

No. 688,358.

Patented Dec. 10, 1901.

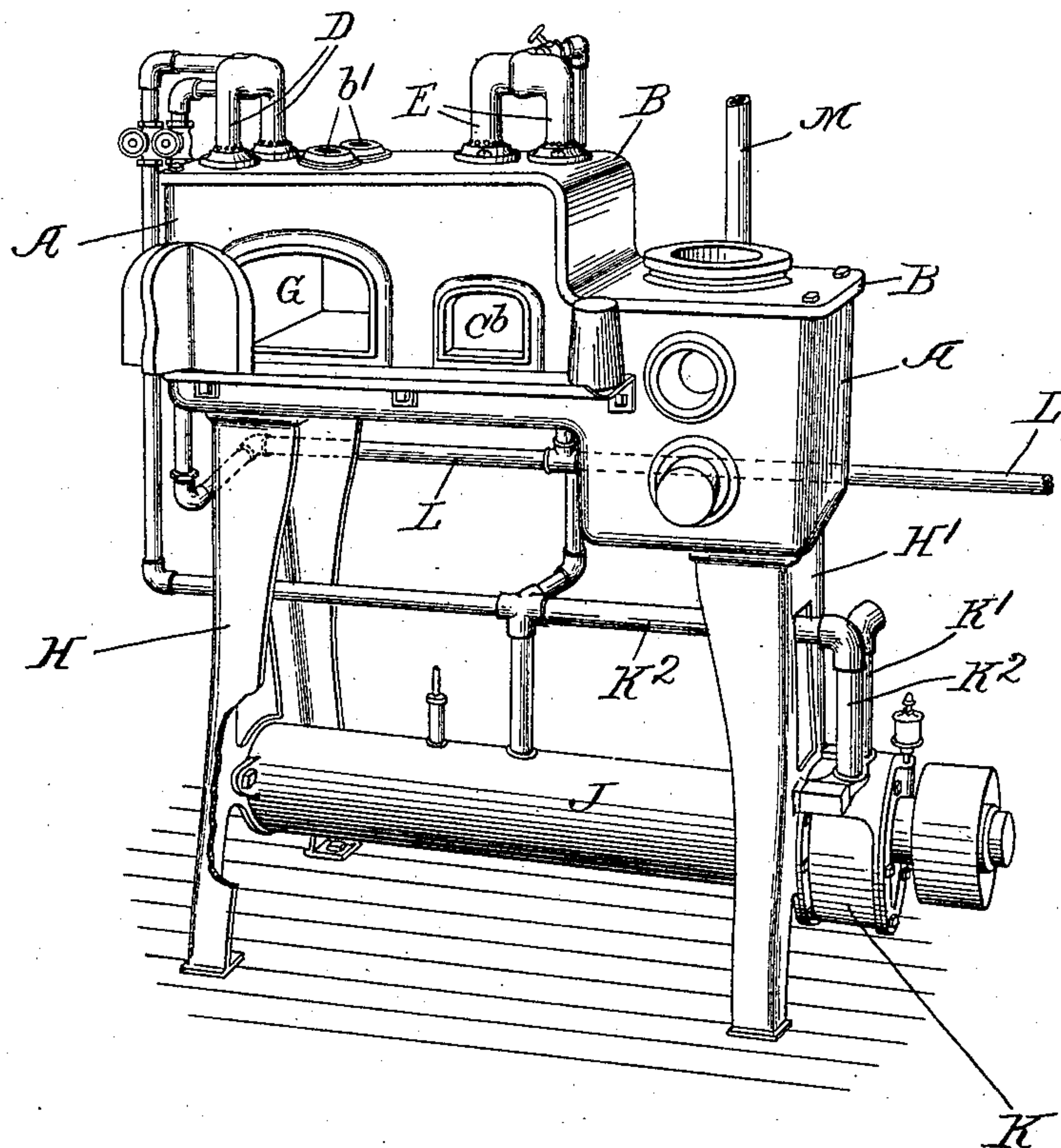
J. K. STEWART.  
COMBINATION FURNACE.

(Application filed Feb. 12, 1900.)

(No Model.)

2 Sheets—Sheet 1.

*Fig. 1.*



*Witnesses.*

*Edward T. Wray.*

*Adna H. Bowen Jr.*

*Inventor.*

*John K. Stewart*  
*by Burton & Burton*  
*his Attys.*

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Fig. 2.

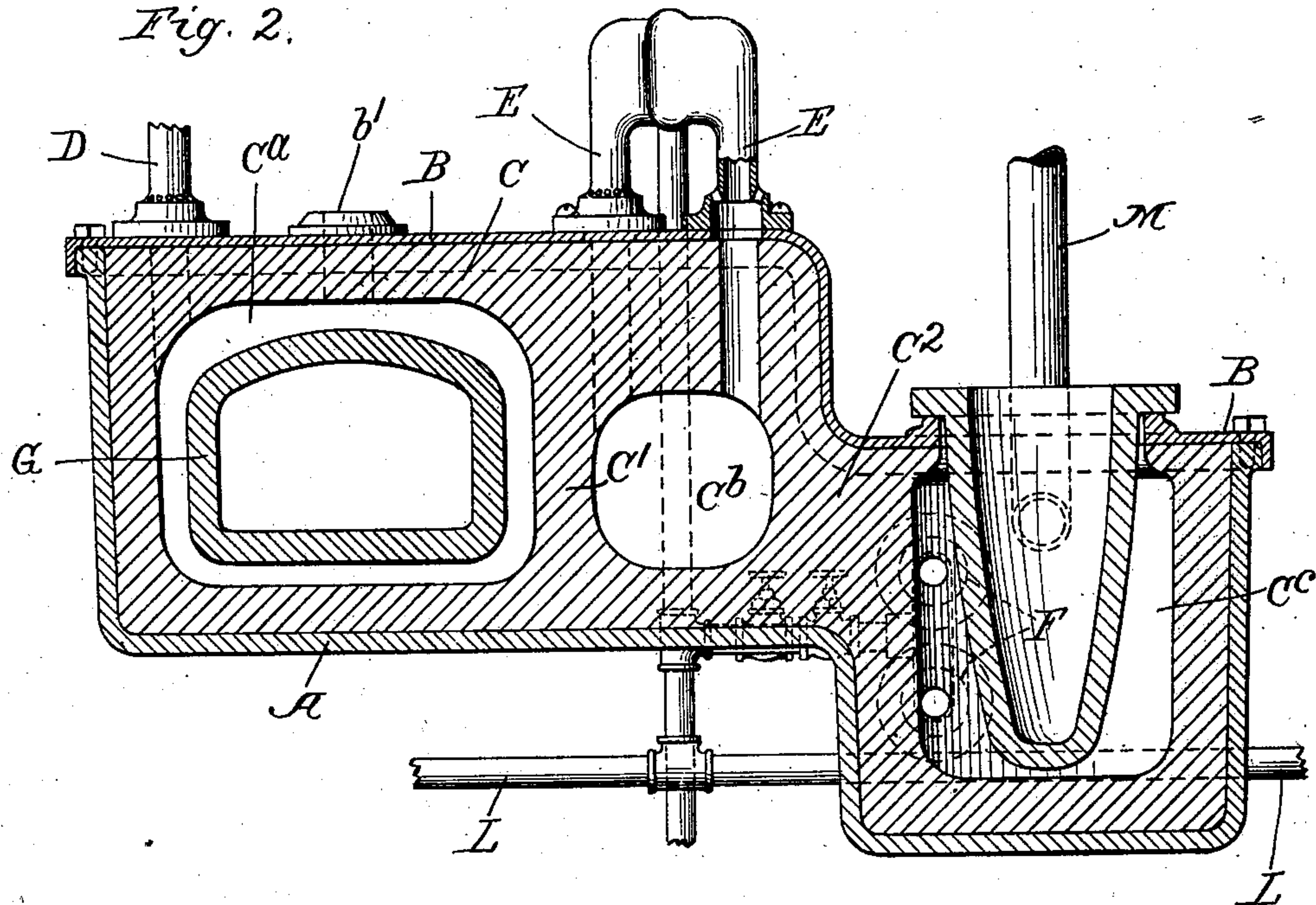
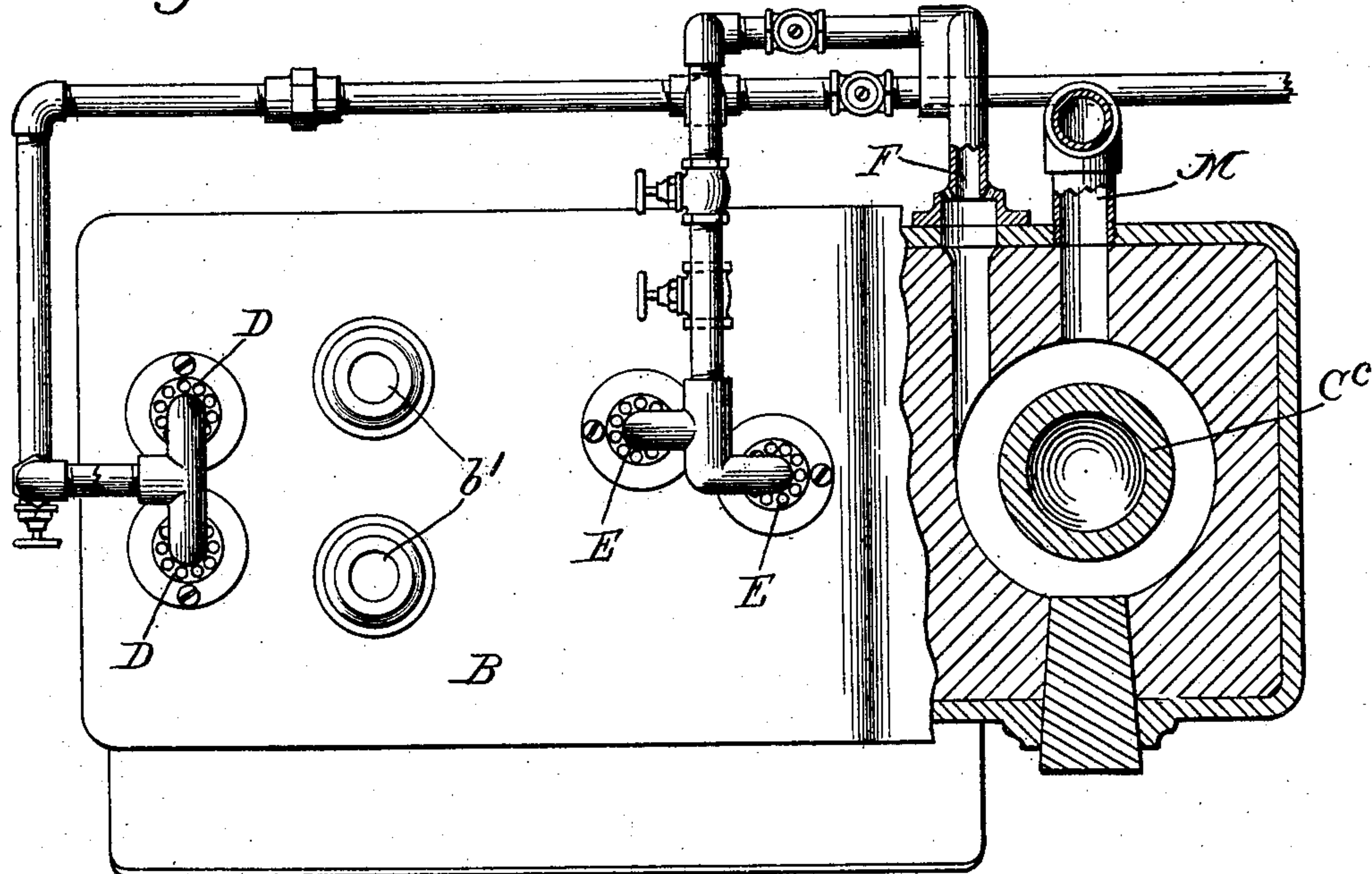


Fig. 3.



Witnesses.

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# UNITED STATES PATENT OFFICE.

JOHN K. STEWART, OF CHICAGO, ILLINOIS.

## COMBINATION-FURNACE.

SPECIFICATION forming part of Letters Patent No. 688,358, dated December 10, 1901.

Application filed February 12, 1900. Serial No. 4,901. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN K. STEWART, a citizen of the United States, residing at Chicago, Cook county, State of Illinois, (having post-office address at No. 158 East Huron street, Chicago, Cook county, Illinois,) have invented certain new and useful Improvements in Combination-Furnaces, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide a combined apparatus or implement in which the several forms of gas-furnaces required for specific processes are assembled in one apparatus.

In the drawings, Figure 1 is a perspective of my combined gas blast-furnace, the standards being partly broken away. Fig. 2 is a longitudinal vertical section. Fig. 3 is a top plan, partly in section, through the crucible-furnace at the plane 3 3 on Fig. 2.

I have shown in this implement or apparatus a muffle-furnace, a forge, and a crucible-furnace all combined in one integral shell, such shell and the air-compressor and compressed-air reservoir for supplying the air-blast to all three furnaces being all assembled as a unitary structure and supported on one base. I have also shown the gas connections for supplying the gas to all the furnaces mounted and supported on the same unitary structure, so that as a whole it requires only one gas connection to be made with any source of gas-supply and a power connection, such as a belt, to be extended to the air-compressor in order to be ready for operation at either or all of the furnaces.

A is the cast-iron shell of my combined furnace, said shell comprising four walls and bottom, and B is the top plate, which completes the inclosure of a single continuous chamber in said shell.

C represents the fire-clay or fire-brick lining of the shell. This lining is extended to form the partitions C' C<sup>2</sup>, which separate the three chambers C<sup>a</sup> of the muffle-furnace, C<sup>b</sup> of the forge, and C<sup>c</sup> of the crucible-furnace. Said lining is extended also over the top to form the lining for the top plate B, having the necessary apparatus, hereinafter described, for fluid-fuel supply and vent corresponding

with the positions at which the fluid-fuel burners and vent-holes are formed in the top plate B. The fluid-fuel burners may be mounted and connected at any desired and convenient position. I have shown two burners or the double burner D D, mounted on the top plate B, for supplying the muffle-furnace, for which vent-apertures *b' b'* are formed in the top plate B, registering with corresponding apertures in the lining leading into the muffle-chamber. The burners E E are similarly mounted upon the top plate, while the burners F F for the crucible-furnace are mounted upon the back plate of the shell A. The interior contour of the lining of the muffle-chamber and the position of the burners and vent-ports with respect to the cavity of the chamber are such that the flame is directed around the muffle G, causing an even distribution of the heat, avoiding conflicting eddies and jets in the flame products of combustion and heat-currents. A similar result is obtained by the interior contour of the forge-chamber, flame-ports from the burners E E through the fire-clay lining being approximately tangential to the curved inner surface of said lining, so that the flame is directed in the manner to cause it to operate most effectively upon the metal exposed in such chamber. A similar relation between the contour in a horizontal plane of the inner wall of the lining of the crucible-chamber and the direction of the flame-ports from the burners leading thereinto can be seen by reference to Fig. 3, resulting in a complete flame-mantle about the crucible, giving an even distribution of heat thereto. The crucible-furnace of this unitary and integral structure is formed, as seen in Figs. 1 and 2, so that its top surface is a step below the top surface of the remainder of the structure, the bottom being similarly dropped below the bottom of the other chamber, thus facilitating the handling of the crucible, which must be lifted out of the chamber and would be difficult to manipulate if that chamber were on a level with the others. The entire unitary structure, comprising the three chambers described, is supported on standards H H', and on the same standards between them near their lower ends there is supported the compressed-air reservoir J, which is a cylinder of suit-



able strength, which may be secured to the standards in a manner to brace them and increase the stability of the entire structure. The pressure-blower K for supplying compressed air for the blast is mounted upon the outer side of the standard H', the web of which is suitably formed to accommodate the blower and afford means of securing it in position with its intake and discharge pipes K' K<sup>2</sup> at the upper side. From the discharge-pipe K<sup>2</sup> pipes extend to the reservoir J and to the mixers of the several burners.

L is a gas-supply pipe which is suitably branched to supply the several burners, valves to control said burners separately being provided at suitably-convenient points.

M is a vent-pipe from the crucible-furnace. I claim—

1. A combined furnace, comprising a unitary metal shell inclosing a single continuous chamber and a fire-brick lining for such chamber extended to form vertical partitions therein continuous with said lining, dividing the cavity into separate, non-communicating chambers, and independent burners for supplying fluid fuel to said chambers respectively.

2. A combined furnace, comprising a unitary metal shell inclosing a single continuous chamber, and a fire-brick lining for such cham-

ber extended to form vertical partitions therein continuous with said lining and dividing the cavity into separate chambers adapted respectively for a crucible-chamber, a muffle-chamber and a forge-chamber; and independent burners for supplying fluid fuel to said chambers respectively.

3. A combined furnace, comprising a standard, a unitary metal shell mounted on and rigid with the standard and inclosing a single continuous chamber; a fire-brick lining for such chamber, extended to form vertical partitions therein continuous with such lining and dividing the cavity into separate non-communicating chambers; a compressed-air reservoir, and a compressor for supplying the same, mounted rigidly on the standard and arranged to embrace the same; and independent fluid-fuel burners mounted on the metal shell connected with the compressed-air reservoir, for heating the several chambers respectively.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 9th day of February, A. D. 1900.

JOHN K. STEWART.

In presence of—

CHAS. S. BURTON,  
ADNA H. BOWEN, Jr.