

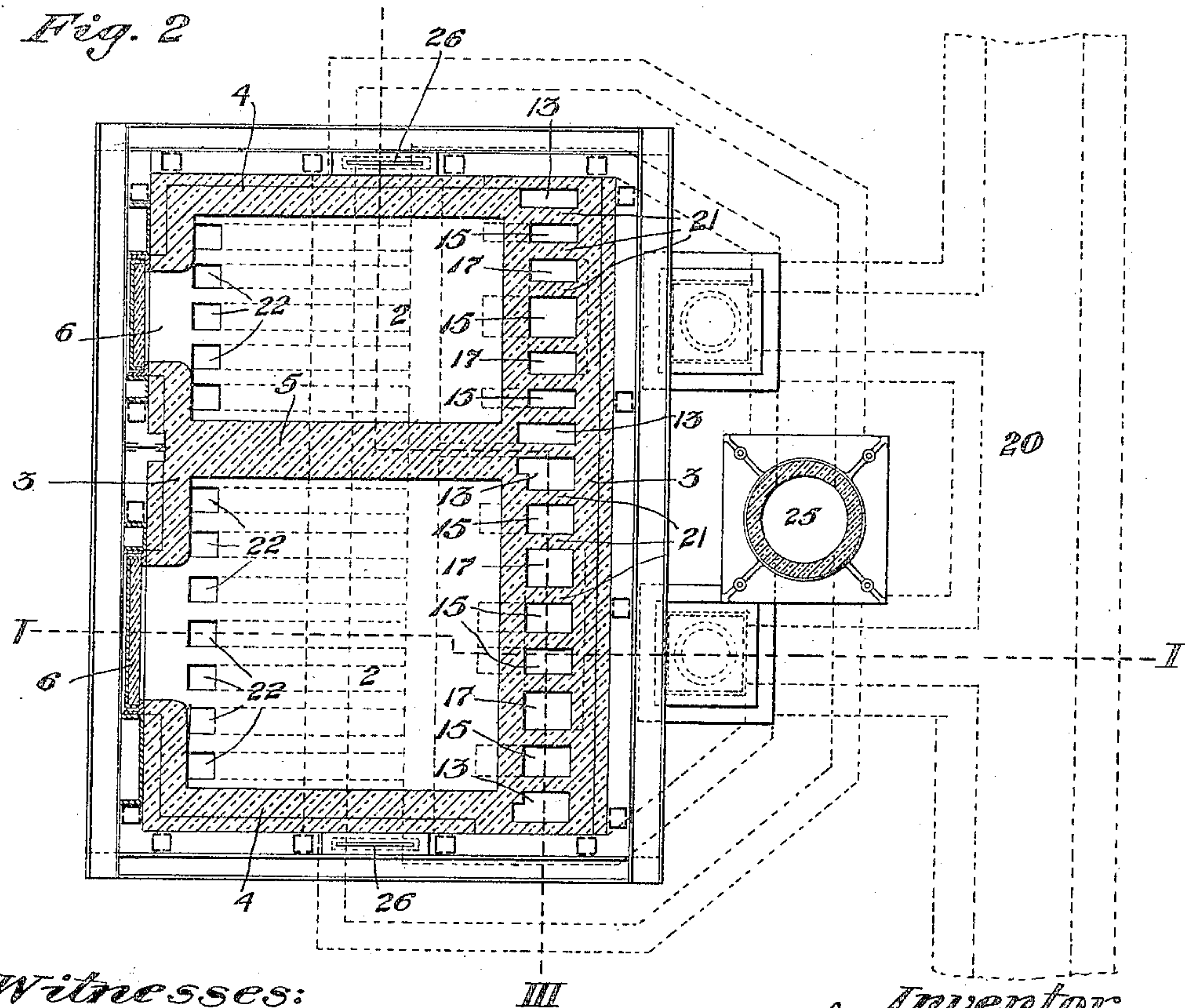
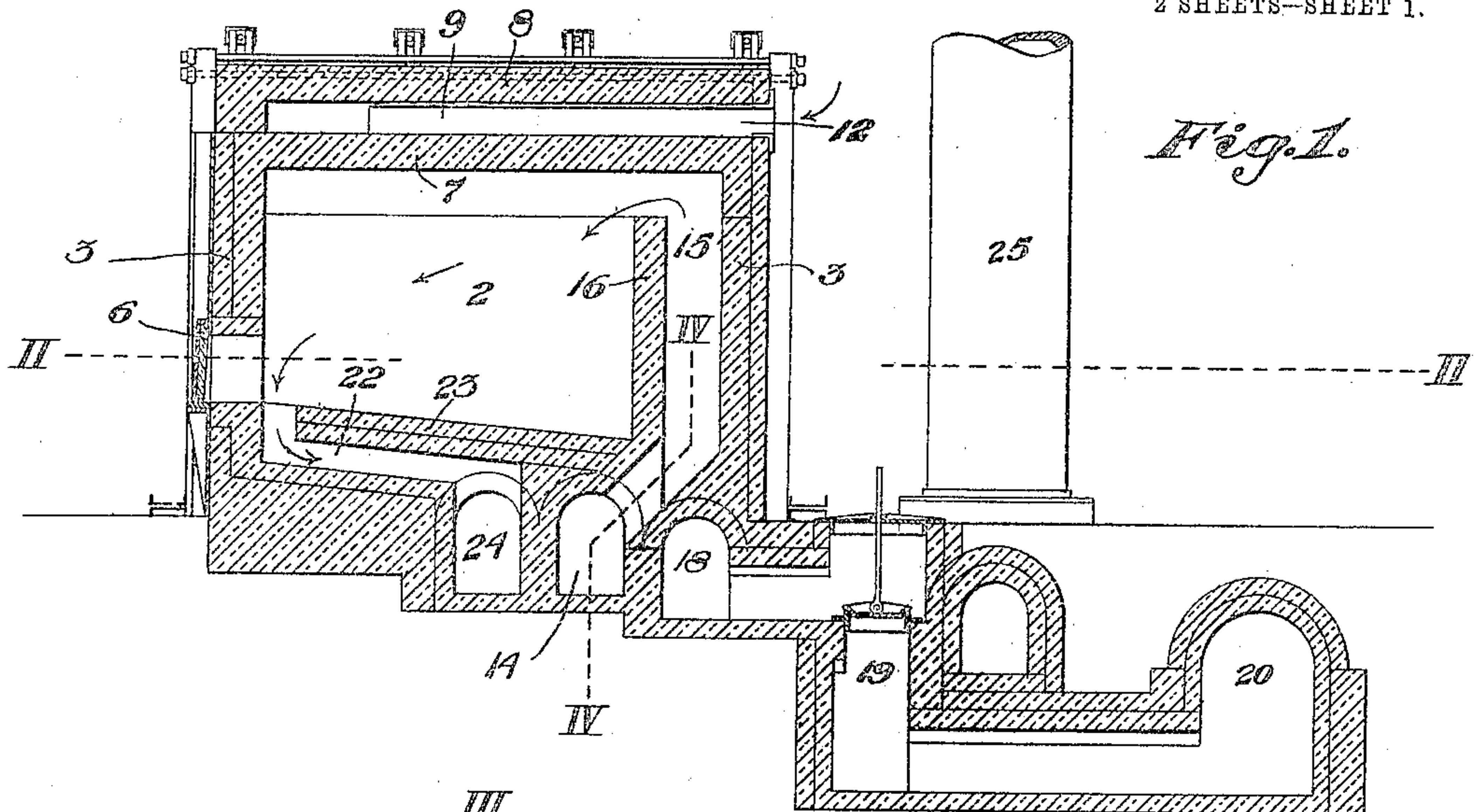
No. 813,226.

PATENTED FEB. 20, 1906.

J. C. MILLER.  
FURNACE.

APPLICATION FILED MAR. 7, 1905.

2 SHEETS—SHEET 1.



Witnesses:  
E. R. Rodd.  
Chas. S. Sibley

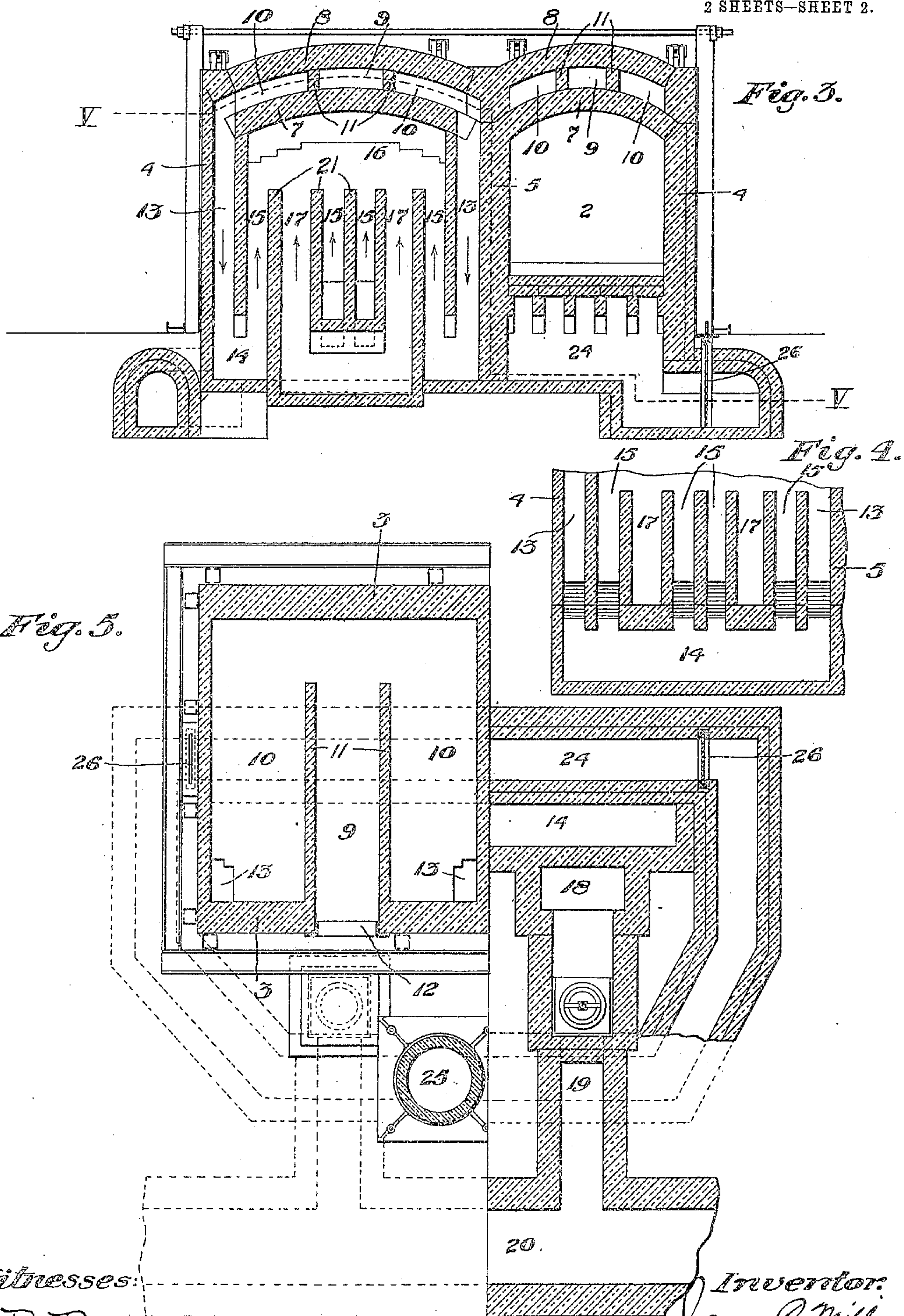
Inventor:  
James C. Miller  
by A. M. Clarke  
his attorney



J. C. MILLER.  
FURNACE.

APPLICATION FILED MAR. 7, 1905.

2 SHEETS—SHEET 2.



Witnesses:

E. R. Rodd.

Chas. S. Spley

Inventor:

James C. Miller  
by C. M. Clarke  
his attorney



# UNITED STATES PATENT OFFICE.

JAMES C. MILLER, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO FORTER MILLER ENGINEERING COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

## FURNACE.

No. 813,226.

Specification of Letters Patent.

Patented Feb. 20, 1906.

Application filed March 7, 1905. Serial No. 248,896.

*To all whom it may concern:*

Be it known that I, JAMES C. MILLER, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical sectional view through my improved heating-furnace indicated by the line I I of Fig. 2. Fig. 2 is a horizontal sectional view indicated by the line II II of Fig. 1. Fig. 3 is a vertical sectional view indicated by the line III III of Fig. 2. Fig. 4 is a partial similar view on the line IV IV of Fig. 1. Fig. 5 is a horizontal sectional view on the broken line V V of Fig. 3.

My invention relates to improvements in heating or annealing furnaces; and it has for its object to provide a construction wherein the incoming air and gas will be highly heated before being brought together at the point of combustion, also to provide a construction wherein the air itself will be caused to traverse a tortuous series of ports in close proximity to the walls of the furnace structure, being finally mixed with the heated gas at a point so located as to provide for a thorough commingling of the air and gas, whereby the resulting gases of combustion will be directed over the bed of the furnace and caused to circulate through its interior to the best advantage, finally emerging downwardly through outlet-flues at the opposite sides, said flues leading underneath the furnace-bed to the main flues communicating with the stack.

One of the principal objects of the invention is to provide a compact construction having these objects in view and which is capable of economical installation and capacity for continuous operation with the desired uniformity of action.

Heretofore in furnaces of this character, which are designed for the combustion of producer or other gas, the gas and air have been introduced from below and above, respectively, whereby the opposing currents were caused to commingle and traverse the furnace-chamber in such a manner as to inter-

fere with complete combustion or else resulting in the combustion some distance beyond the bridge-wall, while also resulting in directing the heat unevenly over the contents of the furnace. My invention provides a construction wherein the gas and air currents are brought together in the same direction of flow, mixed on one side of the bridge-wall at the point of combustion and caused to traverse the interior of the furnace, without conflict of the currents and with a resulting higher efficiency in combustion.

Referring now to the drawings, these illustrate my improved furnace constructed to provide what is known as a "pair" furnace—i. e., one having two adjacent separated heating-chambers preferably of different capacity in which the metal, as sheets, may be successively treated—said furnace-chambers being indicated by the numerals 2. The furnace-chambers are inclosed within front and back walls 3 3 and end walls 4 4 with an intervening partition-wall 5, and are provided with the usual charging - doors 6 6. The roofs or covers of the furnace-chambers 2 are arched in the usual manner and comprise an inner arched roof 7 and an outer roof 8, providing intervening air-circulating passages 9 10, separated by longitudinal partitions 11. The central air - passage 9 is open at the back, as shown at 12, for admission of cold air and extends to the front wall, where it communicates with the laterally-arranged return-passages 10 10, the walls 11 terminating some distance back of the front wall, as shown, thus providing for free return circulation of the air. The return-passages 10 10 communicate at the back portion of the furnace with downwardly-directed air-ports 13 13, communicating at the bottom with a hot - air flue 14, which extends transversely across underneath the furnace-bed. From this flue 14 hot-air ports 15 extend upwardly, terminating somewhat below the level of a bridge-wall 16, located within the structure adjacent to the back wall 3, as shown in Fig. 1. Gas is introduced in a similar manner through gas-supply ports 17, leading upwardly from gas-flues 18, communicating through valve - controlled passages 19 with the main gas-flue 20, the valves con-



trolling passages 19 being capable of being raised and lowered to vary the supply of gas to each chamber. Between the air-ports 15 and gas-ports 17 are partition-walls 21, which preferably terminate below the top of bridge-wall 16, thus providing a common cross-passage somewhat below the top of said bridge-wall in which the upwardly-traveling heated gas and air commingle and ignite. The resulting gases of combustion traverse the furnace-chamber, as indicated by the arrows in Fig. 1, from the top of the bridge-wall downwardly across to the front, where the products of combustion enter a series of ports 22, extending backwardly underneath the floor 23 of the furnace and communicate with a common trunk-flue 24, leading backwardly at one or both sides to the flue-stack 25, which may be of any suitable height to produce the desired draft. By this arrangement of incoming and outgoing flues it will be seen that the air is caused to traverse in a tortuous course between the upper and lower roof of arches, between the flue-walls both downwardly and upwardly, and in contact with the bridge-wall before emerging into the furnace-chamber, the gas likewise passing through similar ports and in contact with heated walls, by which circulation and contact both the air and gas become heated to a very high degree. The resulting combustion is practically perfect, the entire area of the furnace-chamber is thoroughly traversed by the gases, the current is not interfered with by oppositely-meeting volumes of air and gas, and the entire structure is well arranged and adapted to produce the results desired.

The return-flue for the waste gases is provided at the side of each furnace with gates 26, by which the draft may be controlled or regulated, so that by these gates and by the valves controlling passages 19 the operation of one or both furnaces may be very accurately regulated.

It is obvious that the furnace may be built for annealing and other heating purposes with a single chamber, or double, as shown, or that any convenient number of furnace-chambers may be incorporated within a single structure by properly arranging the various ports, flues, walls, &c., and such changes are to be considered as within the province of the designing engineer or builder.

It is obvious that various other changes or variations may be made in the design or details of construction; but all such changes are to be considered as within the scope of the following claims.

What I claim is—

1. A furnace provided with a bridge-wall, a series of air-ports traversing the roof and walls of the furnace and finally leading upwardly terminating below the top of the bridge-wall, a series of gas-ports traversing

the walls of the furnace structure also leading upwardly and terminating below the top of the bridge-wall, whereby the heated air and gas are caused to commingle and flow in the same direction, with an outlet-flue for the products of combustion opening into the furnace-chamber at the opposite lower portion thereof, whereby the gases circulate diagonally across the furnace area, substantially as set forth.

2. A furnace provided with a bridge-wall, a series of air-ports traversing the roof and walls of the furnace and finally leading upwardly terminating below the top of the bridge-wall, a series of gas-ports traversing the walls of the furnace structure also leading upwardly and terminating below the top of the bridge-wall, whereby the heated air and gas are caused to commingle and flow in the same direction, an outlet-flue for the products of combustion opening into the furnace-chamber at the opposite lower portion thereof, and a series of return-ports communicating with said opening leading underneath the furnace-floor and communicating with an outlet-conveyer for the waste products, substantially as set forth.

3. In a heating-furnace, the combination of inclosing walls and a roof formed by upper and lower layers with intervening air-passages communicating with the atmosphere, air-ports leading downwardly from said roof-passages to a hot-air flue, a series of heated-air flues leading upwardly to a combustion-chamber, and a series of intervening gas-ports also leading upwardly to said combustion-chamber, with a series of outlet-ports communicating with an escape-flue and opening into the furnace-chamber at the opposite lower portion thereof, substantially as set forth.

4. In a heating-furnace, the combination of inclosing walls and a roof formed by upper and lower layers with intervening air-passages communicating with the atmosphere, air-ports leading downwardly from said roof-passages to a hot-air flue, a series of heated-air flues leading upwardly to a combustion-chamber, and a series of intervening gas-ports also leading upwardly to said combustion-chamber, with a series of outlet-ports communicating with an escape-flue and opening into the furnace-chamber at the opposite lower portion thereof, and an intervening bridge-wall extending upwardly beyond the combustion-chamber, substantially as set forth.

5. In a heating-furnace, the combination with a chamber inclosed within the walls of the furnace structure having a roof provided with upper and lower portions, of return-air passages incorporated between the upper and lower portions of the roof structure communicating with the atmosphere, with commu-



5 nicating downwardly and upwardly leading  
air-ports, and a series of gas-supply ports, ter-  
minating in a common combustion-chamber;  
with a series of return-ports leading under-  
neath the furnace-floor and opening into the  
furnace-chamber at its lower portion oppo-  
site the combustion-chamber, whereby the  
products of combustion are caused to trav-

erse the furnace-chamber, substantially as  
set forth. 10

In testimony whereof I affix my signature  
in presence of two witnesses.

JAMES C. MILLER.

Witnesses:

C. M. CLARKE,  
JAS. J. McAFEE.