

963,602.

L. H. LONG.  
SMOKE PREVENTER.  
APPLICATION FILED MAY 19, 1909.

Patented July 5, 1910.

2 SHEETS—SHEET 1.

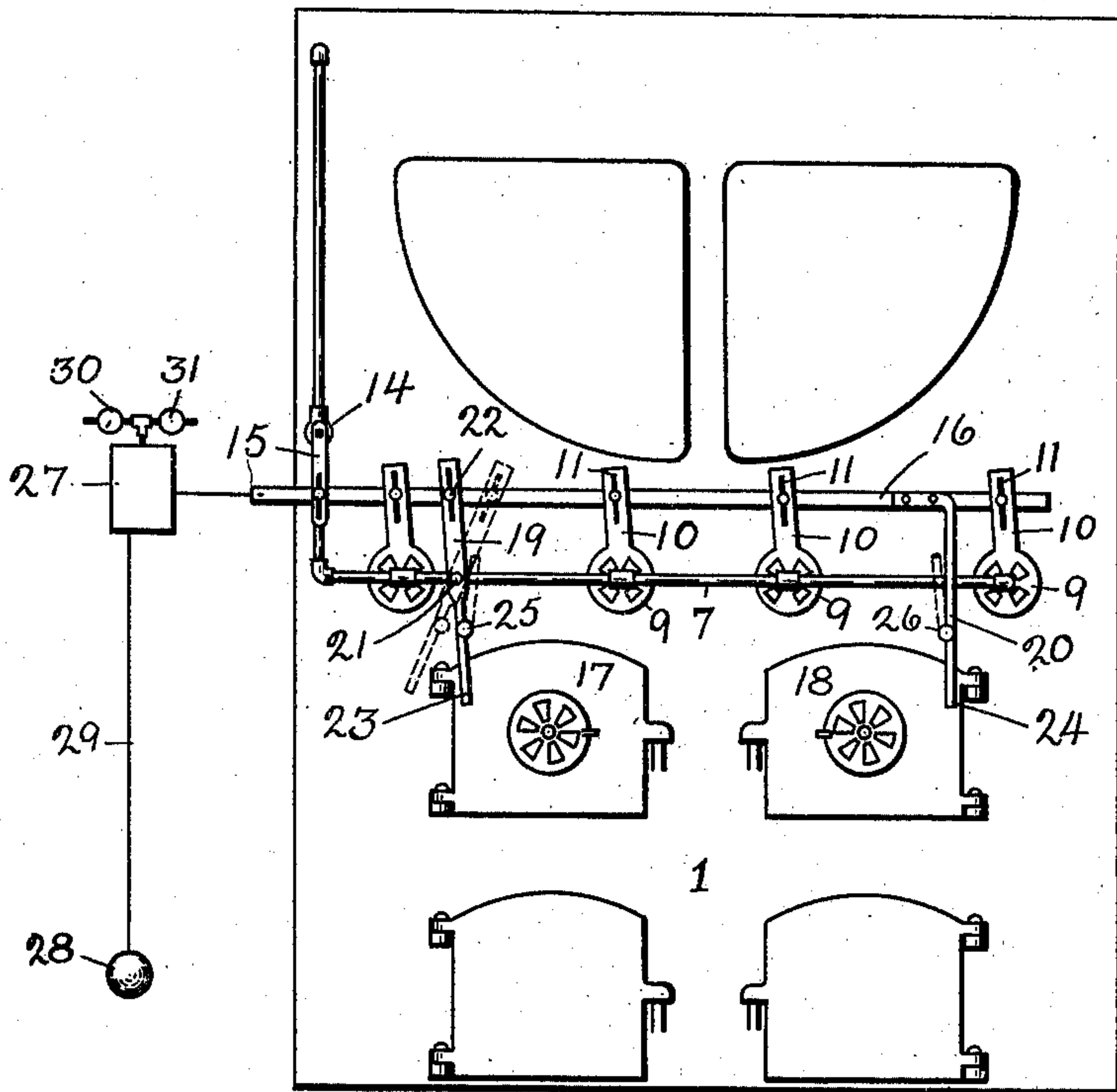


FIG. 1.

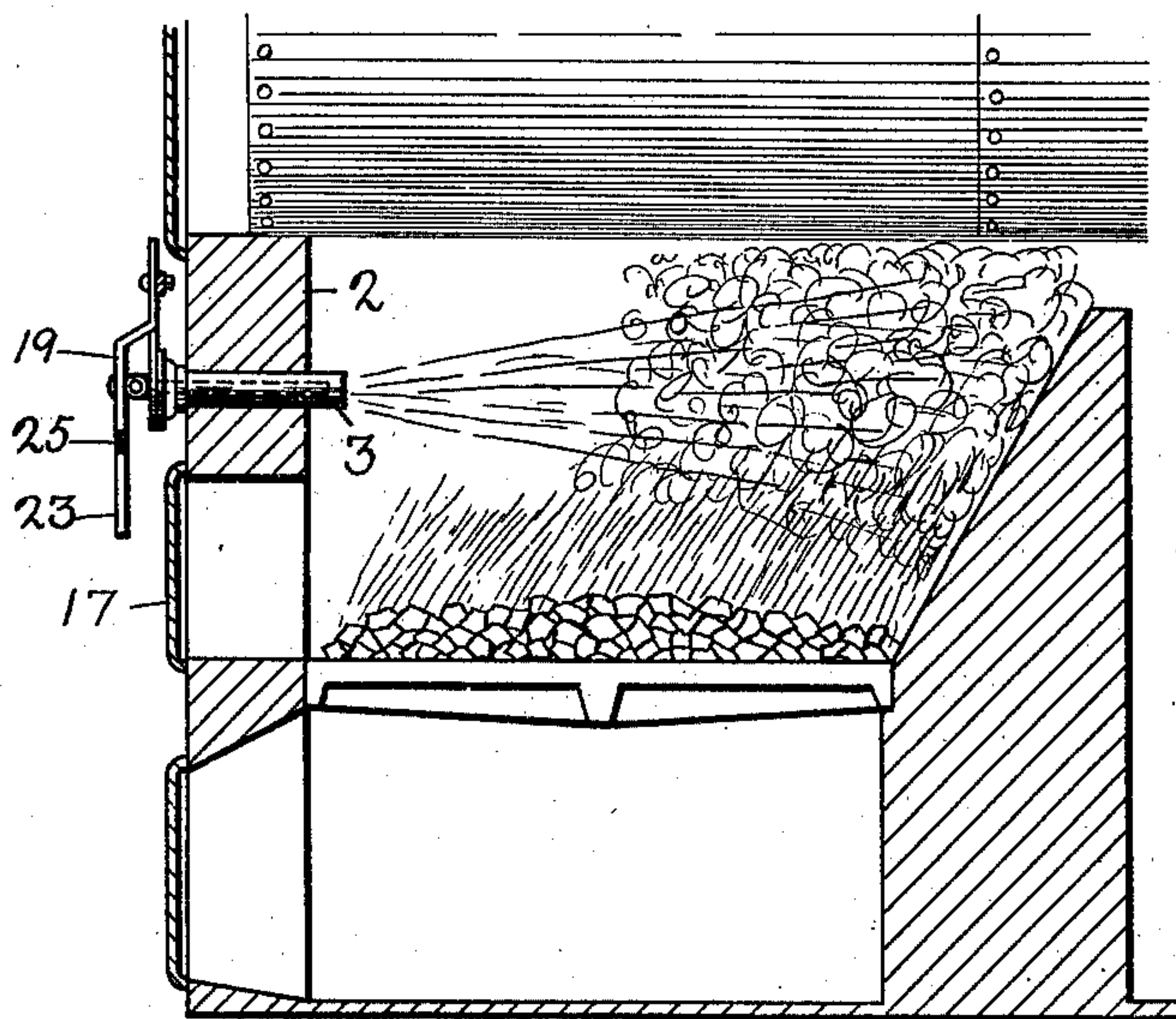


FIG. 2.

WITNESSES:

John E. Heller.  
Maria K. Beynroth

INVENTOR.

Latimer H. Long,  
BY  
Abraham Knobel,  
ATTORNEY.

963,602.

L. H. LONG.  
SMOKE PREVENTER.  
APPLICATION FILED MAY 19, 1909.

Patented July 5, 1910.

2 SHEETS—SHEET 2.

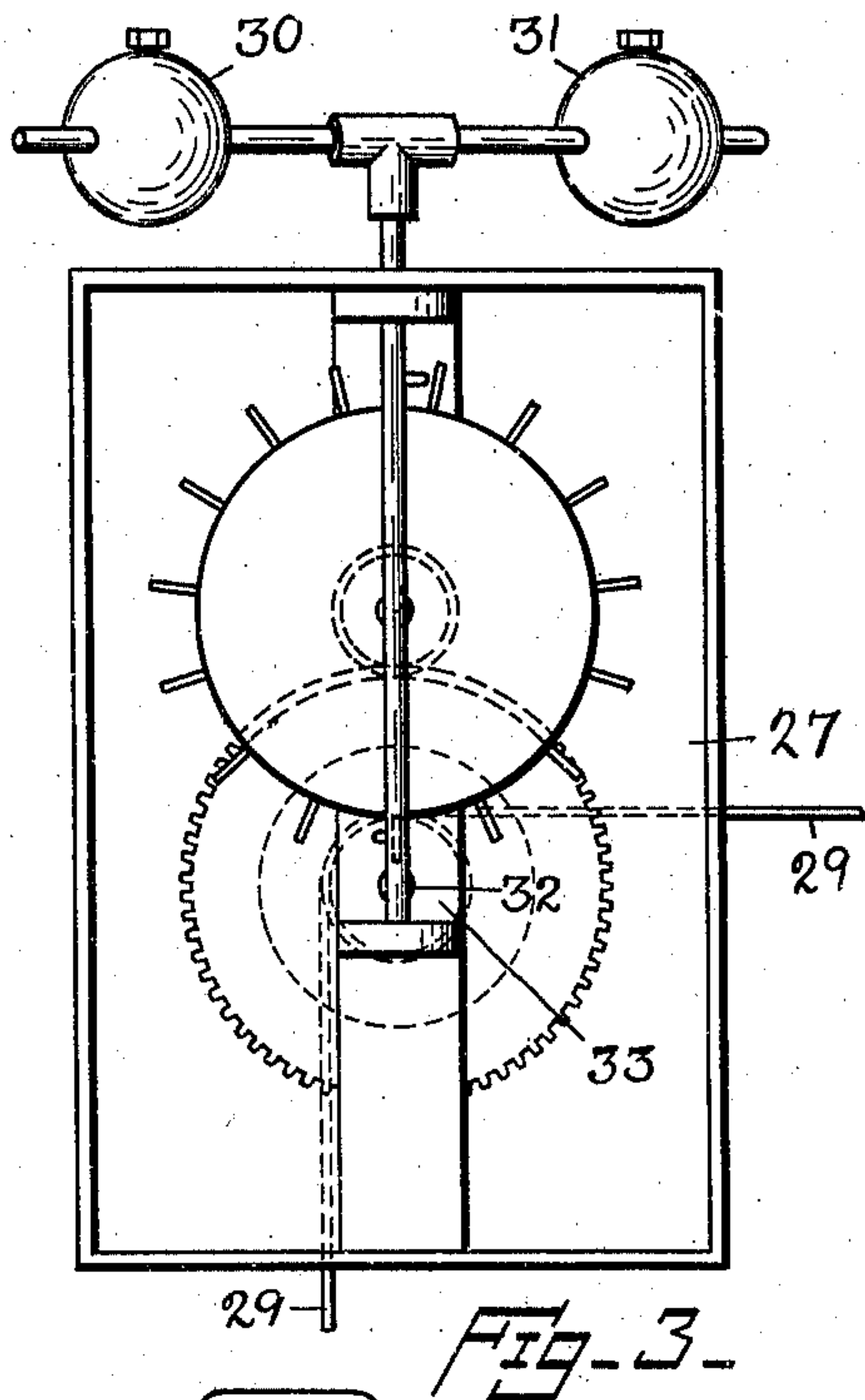


Fig. 3.

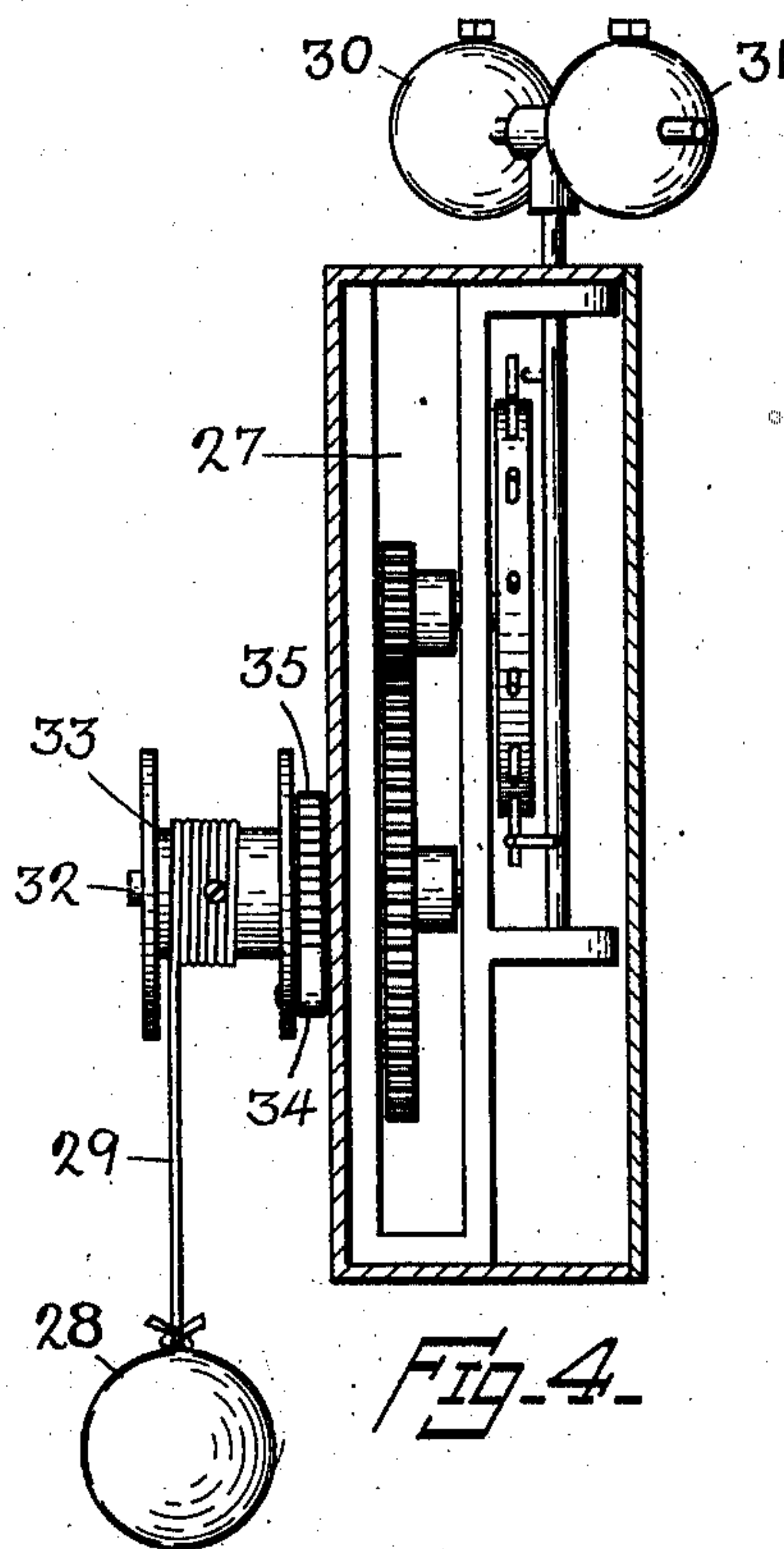


Fig. 4.

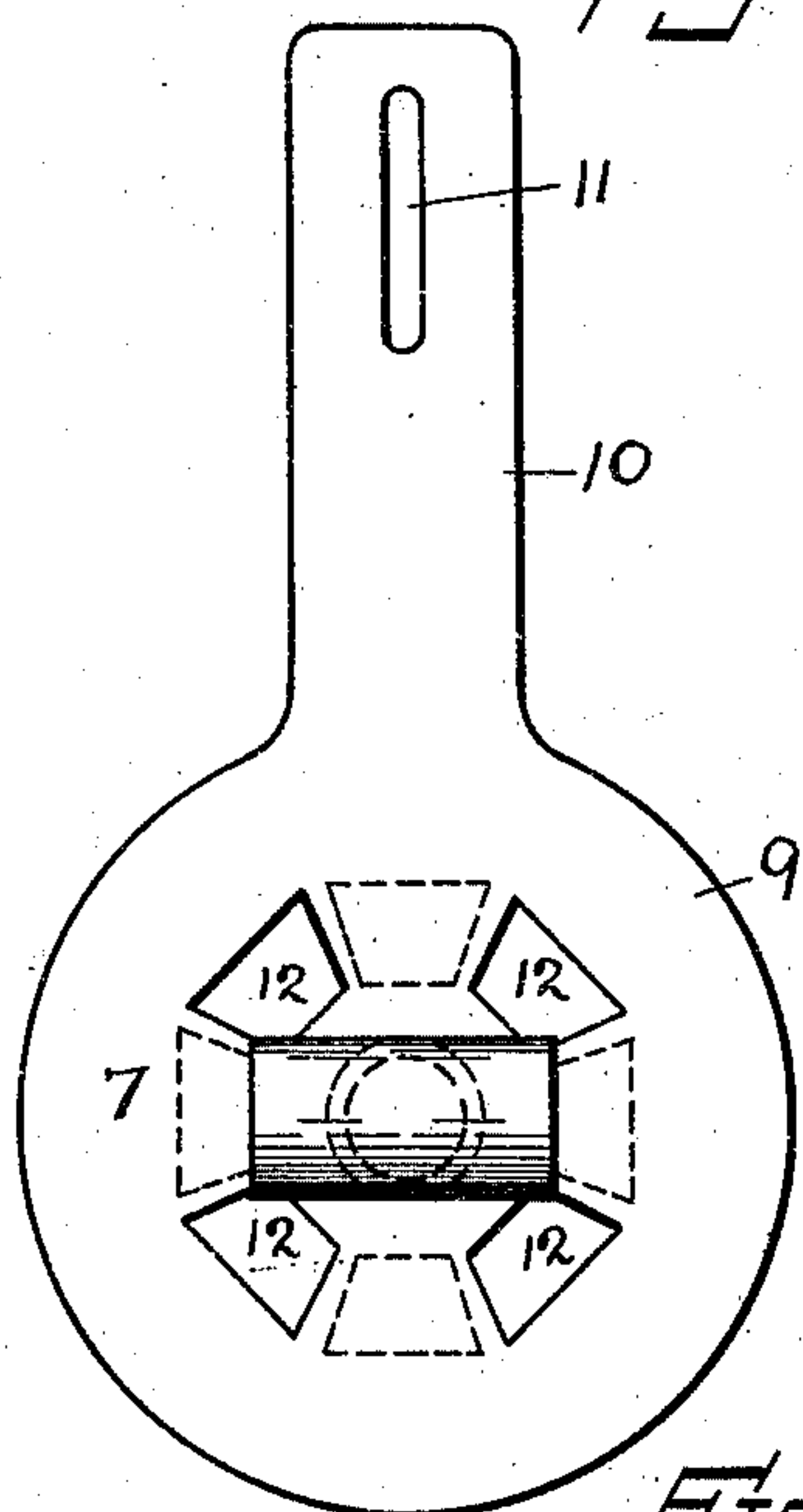


Fig. 5.

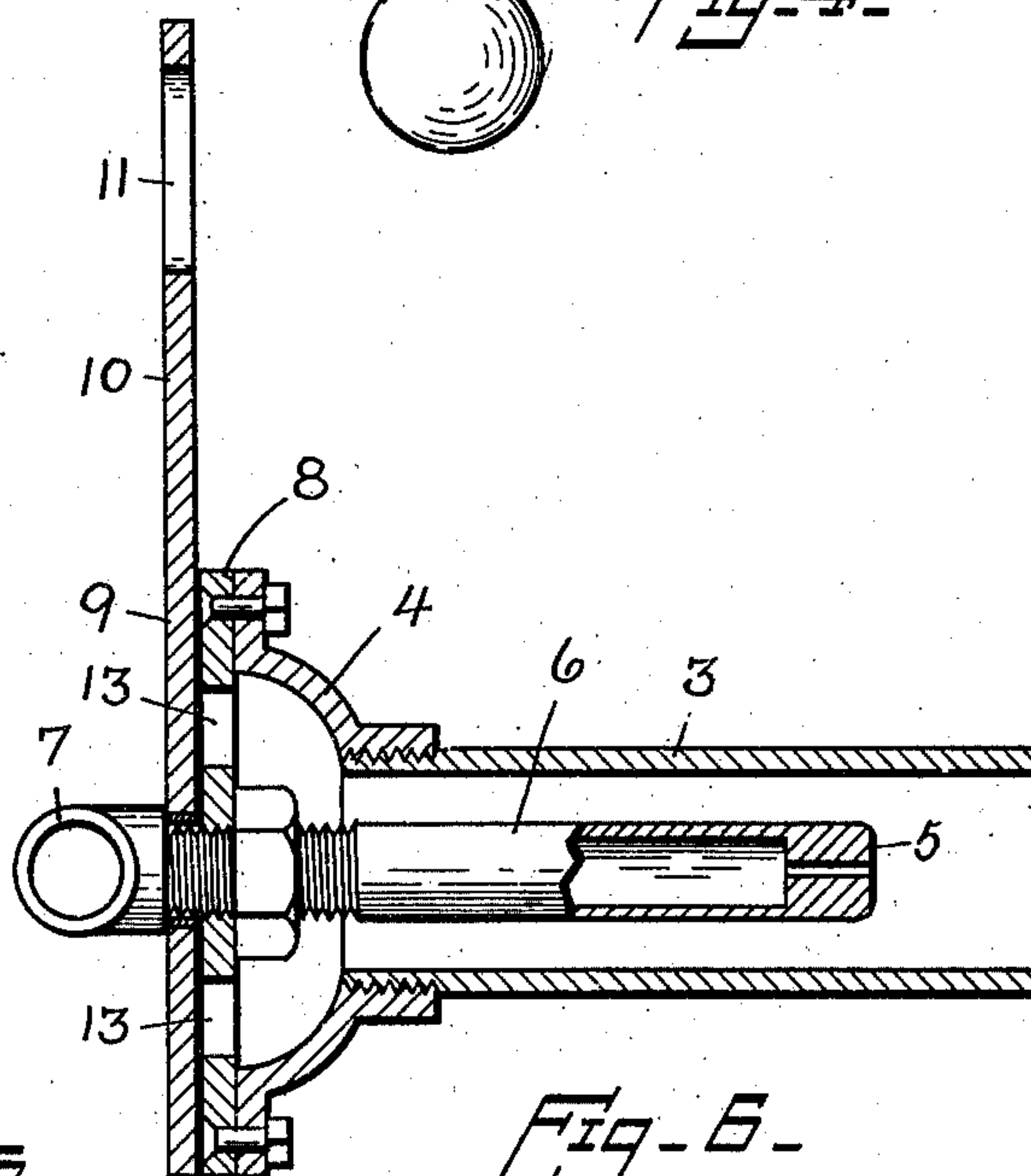


Fig. 6.

WITNESSES:

John E. Heller.

Maria K. Beynroth.

INVENTOR.

Latimer H. Long,

BY

Abraham Knobel,

ATTORNEY.



# UNITED STATES PATENT OFFICE.

LATIMER H. LONG, OF LOUISVILLE, KENTUCKY.

SMOKE-PREVENTER.

963,602.

Specification of Letters Patent.

Patented July 5, 1910.

Application filed May 19, 1909. Serial No. 496,947.

*To all whom it may concern:*

Be it known that I, LATIMER H. LONG, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented a new and useful Improvement in Smoke-Preventers, of which the following is a specification.

This invention relates to methods and apparatus for preventing what is commonly known in cities as the smoke nuisance.

It is usual for boiler and other furnaces to belch forth great volumes of black smoke at the time of and for some time after being fed with a fresh supply of bituminous coal. This is particularly the case if slack is used. Smoke is due to the condensation of the hydrocarbon gases liberated from fuel. If these gases are consumed as soon as liberated, or before they have opportunity to condense, smoke is not formed.

Heretofore smoke-consumers have been made, having for their object the consuming the smoke after it is formed, and smoke-condensers and smoke-washers, for removing the free carbon from the products of combustion, but the object of my method and apparatus is to consume the gases before smoke is formed.

To this end, an object of my improvement is to thoroughly mix the gases evolved with heated air while they are at the combustion-temperature.

Another object is to supply the heated air only so long as it is required, or while the condensable hydrocarbons are being liberated and to cut off the air supply when it is no longer needed.

Another object is to supply heated air in a boiler furnace by siphoning it in by means of a jet of live steam from the boiler, and, furthermore, to control this jet of steam and the air-supply by means of automatic apparatus which turns on the steam and opens air vents for the admission of air when the furnace doors are opened for the purpose of stoking, and shuts off the steam when the coal added to the fire has been coked to such a degree that it no longer liberates condensable hydrocarbon gases which may form smoke.

Further objects are, economy of steam and heat, saving of labor and attention, simplic-

ity of construction and operation of the apparatus, ease of installation, durability, and comparatively low first cost of apparatus and installation.

The accompanying drawings illustrate the apparatus preferred for carrying out my method, and in these:—

Figure 1 is a front elevation of a boiler front showing the apparatus applied; Fig. 2, a vertical longitudinal section of a boiler furnace showing the apparatus applied and in operation; Fig. 3, a detail front view of the clock; Fig. 4, a detail edge view of the clock; Fig. 5, a detail view of the air-supply regulating shutter; and Fig. 6 is a detail sectional view of the air-siphoning apparatus.

Similar reference numerals refer to similar parts throughout the several views of the drawings.

In carrying out this invention, when the fire is replenished with fresh coal, a blast of air is injected over it. By this means the hydrocarbon gases liberated from the fuel are thoroughly mixed with oxygen while the gases are at the combustion-temperature and before they have opportunity to rise and be cooled in the gases above the fire from which heat has been absorbed by the boiler and other surfaces, and thus before they have opportunity to condense and form smoke. Thus the free carbon of the gases forms, with the oxygen of the air, carbon monoxid and carbon dioxid, and the monoxid is in turn consumed, forming carbon dioxid and water. Thus complete combustion is attained and smoke is prevented.

In the preferable manner of injecting the air, live steam is used, which, being mingled with the air, raises the temperature of the air and produces a humid mixture. When this humid mixture is blown over and into the fire, the water is decomposed by the incandescent coals, producing water-gas, which immediately burns and assists in maintaining the combustion-temperature of the gases in the furnace.

Since the hydrocarbon gases are liberated from the coal in greatest volume at the beginning when the coal is fed into the furnace, the strongest and most voluminous blast of air is injected at this time, and then,



as the coal becomes gradually coked, the air blast is gradually diminished, until it is entirely shut off when the fuel becomes entirely coked or when the condensable gases cease to be evolved therefrom. Automatic apparatus is used to accomplish the several functions just described.

In the boiler-front, 1, and through the front furnace-wall, 2, are inserted air-supply pipes, 3, which are provided with funnel shaped openings, 4, at their front or outer ends, and nozzles, 5, at the inner end of concentrically placed tubes, 6. The tubes 6 are connected with a supply pipe, 7, by which they are supplied with live steam or other fluid under pressure. As the steam or other fluid issues from nozzle 5 it siphons air through the tube 3 in the usual way, and injects it into the furnace. The funnel 4 is provided with a stationary shutter-plate, 8, and over this is pivotally mounted an adjustable shutter, 9, having an arm, 10, provided with a slotted opening, 11, in its outer end. Plate 8 and shutter 9 are provided with corresponding air-inlet openings, 12, and 13. When these openings register, the air is admitted to tube 3, but when shutter 9 is rotated until openings 12 and 13 are out of register, the air supply is shut off from tube 3. It will be seen that by this means the air supply may be gradually reduced by slowly rotating shutter 9. The steam-supply pipe 7 is provided with a valve, 14, which is operated by means of a lever, 15.

Any suitable number of air-inlet tubes 3 and their shutters 9 may be applied to a boiler furnace, and these are all operated simultaneously and similarly by means of a bar, 16, to which all of the arms 10 are pivotally connected. The bar 16 extends across the furnace front, and the valve-operating lever 15 is also pivotally connected thereto, so that it is operated simultaneously and correspondingly with the shutters 9.

Near each furnace-door, 17 and 18, is placed an operating-lever, 19, and a bar, 20. These are adapted to be engaged by the furnace-doors when they are opened. Lever 19 is pivoted at 21 and pivotally connected with bar 16 at 22, in such a manner that when door 17 is opened, it engages the arm, 23, of the lever and pushes it toward the left. The result is that bar 16 is moved toward the right.

Shutters 9 and valve 14 are so arranged that they are closed in their normal position, when furnace-doors 17 and 18 are closed. When door 17 is opened and bar 16 is moved to the right, all the shutters 9 and valve 14 are opened to their fullest capacity, so that the greatest volume of air and steam is injected upon the fire.

Bar 20 is rigidly secured to and pendent from bar 16, so that when door 18 is opened and engages the portion 24 of bar 20, bar 16 is moved to the right and the air blast is turned on. Thus it will be seen that by opening either or both furnace doors, the air blast is turned on. There are times, however, when the doors are opened when it is not necessary to replenish the fire, but merely to stir it. In this case, the air-blast is not required, and it would not be expedient to turn it on. Lever 19 and bar 20 are therefore provided with a hinge-joint, 25 and 26 respectively, which enables the portions 23 and 24 to be folded up out of the path of the doors, so that the doors may be opened without affecting the lever and the bar.

In order to close the shutters and valve 14 slowly as the fuel is gradually becoming coked, a clock, 27, or other chronometric means is provided to govern the movement of bar 16 to the left or closed position of the shutters and the valve 14. A weight, 28, or equivalent means draws bar 16 toward the left, through the instrumentality of a cord, 29, which is attached to the bar. The clock 27 comprises a suitable box, in which is mounted an escapement and gearing of well known construction. The speed of the escapement, may be regulated by adjustable governor-balls, 30 and 31, which are oscillated at longer intervals if shifted toward the end of their arms than when placed nearer the middle.

On the inner arbor of the clock is mounted a drum, 33. This is loosely mounted upon arbor 32 and provided with a pawl, 34, which engages a ratchet wheel, 35, which in turn is rigidly mounted on arbor 32.

It will be understood that when bar 16 is moved to the right, cord 29 draws weight 28 upward and pawl 34 drags freely around ratchet wheel 35. As soon as bar 16 is released, weight 28 rotates drum 33 in the opposite direction, pawl 34 engages ratchet 35 and the escapement begins to work, so that the pawl is permitted to descend slowly and bar 16 slowly moves toward the left and gradually closes shutters 9 and valve 14. Clock 27 is regulated correspondingly, according to the kind of fuel that is being supplied to the furnace.

It has been found necessary to close the funnels 4 when the steam jet is not operating, in order to prevent the admission of cold drafts of air into the furnace, which reduce the temperature of the furnace gases.

Having thus described my invention so that any one skilled in the art pertaining thereto, may install and use it, I claim—

A smoke preventer for furnaces, comprising air and steam inlets forming a siphon



jet, a bar for controlling the admission of steam and air therethrough, means for moving said bar to slowly cut off the steam and air when opened, and a lever for moving  
5 said bar to open the steam and air pipes, said lever lying in the path of the furnace door to be actuated thereby when opened and being formed with a hinge intermediate

its length whereby it may be folded out of the path of movement of said door when 10 desired.

LATIMER H. LONG.

Witnesses:

WM. J. SAUER,  
ABRAHAM KNOBEL.