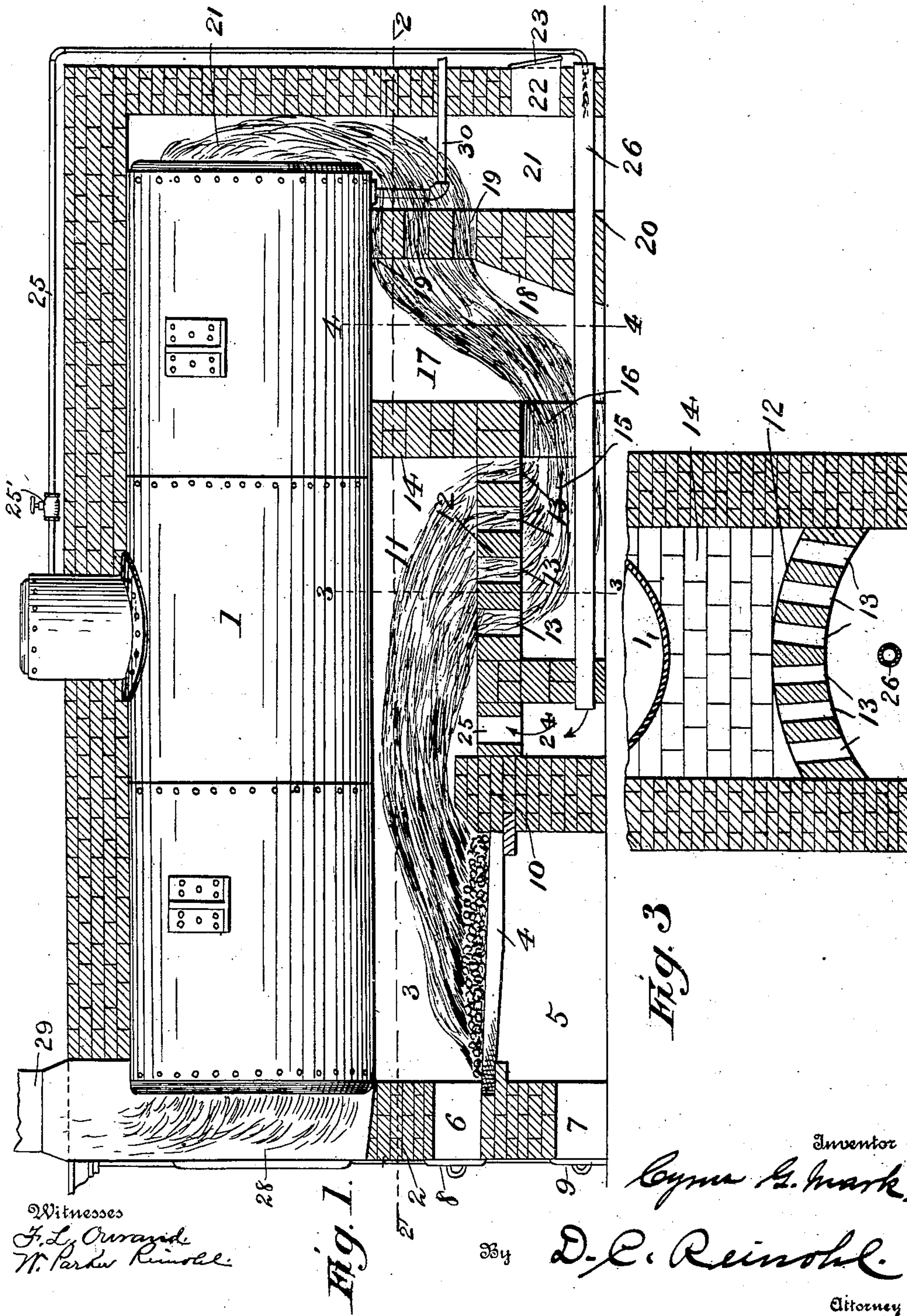


No. 824,497.

PATENTED JUNE 26, 1906.

C. G. MARK.  
SMOKE CONSUMING FURNACE.  
APPLICATION FILED NOV. 27, 1905

2 SHEETS—SHEET 1.



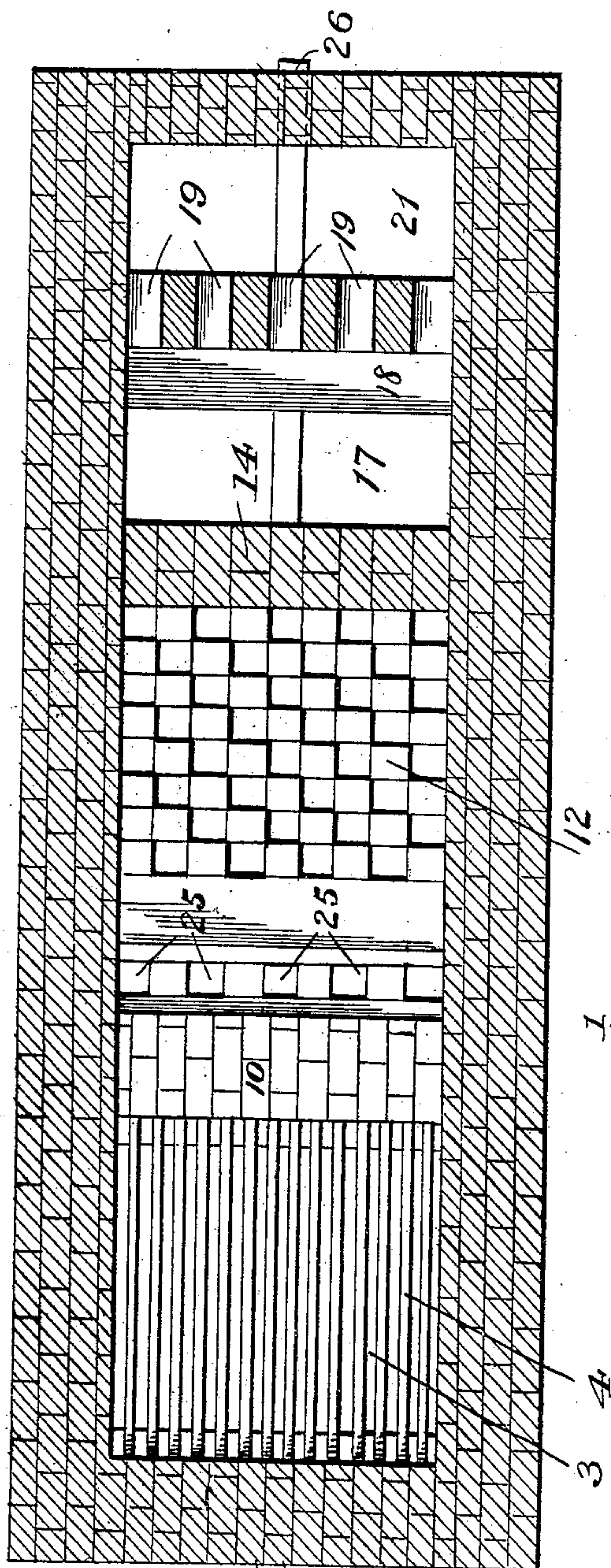


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2 SHEETS—SHEET 2.



Witnesses  
J. L. Orvand.  
W. Parker Reinold.

Fig. 2

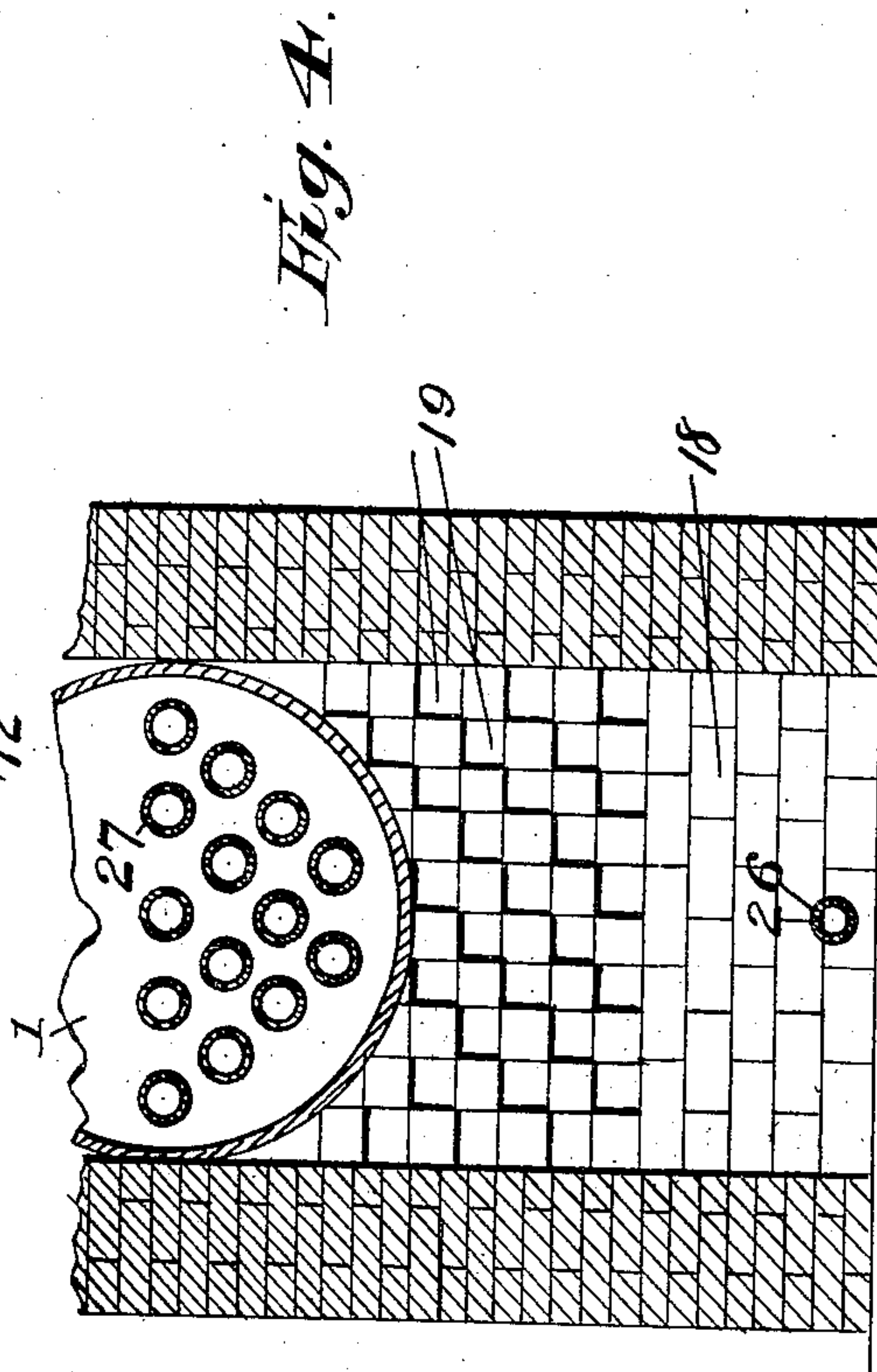


Fig. 4.

Inventor  
Cyrus G. Mark.

By D. P. Reinold.

Attorney



# UNITED STATES PATENT OFFICE.

CYRUS G. MARK, OF ROBESONIA, PENNSYLVANIA.

## SMOKE-CONSUMING FURNACE.

No. 824,497.

Specification of Letters Patent.

Patented June 26, 1906.

Application filed November 27, 1905. Serial No. 289,217.

*To all whom it may concern:*

Be it known that I, CYRUS G. MARK, a citizen of the United States, residing at Robesonia, in the county of Berks and State of Pennsylvania, have invented certain new and useful Improvements in Smoke-Consuming Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to steam-boiler furnaces, has especial reference to that class of furnaces designed to consume the smoke arising from the combustion of fuel and reduce its emission from the smoke-stack to a minimum.

The invention consists in certain improvements in construction, which will be fully disclosed in the following specification and claims.

In the accompanying drawings, which form part of this specification, Figure 1 represents a vertical longitudinal section of a furnace embodying my invention, the boiler and smoke-stack being shown in side elevation; Fig. 2, a top plan view of the furnace on line 2 2, Fig. 1; Fig. 3, a vertical transverse section on line 3 3, and Fig. 4 a like view on line 4 4.

Reference being had to the drawings, and the designating characters thereon, the numeral 1 indicates a boiler, which may be of any preferred type or form; 2, the front wall of the furnace; 3, the furnace or primary combustion-chamber, having grate-bars 4; 5, the ash-pit; 6, the opening through which fuel is supplied to the furnace; 7, the opening through which ashes are removed from the ash-pit, each of which openings are provided with suitable doors 8 9, respectively. The furnace as described is of ordinary construction.

10 indicates the bridge-wall; 11, a secondary combustion-chamber having a bottom of fire-brick 12, provided with numerous unobstructed openings 13, resembling "checker-work" in a metallurgical furnace, and these openings extend throughout the area of the bottom 12, and at the rear end of said chamber is a solid or imperforate wall 14, which extends up to the boiler 1 and prevents any of the burning gases passing said chamber 11, except through the openings 12 into the supplemental combustion-chamber 15 under or beneath the chamber 12.

16 is an opening in the wall 14, through which the gases pass to the additional combustion-chamber 17, whose rear wall of masonry 18 is provided with openings 19 of like checker-work construction above the plane of the bottom 12 of the chamber 11 and solid from there down to its base 20 to provide for the passage of the gases to the chamber 21, in which the solid or unconsumed particles of fuel are deposited by gravity and subsequently removed therefrom through an opening 22, having a door 23.

Adjacent to the bridge-wall 10 is a transverse chamber 24, into which air or air and steam is conducted, and forms a commingling-chamber for the air and the steam and is provided with openings 25 in its top, through which oxygen or oxygen and hydrogen from the chamber 24 is discharged into the chamber 11 and commingles with the gases or products of combustion therein, stimulating and increasing the combustion. In the passage of the products of combustion through the openings 13 the walls of the openings become highly heated, and the carbonic oxid and the smoke coming in contact therewith are neutralized and consumed.

The chamber 24 is supplied with steam from the boiler through a pipe 25, provided with a stop-cock 25', and with atmospheric air through pipe 26, the two mixing in the latter pipe and are heated in their passage through the supplemental combustion-chamber 15 on their way to the chamber 24. After leaving the chamber 21 the gases pass forward through the tubes 27 of the boiler to the uptake 28 and the smoke-stack 29.

30 indicates an ordinary blow-off pipe for discharging the contents of the boiler.

The checkers may be cleaned in the usual way by directing steam thereon to blow out the dust, and the wall 18 is provided with means (not shown) for the removal of ashes and dust from the chamber 15.

Having thus fully described my invention, what I claim is—

1. In a smoke-consuming furnace, a boiler, a secondary combustion-chamber, a supplemental combustion-chamber below the secondary chamber, means of communication between the two chambers consisting of a perforated wall adapted to become highly heated and neutralize the carbonic oxid, an imperforate wall of masonry forming the rear end of the combustion-chamber and extending to the boiler, and means for supply-



ing air to the secondary combustion-chamber through the bottom at the front end thereof adjacent to the bridge-wall.

2. In a smoke-consuming furnace, a boiler,  
5 a furnace, a secondary combustion-chamber, a supplemental combustion-chamber under the secondary combustion-chamber, an additional combustion-chamber in rear of both of  
10 said chambers, means of communication between the lower part of the secondary chamber and the upper part of the supplemental chamber consisting of a perforated wall adapted to be brought to a state of incandescence, an imperforate wall of masonry extending to the boiler and forming the rear  
15 end of the secondary combustion-chamber, and an air-chamber intermediate the furnace and the secondary combustion-chamber provided with openings in the top thereof communicating with said secondary combustion-chamber.  
20 chamber.

3. In a smoke-consuming furnace, a boiler, a furnace, a secondary combustion-chamber, a supplemental combustion-chamber under  
25 the secondary combustion-chamber, an addi-

tional combustion-chamber in rear of both of said chambers, means of communication between the lower part of the secondary chamber and the upper part of the supplemental chamber consisting of a perforated wall  
30 adapted to be brought to a state of incandescence, an imperforate wall of masonry extending to the boiler and forming the rear end of the secondary combustion-chamber, an air-chamber intermediate the furnace and  
35 the secondary combustion-chamber provided with openings in the top thereof communicating with said secondary combustion-chamber, and an air-supply pipe extending from the rear end of the structure, through the  
40 supplemental combustion-chamber and heated by the gases therein, and discharging into the air-chamber.

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

CYRUS G. MARK.

Witnesses:

DANIEL J. MOYER,  
JOHN H. ANDERSON.