No. 833,467. PATENTED OCT. 16, 1906.

D. & D. D. LAMOND.

APPARATUS FOR PURIFYING AND REHEATING FURNACE GASES.

APPLICATION FILED APR. 9, 1904.

2 SHEETS—SHEET 1.

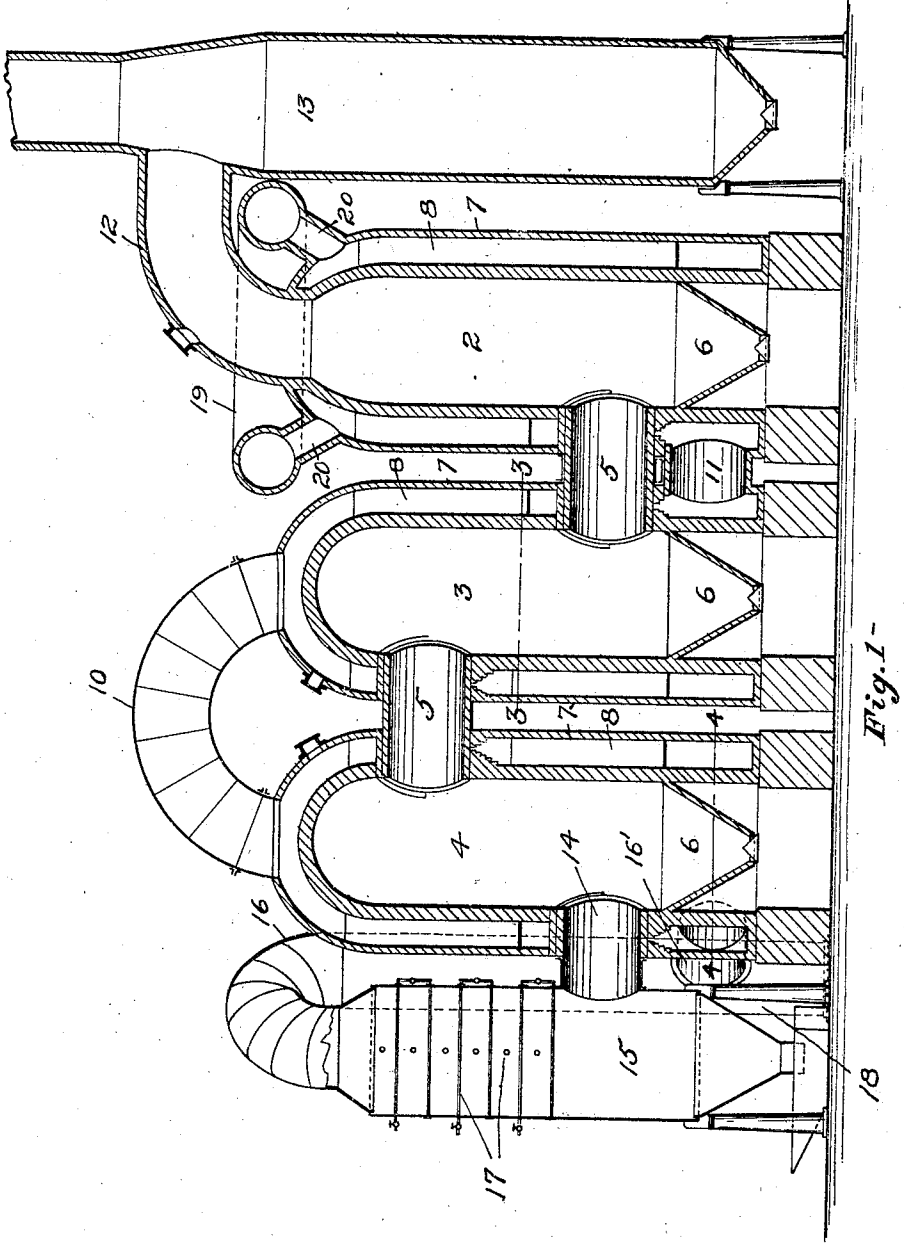



Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2

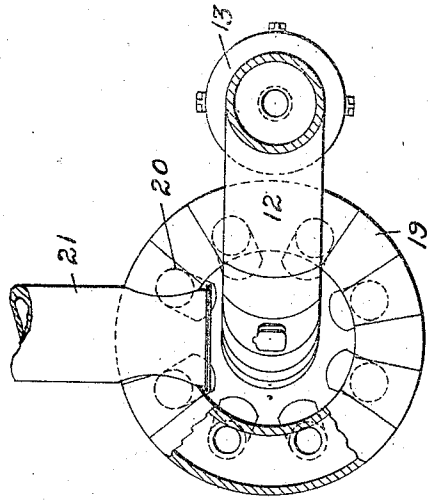



Fig. 4

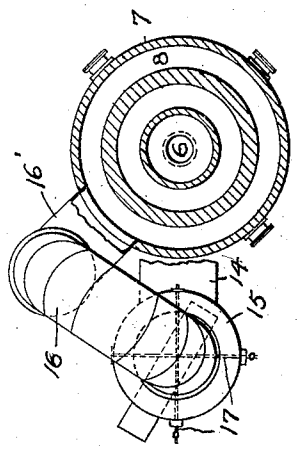



Fig. 3

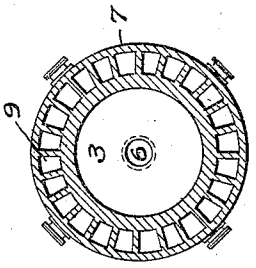
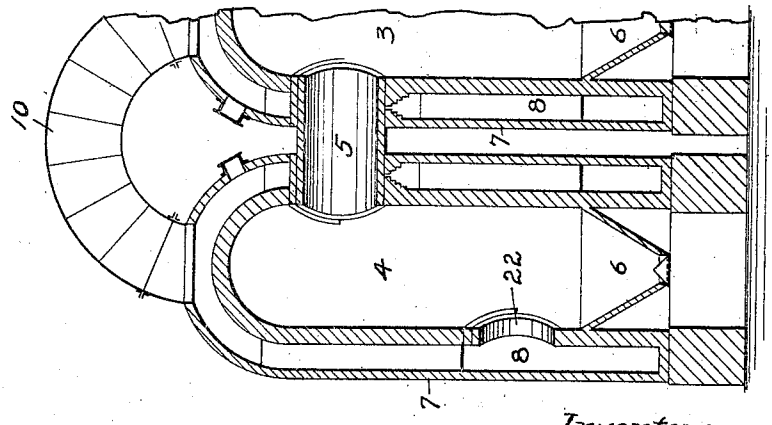



Fig. 5




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# UNITED STATES PATENT OFFICE.

DAVID LAMOND, OF PITTSBURG, AND DAVID D. LAMOND, OF ALLEGHENY, PENNSYLVANIA.

## APPARATUS FOR PURIFYING AND REHEATING FURNACE-GASES.

No. 833,467. Specification of Letters Patent. Patented Oct. 16, 1906

Application filed April 9, 1904. Serial No. 202,379.

*To all whom it may concern:*

Be it known that we, DAVID LAMOND, residing at Pittsburg, and DAVID D. LAMOND, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, citizens of the United States, have invented certain new and useful Improvements in Apparatus for Purifying and Reheating Blast-Furnace Gases, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to purifying and reheating blast-furnace gases; and the object thereof is to provide improved apparatus for utilizing heat radiated from the impure gas for reheating the gas after it is purified and before it passes to the furnaces, stoves, &c., for use as fuel, thereby feeding the purified gas at substantially the temperature at which it left the blast-furnace and greatly increasing its efficiency without the employment of special regenerating apparatus.

In the accompanying drawings, Figure 1 is a vertical sectional view of apparatus constructed in accordance with our invention. Fig. 2 is a top plan view, partly in section, of the initial purifying-chamber shown in connection with the dust-catcher. Fig. 3 is a sectional plan view on line 3 3 of Fig. 1. Fig. 4 is a top plan view of the gas-washer shown in connection with the next adjacent purifying-chamber, which is shown in section taken on line 4 4 of Fig. 1. Fig. 5 illustrates a modification.

In the embodiment of the invention herein disclosed we have shown three relatively large stove-like settling-chambers 2, 3, and 4, connected in series by horizontal pipes 5, the latter being preferably arranged out of horizontal line, so as to make a circuitous passage for the gas. These chambers have the usual bell and hopper bottom construction 6 for the accumulation and discharge of impurities which separate by gravity from the gas.

Each of chambers 2, 3, and 4 is surrounded and inclosed by an outer wall 7, which is separated sufficiently from the inner chamber-wall to form a surrounding cavity or flue 8. The lower portion of this cavity is horizontally continuous or uninterrupted, as shown in Fig. 1 and more clearly in Fig. 4, while the upper portion thereof is of vertical-flue or checker formation, as shown at 9, Fig. 3. The upper ends of spaces 8 surrounding chambers 4 and 3 are connected by elbow 10, while the lower ends thereof surrounding chambers 3 and 2 are connected by duct 11. The upper portion of the initial chamber 2 is connected by pipe 12 with the dust-catcher or down-comer 13 of the blast-furnace. (Not shown.) Chamber 4 is connected by duct 14 with the lower portion of the upright gas-washer 15, and the upper end of the latter is connected by vertical pipe 16 with the lower end of cavity 8 surrounding chamber 4.

In operation the blast-furnace gas passes directly from the dust-catcher 13 into the upper end of chamber 2 and from thence successively through pipes 5 into chambers 3 and 4. In passing through these chambers the gas expands and the heat thereof is absorbed by the chamber-walls, thereby heating cavities or flues 8 to the temperature of the gas as it leaves the blast-furnace. The passage of the gas through these chambers is comparatively slow, so that there is ample time for it to give off its heat and also ample space in which it may expand and release the heavier impurities which collect in the hopper-bottoms 6. By the time the gas passes from chamber 4 into washer 15 it is comparatively cool and relatively clean. In its upward passage through the washer the gas encounters downward sprays of water discharged from transverse perforated pipes 17 and all of the dust and lighter impurities are removed. The pure and cool gas passes from the washer downward through pipe 16 and into the lower end of space 8 surrounding chamber 4. Pipe 16 extends below its connection 16″ with said space, as indicated at 18, and forms a trap for collecting moisture carried over from the washer. The gas passes upward through this space 8 and through elbow 10 into the corresponding space surrounding chamber 3 and from the latter through duct 11 into the space surrounding initial chamber 2, its course being in direction reverse to that followed by it in flowing through the purifying apparatus. The pure gas is thus thoroughly heated, its temperature when it enters bustle-pipe 19, at the upper end of chamber 2, being substantially the same as that of the impure gas entering said chamber from the dust-catcher. This bustle-pipe has a series

of connections 20, through which the gas enters, and pipe 21 operates to pass the same to the steam-boiler furnace, hot-blast stoves, or wherever required for fuel use.

In some instances the gas may be sufficiently purified by its passage through the settling-chambers, in which event the washer may be eliminated and the outer chamber 4 placed in direct communication with flue or space 8, as indicated at 22, Fig. 5.

While we have here shown three combined gas purifying and reheating chambers, we do not confine ourselves thereto, as a greater or less number may be used, as may be found convenient or desirable; nor do we restrict our invention to the form and construction of said chambers herein disclosed, nor to entirely surrounding the same with a pure-gas space, although such construction is preferred.

As no claim is here made to the construction of the washer, we have neither shown nor described it in detail, and we do not desire to limit ourselves in this regard, as washers of various constructions may be used or the same may be dispensed with entirely, as above indicated.

The method herein disclosed of purifying and reheating blast-furnace gases is claimed in an application, Serial No. 229,477, filed October 21, 1904.

We claim—

1. Apparatus of the character described having a settling-space adapted to receive impure heated gases, said space having a hollow wall, and a washer having its inlet communicating with the gas-settling space and its outlet communicating with the said hollow wall.

2. Apparatus of the character described, comprising a succession of communicating gas-settling chambers constructed with communicating hollow walls, means for admitting heated impure gas to one of said chambers, and means for passing the gas purified in the chambers into and through the hollow walls thereof for the purpose of heating the pure gas.

3. Apparatus of the character described, comprising a plurality of communicating settling-chambers having communicating hollow walls, means for admitting heated impure gas to the first of said chambers, a gas-washer communicating with the last of said chambers, and a connection between the discharge of the gas-washer and the hollow walls of said chambers for the purpose of conducting the purified gas into said hollow walls for heating the same.

4. Apparatus of the character described, comprising a plurality of communicating settling-chambers having communicating hollow walls, a connection with the initial chamber for admitting impure gas thereto, a gas-washer communicating with the last of said chambers, a connection between the discharge of the gas-washer and the hollow walls of the chambers for passing the purified gas through the latter and heating the same, and a discharge for the purified gas at the upper end of the hollow wall of the initial chamber.

5. Apparatus of the character described comprising a series of settling-chambers, each chamber being inclosed by a hollow wall, communicating connections between the chambers, communicating connections between the hollow-wall spaces, a gas-inlet for one of the settling-chambers, and means for admitting gas passing from said chambers into the said hollow-wall spaces.

6. Apparatus of the character described comprising a series of relatively large settling-chambers each constructed with a hollow wall, communicating connections between the chambers, communicating connections between the hollow walls of adjacent chambers, a gas-inlet connection for the first of the series of chambers, means for passing gas discharged from the last of the series of chambers into the hollow-wall space of that chamber, and a gas-outlet for the hollow-wall space of the initial chamber.

7. Apparatus of the character described comprising a series of separate settling-chambers each constructed with a hollow inclosing wall, communicating connections between the chambers, communicating connections between the wall-spaces of the chambers, a gas-inlet for the initial chamber and a gas-outlet for the hollow-wall space of that chamber, and a washer having its inlet connected with the last of said series of chambers and its outlet connected to the hollow-wall space of said chamber.

In testimony whereof we affix our signatures in presence of two witnesses.

DAVID LAMOND.
DAVID D. LAMOND.

Witnesses:
JNO. M. IRWIN,
W. A. THOMPSON.