being opened and valve 29 closed, blower 16 is started, air passes through pipe 15, through tubes 24, 24, 24, of the preheater, through pipes 12 and 11, through combustion chamber 10, through pipes 8 and 7, into the air pipe 2 at the furnace and through pipes 3, through tuyers 4 into the furnace. Damper 30 being closed, the waste gases pass from the furnace through pipe 23 around pipes 24, 24, 24, of the tubular preheater and are discharged through stack 26 by means of fan 25. This circulation being established, fan 17 is started, valve 29 is opened, steam admitted by valve 22, and the production of producer gas begins in gas producer 6. It leaves the fuel bed hot enough to ignite in combustion chamber 10 and its heat of combustion is added to the volume of air passing, raising this volume of air to a tempera- 119

ture dependent upon the volume of gas made. This operation continues until the body of fuel in producer 6 has been reduced to such an extent that the producer requires to be recharged. Fans 16 and 17 are then stopped, valves 9 and 14 closed, cover 31 on top of the producer is removed and a new charge of fuel put in the producer, when it is started up as before. The temperature of the blast is dependent upon the amount of air passing through valve 29, inasmuch as this valve controls the amount of gas produced. It is understood that the use of steam is merely to prevent the clinkering of the producer and insure its proper working. If desired, the valve 29 may be controlled by a thermostat which will open the valve when the temperature falls below the desired point and close it to a greater or less extent as the temperature rises. The use of the tubular preheater 13 is not essential to this method of heating blast, but it is desirable in case the waste gases leaving the furnace are of sufficient temperature to warrant their use in giving the blast a preliminary heating, to this extent effecting an economy of fuel in the producer.

In a divisional application filed by us September 17, 1903, Serial Number 173,510, 30 claims are made upon the apparatus described herein.

I claim as my invention:

1. The method of heating air for the blast of a smelting or other furnace, which consists in delivering all the air to a combustion chamber coincident with the delivery thereto of gas from a producer, utilizing a portion of the oxygen of the air in the combustion

chamber in supporting the combustion of the gas, causing the products of combustion to mingle with the air, utilizing a portion of the waste heat of the furnace in preheating the air prior to its delivery to the combustion chamber and delivering the products of combustion and air to the smelting furnace.

2. The method of heating air for the blast of a smelting or other furnace, which consists in generating producer gas, mingling all the air to be heated with the producer gas, utilizing a portion of the oxygen of the air to support the combustion of the gas, mingling the products of combustion with the air to be heated, utilizing a portion of the waste heat of the furnace in preheating the air prior to its mingling with the producer gas and then delivering products of combustion and heated air to the smelting furnace.

3. A method of heating air for the blast of a smelting or other furnace, which consists in generating producer gas, burning the gas generated so as to conserve the sensible heat of the generating operation, mingling the products of the combustion of the gas with all the air to be heated near the fuel bed and utilizing a portion of the waste heat of the furnace in preheating the air.

Signed at New York, in the county of New York, and State of New York, this 21st day of April, 1902.

GEO. WESTINGHOUSE.
ALEXANDER M. GOW.

Witnesses:

Wm. H. CAPEL,
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