

No. 807,743.

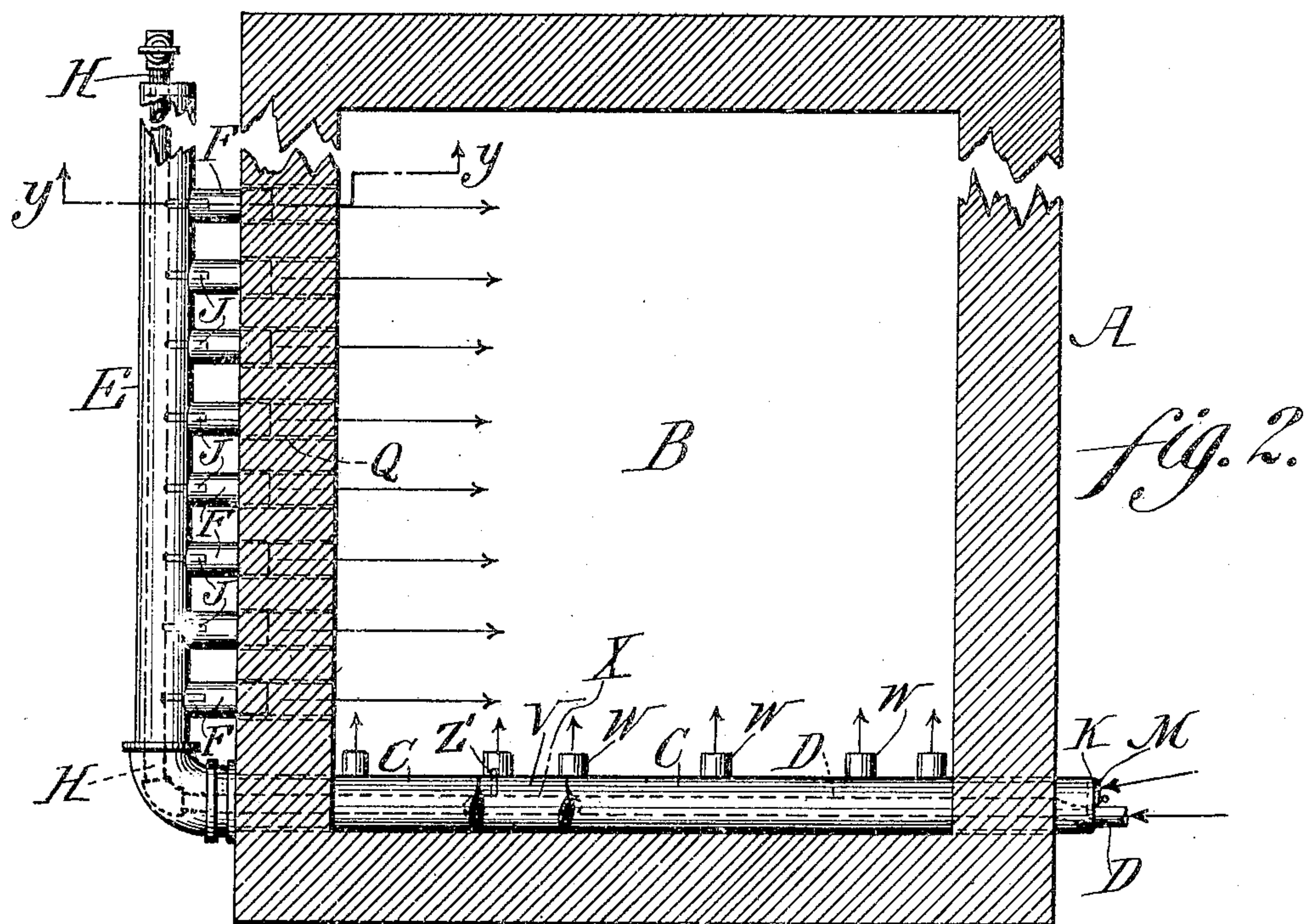
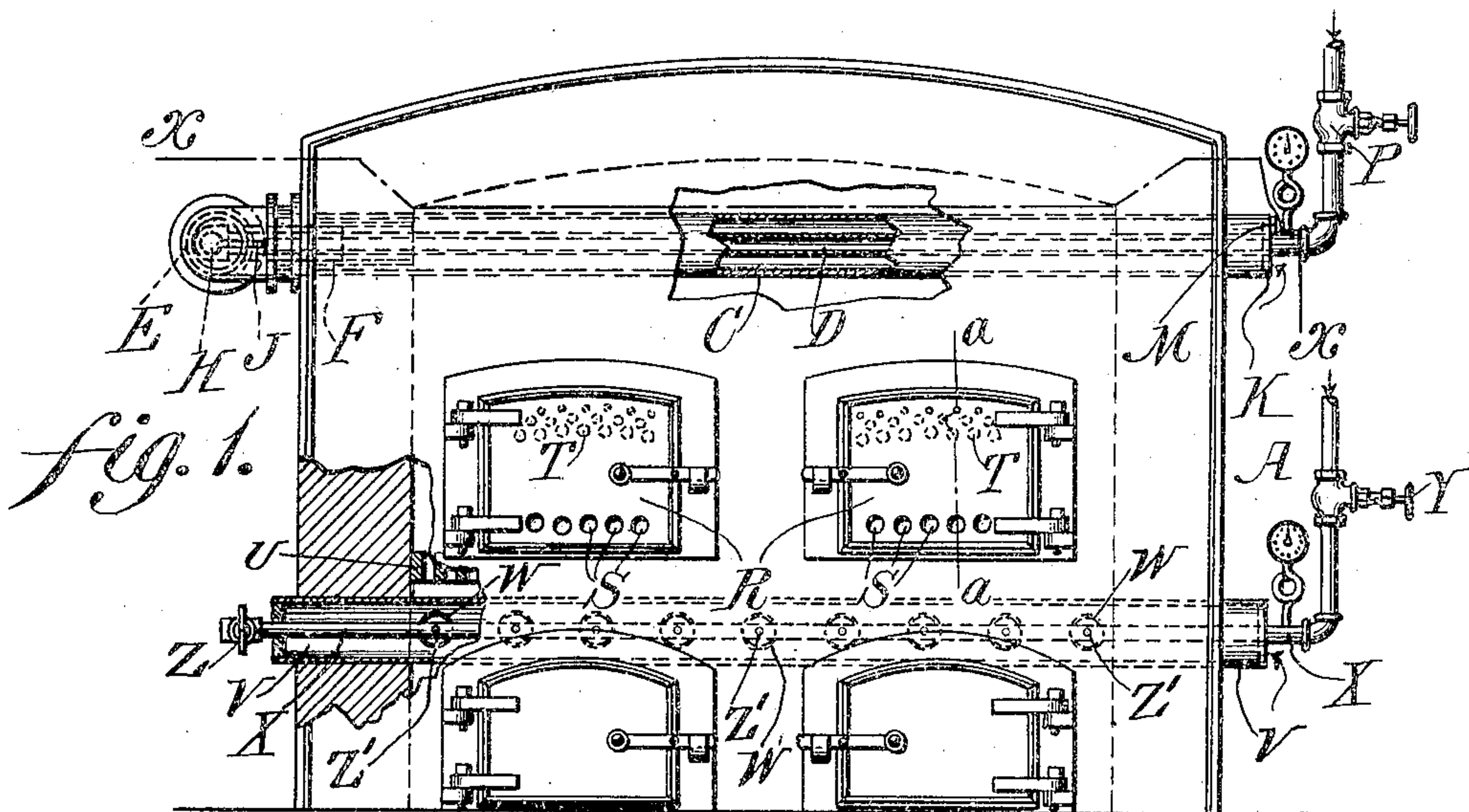
PATENTED DEC. 19, 1905.

S. P. HUTCHINSON.

SMOKE CONSUMING ATTACHMENT TO FURNACES.

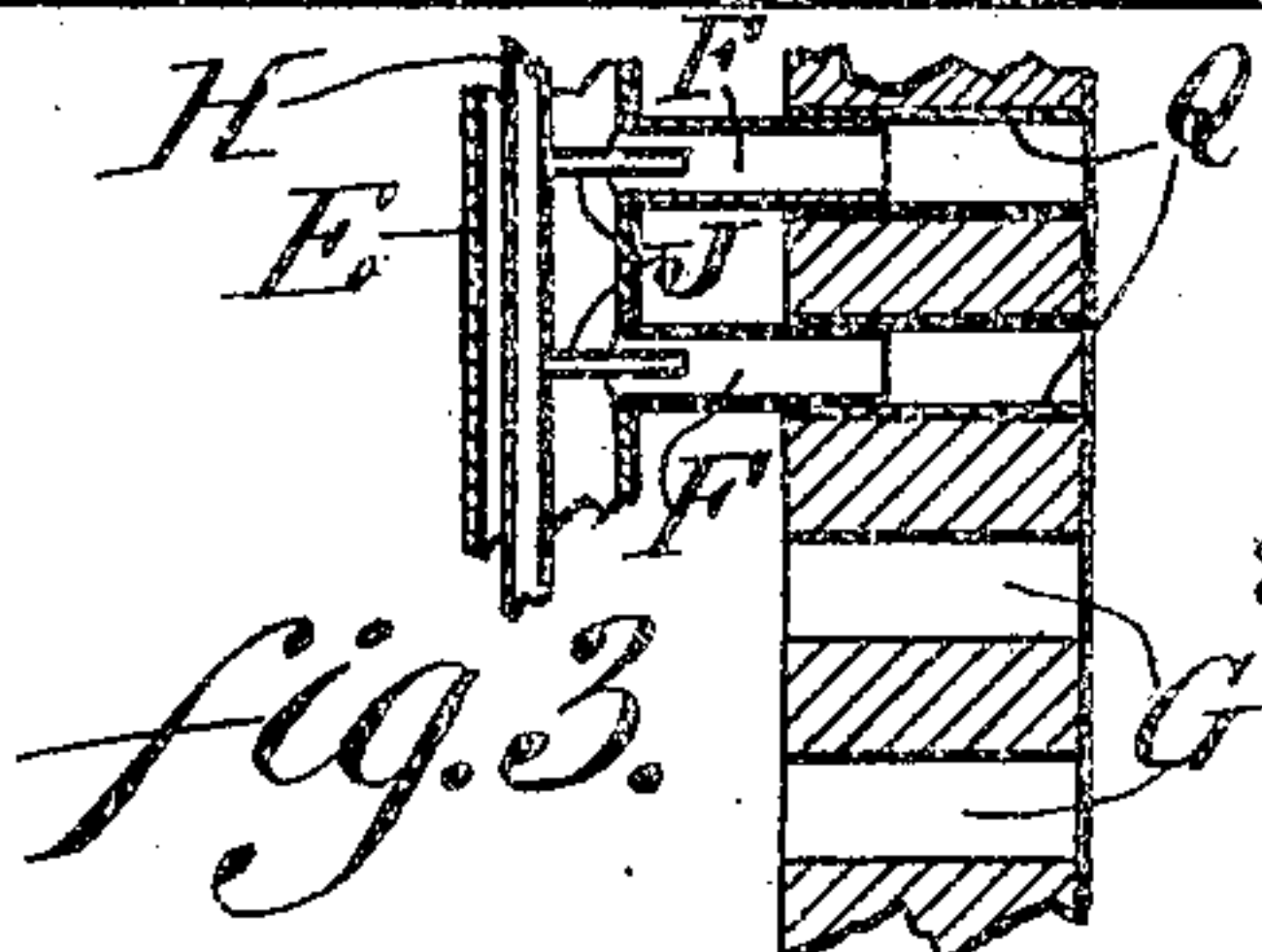
APPLICATION FILED AUG. 26, 1904.

2 SHEETS--SHEET 1.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 4.

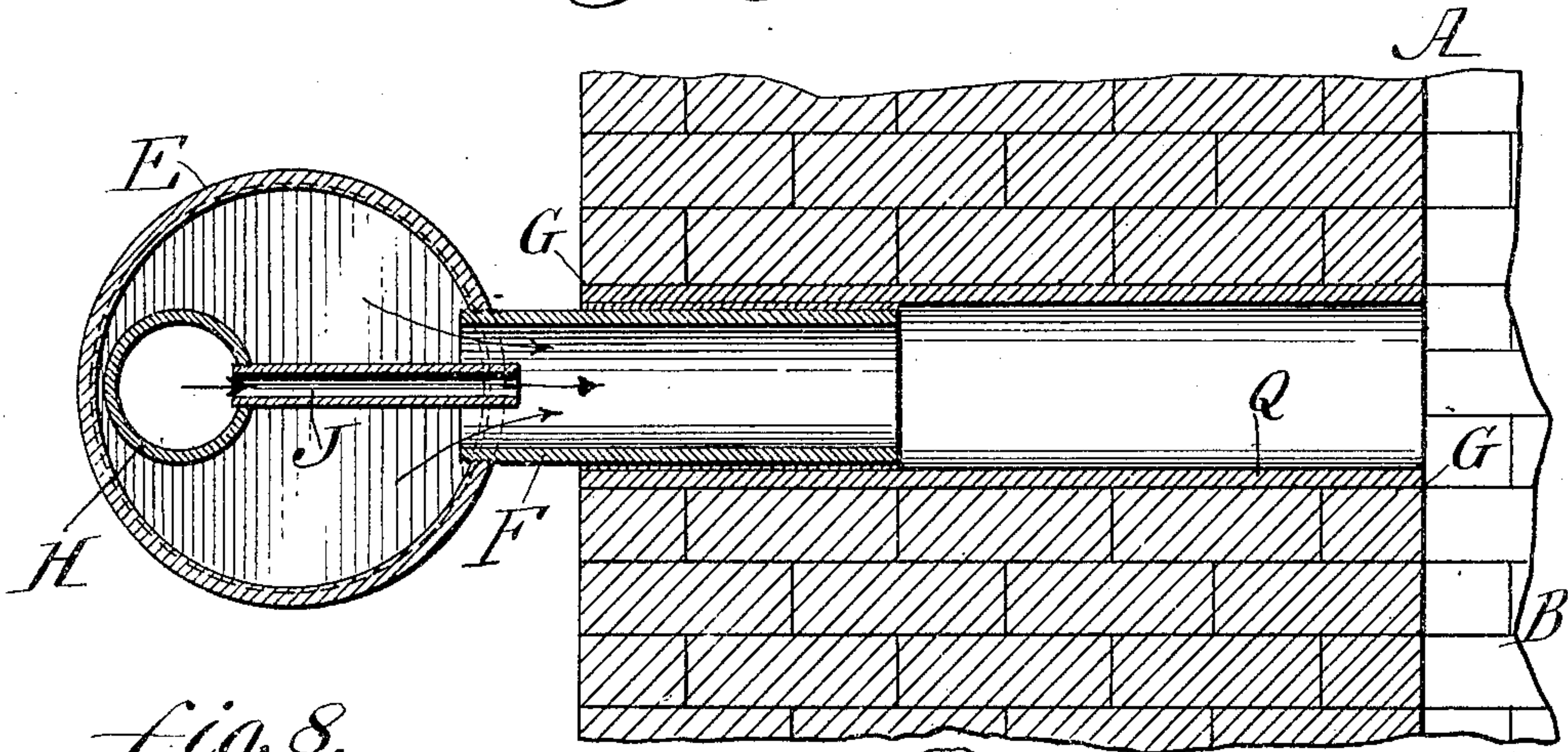


Fig. 8.

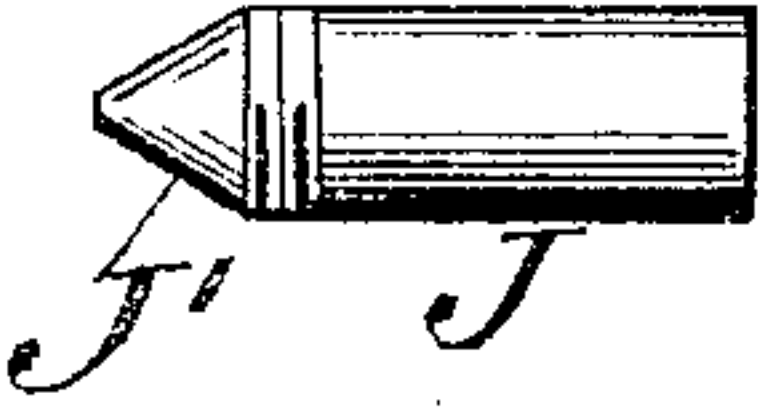


Fig. 9.

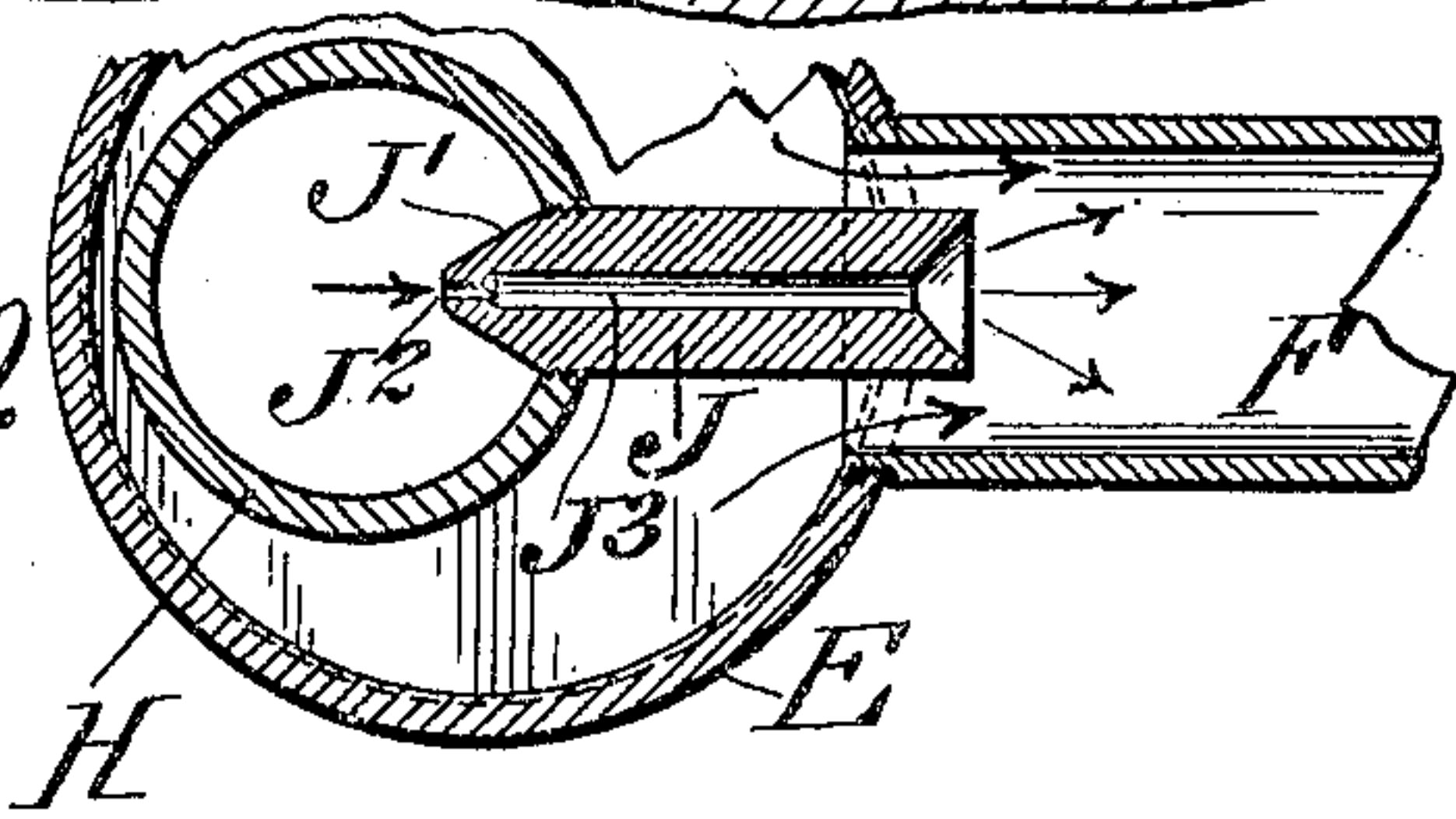


fig. 5.

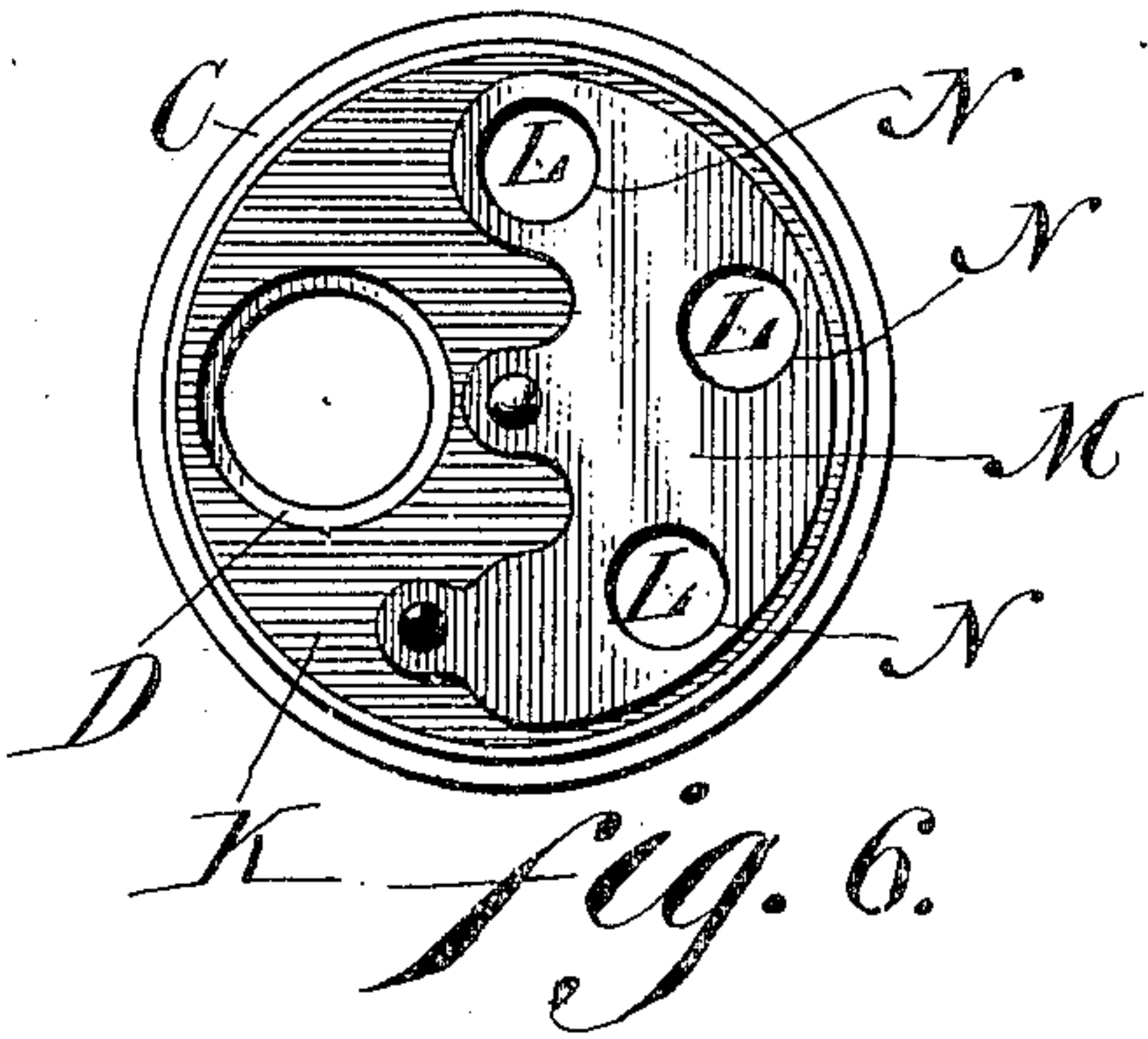
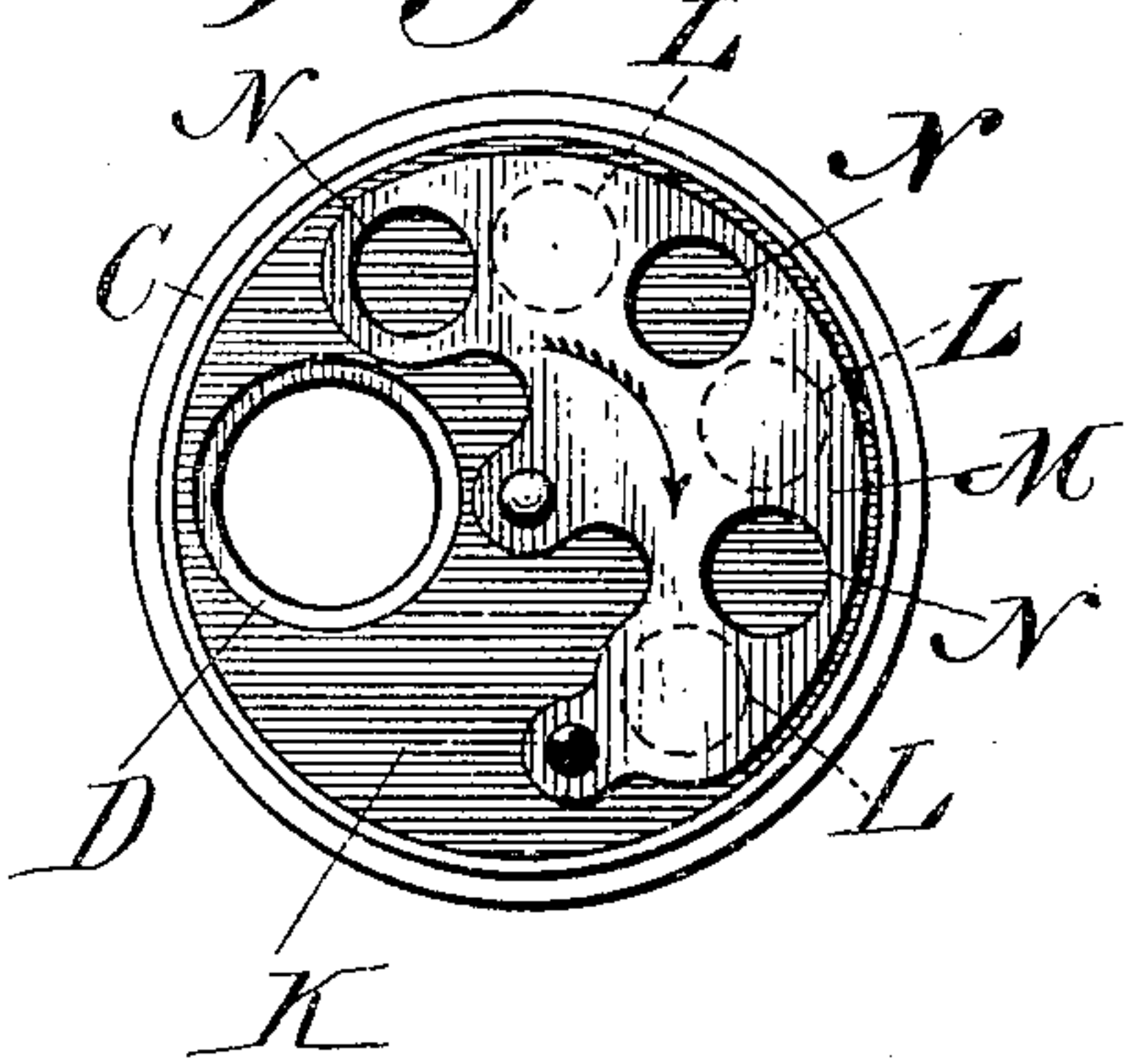
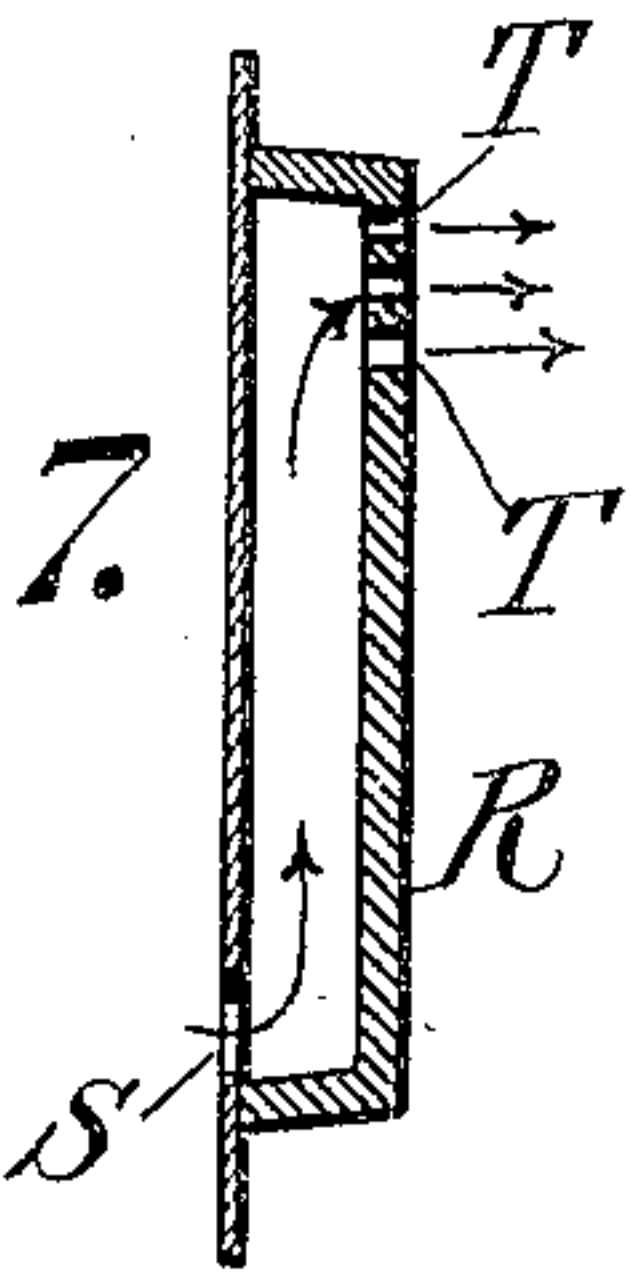


fig. 7.



Witnesses

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UNITED STATES PATENT OFFICE.

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SMOKE-CONSUMING ATTACHMENT TO FURNACES.

No. 807,743.

Specification of Letters Patent.

Patented Dec. 19, 1905.

Application filed August 26, 1904. Serial No. 222,213.

To all whom it may concern:

Be it known that I, SAMUEL P. HUTCHINSON, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Smoke-Consuming Attachments to Furnaces, of which the following is a specification.

My invention relates to means for consuming the smoke of furnaces, and thus perfect or improve the combustion of the fuel; and it consists of novel details of construction, as will be hereinafter set forth, and pointed out in the claims.

It also consists of novel means for regulating the supply of air to the device.

Figure 1 represents a front view, partly broken away, of a furnace embodying my invention. Fig. 2 represents a horizontal section on line $x x$, Fig. 1. Fig. 3 represents a horizontal section of a detached portion. Fig. 4 represents a vertical section on line $y y$, Fig. 2, on an enlarged scale. Figs. 5 and 6 represent end views of the air and steam pipes, the parts being in different positions. Fig. 7 represents a vertical section of one of the doors of the furnace on line $a a$. Figs. 8 and 9 represent, respectively, a side elevation and a vertical section of a modification.

Similar letters of reference indicate corresponding parts in the figures.

Referring to the drawings, A designates a furnace, and B the combustion or fire chamber thereof, which parts, excepting the feature of my invention applied thereto, are of usual construction.

C designates an air-receiving pipe which is supported on the walls of the furnace and occupies a position mainly within the chamber B, so as to be heated by the products of combustion thereof. Within said pipe C is a steam-receiving pipe D, which is connected with a generator or boiler in any suitable manner.

E designates a pipe which is connected with the terminal of the pipe C at an angle thereto and is in communication with the pipe C. Extending laterally from the wall of said pipe E are nozzles F, which form mixing-chambers and enter passages G in the walls of the furnace, said chambers being in communication with said pipe E and form a communication for the same with the interior of the furnace or combustion-chamber B thereof.

H designates a pipe which is contained within the pipe E and connected with the terminal

of the steam-pipe D, the pipes D and H thus being in communication.

Connected with the wall of the pipe H are laterally-extending nipples J, which project into the chambers F and form communication between said pipe H and said chambers F, and consequently with the interior of the furnace or combustion-chamber B thereof, it being noticed that the nipples J are of less diameter than the chambers F, whereby the adjacent ends of said chambers are freely in communication with the pipe E. At the inlet end of the pipe C is a plate K, which has an opening to receive the pipe D and a series of ports L for the admission of air.

Pivoted on the plate K is a rotatable valve-plate M, in which is a series of openings N, which may be respectively placed in communication with the ports L, as shown in Fig. 6, or cut off therefrom, as shown in Fig. 5, it being evident that by this provision more or less air may be admitted into the pipe C or entirely cut off therefrom.

It will be seen that as the pipe D passes through the plate K and the latter closes the pipe C the damper or valve-plate M is made segmental, so that it may be properly rotated regardless of the pipe D.

The operation is as follows: The valve-plate M is adjusted to admit the required degree of air to the pipe C and the steam-valve P opened, whereby steam is admitted into the pipe D, the air being drawn into the pipe C and heated therein by the pipe D, said pipe C being also subjected to the products of combustion, thus acting to heat the air in said pipe C, and consequently the steam in the pipe D, the superheated air then entering the distributing-pipe E and the superheated steam entering the distributing-pipe H. The steam is then ejected from said pipe H, through the nipples J, into the chambers F, and the air will be drawn from the pipe E into said chambers F, when the highly-heated air and superheated steam are mixed and united in the condition of highly-combustible vapor, the same being directed into the combustion-chamber, where it unites with the smoke, thus consuming the latter, whereby there will be a perfect combustion or at least a more thorough combustion of the fuel. It will also be seen that the pipe E, with its contained pipe H, is on the exterior of the wall of the furnace, and as it is provided with the mixing-chambers F and the pipe H with the nipples J it is evident that said mixing-chambers may be readily intro-

duced into the passages G and the pipe H connected with the pipe D and the pipe E connected with the pipe C, when the device is ready for operation, it being also evident
 5 that for purposes requiring the same the pipe E is accessible on the exterior of the furnace and may be readily disconnected from the pipe C, the pipe H being also disconnectible from the pipe D, when said pipes E and H,
 10 with their appurtenances, may be readily removed, the mixing-chambers F, emerging from the passages G, allowing access to the latter for purposes requiring the same.

In order to strengthen the walls of the passage G, the same are lined with the bushings Q, thus also permitting the mixing-chambers F to freely enter the same.

The doors R of the furnace are made hollow and have ports S in the lower end of the outside walls thereof and ports T in the upper
 20 end of the inner wall, by which provision air may enter the door through the port S and, becoming highly heated, escape therefrom through the port T, and so be passed over the
 25 fuel, thus assisting combustion. As the air enters the combustion-chamber in highly-heated condition, it is prevented from exploding therein and injuring the dome of the furnace, which would occur if in cool condition,
 30 while, on the contrary, it will act with the smoke to thoroughly consume the latter, or comparatively so, as has been stated.

In order to admit vapor similar to the above to the fuel from below, I employ the
 35 pipe V, which is adapted to receive air at one end thereof and is located within the ash-pit below the grate U, it also having outlet-nozzles W, which project into said ash-pit. Within said air-receiving pipe V is the steam-
 40 receiving pipe X, which is provided with a valve Y at the inlet thereof and a valve Z at the discharge end thereof. Extending from said pipe X are nipples Z', which enter the nozzles W, it being evident that as the steam
 45 is admitted into the pipe X it heats the air injected with the steam as a combustible vapor through the nozzles W into the ash-pit, whereby it commingles with the fuel, and thus highly increases the combustion of the latter.

In Figs. 8 and 9 I show a preferred form of a nozzle J, having a conical end J' where
 50 it enters the steam-pipe H, thus deflecting dirt, dust, grime, &c., from entering the bore of the nozzle, said bore being narrow, as at
 55 J², to increase the effect of the injection of the steam into the nozzle, the bore then widening at J³ to permit rapid passage of the steam injected therinto. Then the end of the bore where it enters the nozzle F is flaring or con-
 60 ical, so that the steam is permitted to expand or spread, and so act effectively in intermingling with the air entering said nozzle.

Various changes may be made in the details of construction shown without departing from the general spirit of my invention, and I do

not, therefore, desire to be limited in each case to the same.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a smoke-consuming attachment to a furnace, an air-receiving pipe located within the combustion-chamber of the furnace near the bottom thereof, a steam-receiving pipe located within said air-receiving pipe, an air-distributing pipe connected with said air-receiving pipe, an auxiliary steam-pipe connected with said steam-receiving pipe, a nipple extending from the side of said auxiliary steam-pipe and a mixing-chamber extending
 75 from the side of said air-distributing pipe and bridging the space between the same and the wall of the furnace, said nipple projecting into said chamber and the latter being adapted to lead into said combustion-chamber, said
 80 air-distributing pipe being on the exterior of the furnace.

2. In a smoke-consuming attachment to a furnace, an air-distributing pipe, a steam-distributing pipe within said air-distributing
 90 pipe, a nipple extending from the side of said steam-pipe, and a mixing-chamber extending from the side of said air-distributing pipe, said nipple entering said chamber forming an injector and said chamber being adapted to
 95 lead into the combustion-chamber of said furnace, said air-distributing pipe with its appurtenances being on the exterior of said furnace, in combination with an air-receiving pipe and a steam-receiving pipe therein, said
 100 pipes being located wholly within and near the bottom of the combustion-chamber of the furnace and being connected with said air-distributing and steam-distributing pipes respectively.

3. In a smoke-consuming attachment to a furnace, an air-distributing pipe, a steam-distributing pipe disposed eccentrically within said air-distributing pipe, a nipple extending
 110 from the side of said steam-pipe, and a mixing-chamber extending from the side of said air-distributing pipe, said nipple entering said chamber forming an injector and said chamber being adapted to lead into the combustion-chamber of said furnace, said air-distributing pipe with its appurtenances being
 115 removably supported on the exterior of the furnace, in combination with an air-receiving pipe within the furnace and a steam-receiving pipe within said air-receiving pipe, said
 120 pipes being connected respectively with said exterior air and steam distributing pipes.

4. In a smoke-consuming attachment to a furnace, an air-distributing pipe arranged exteriorly of the furnace, a steam-distributing
 125 pipe disposed eccentrically within said air-distributing pipe, a nipple extending from the side of said steam-pipe, a mixing-chamber outside of the furnace extending from the side of said air-distributing pipe, said nipple
 130

entering said chamber forming an injector and said chamber being adapted to lead into the combustion-chamber of said furnace, said air-distributing pipe with its appurtenances
 5 being removably supported on the exterior of the furnace, in combination with an air-intake pipe located within the furnace as a heater for the air, and a steam-pipe within said air-intake pipe, said steam-pipe and air-
 10 intake pipe being connected respectively with said air and steam distributing pipes.

5. In a smoke-consuming attachment to a furnace, an air-intake pipe, a steam-receiving pipe, in said air-intake pipe, a plate closing
 15 the inlet end of said air-intake pipe, a port in said plate, a segmental damper mounted on said plate and provided with an opening adapted to be placed into and out of register with said port, said steam-receiving pipe being
 20 passed eccentrically through said plate, combined with an exterior air-receiving pipe connected with said air-intake pipe, and a steam-receiving pipe eccentrically disposed within said air-receiving pipe and connected with the
 25 combustion-chamber.

6. In a smoke-consuming attachment to a furnace, an exterior air-intake pipe, a steam-receiving pipe eccentrically disposed therein, a nozzle extending from said air-intake pipe
 30 into the furnace above the grate thereof, a nozzle extending from the steam-receiving pipe through the nozzle of the air-intake pipe, in combination with an air-intake pipe, a steam-receiving pipe eccentrically disposed
 35 therein and a nozzle extending from the air-intake pipe, a nozzle extending from said steam-receiving pipe through the nozzle of the air-intake pipe into the furnace below the grate, said air-intake pipe being within the
 40 furnace.

7. In a smoke-consuming attachment to a furnace, an air-intake pipe, a steam-receiving

pipe eccentrically disposed therein, a nozzle extending from said air-intake pipe into the furnace above the grate thereof, and a nozzle
 45 extending from said steam-receiving pipe through the nozzle of the air-intake pipe, in combination with an air-intake pipe, a steam-receiving pipe eccentrically disposed therein and a nozzle extending from the air-intake
 50 pipe, a nozzle extending from said steam-receiving pipe through the nozzle of the air-intake pipe into the furnace below the grate, said air-intake pipe being within the furnace, and an air-distributing pipe on the exterior
 55 of the furnace, a steam-distributing pipe within said air-distributing pipe, a nipple extending from the side of said steam-pipe and a mixing-chamber extending from the side of said air-distributing pipe, said nipple enter-
 60 ing said chamber and said chamber being adapted to lead into the combustion-chamber of the furnace, said exterior air-distributing pipe and its contained steam-distributing pipe being connected respectively with the air-re-
 65 ceiving pipes which are located within the combustion-chamber of the furnace.

8. In a smoke-consuming attachment to a furnace, an air-intake pipe, a steam-receiving pipe extended through the first-named pipe
 70 to heat the air, means for discharging the air and steam from said pipes into the furnace above the grate thereof, in combination with an air-intake pipe, a steam-receiving pipe extended through the first-named pipe to heat
 75 the air, and means for discharging the air and steam from said pipes into the furnace below the grate thereof, said air-intake pipes being respectively within the combustion-chamber of the furnace.

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