

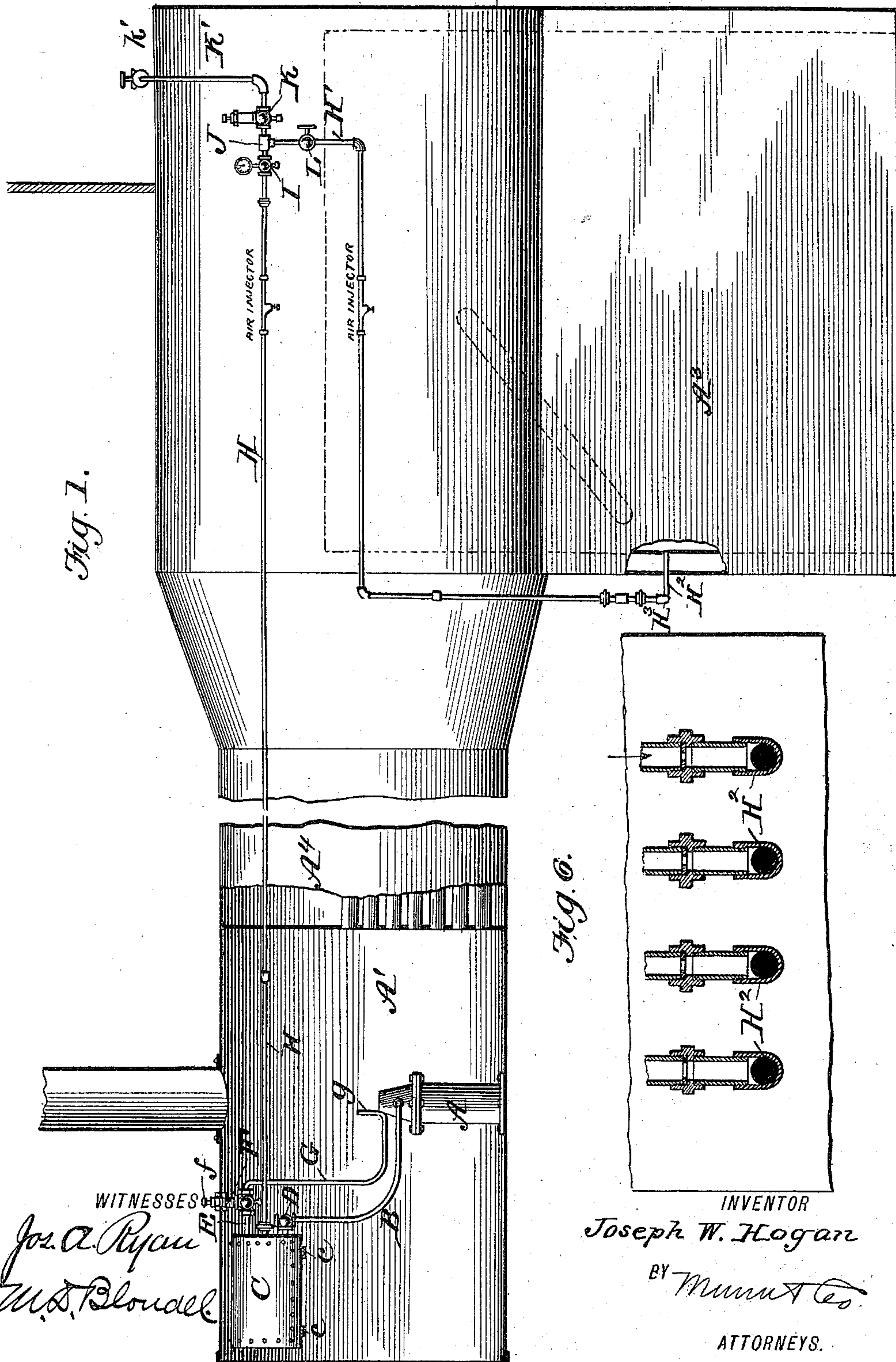
(No Model.)

3 Sheets—Sheet 1.

J. W. HOGAN.
SMOKE CONSUMING FURNACE.

No. 572,896.

Patented Dec. 8, 1896.



(No Model.)

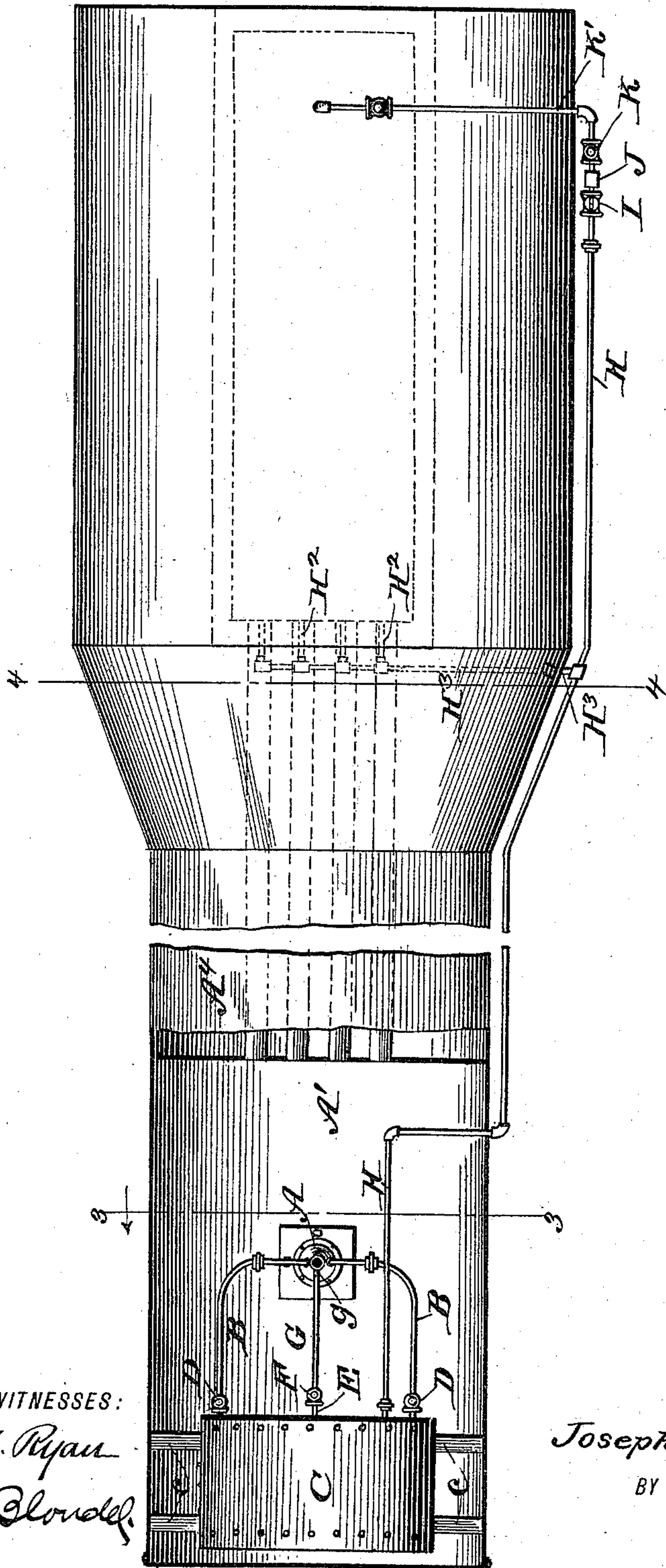
3 Sheets—Sheet 2.

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No. 572,896.

Patented Dec. 8, 1896.

Fig. 2.



WITNESSES:

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INVENTOR

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BY *Munn & Co.*

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Fig. 3.

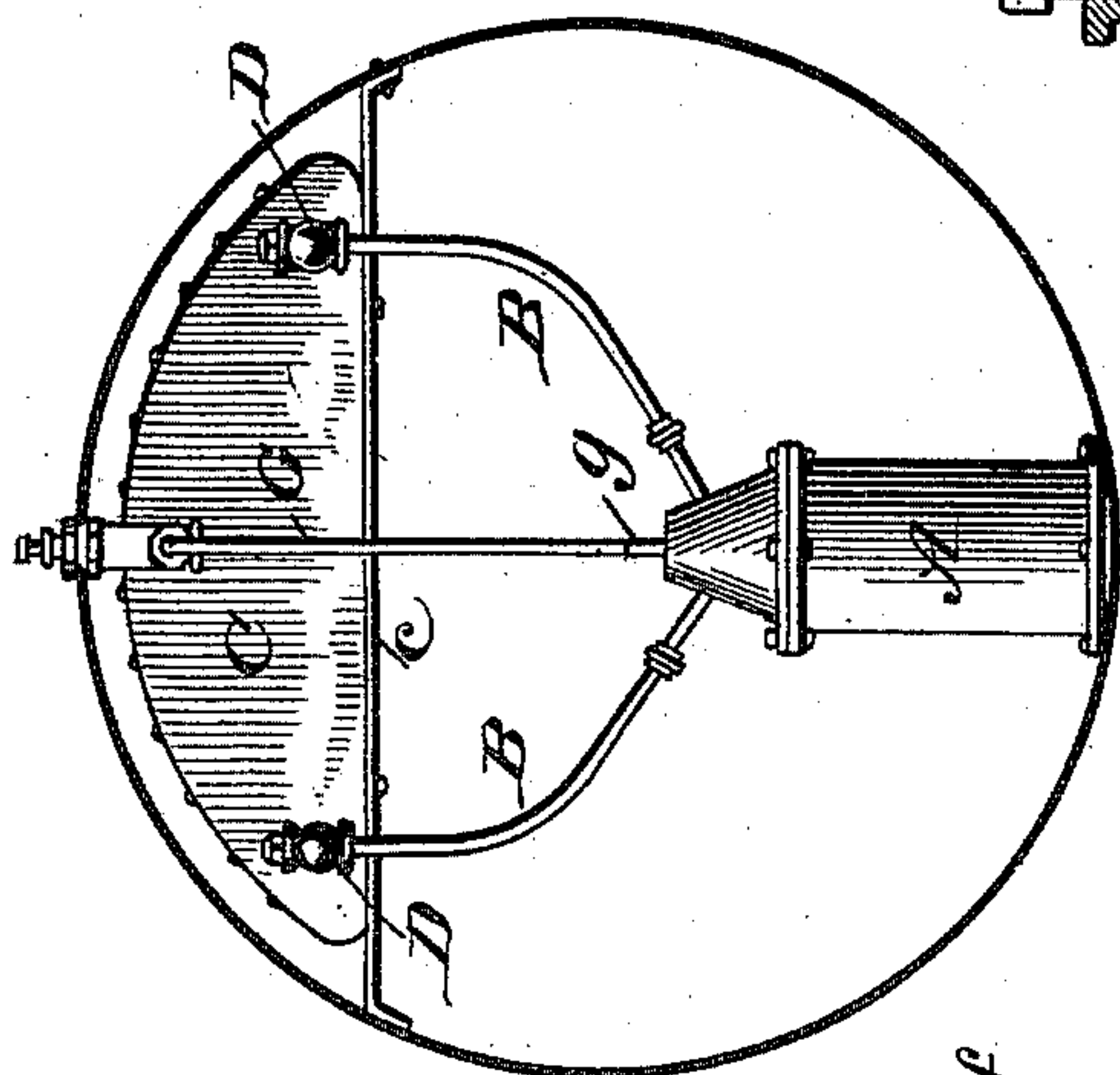


Fig. 7.

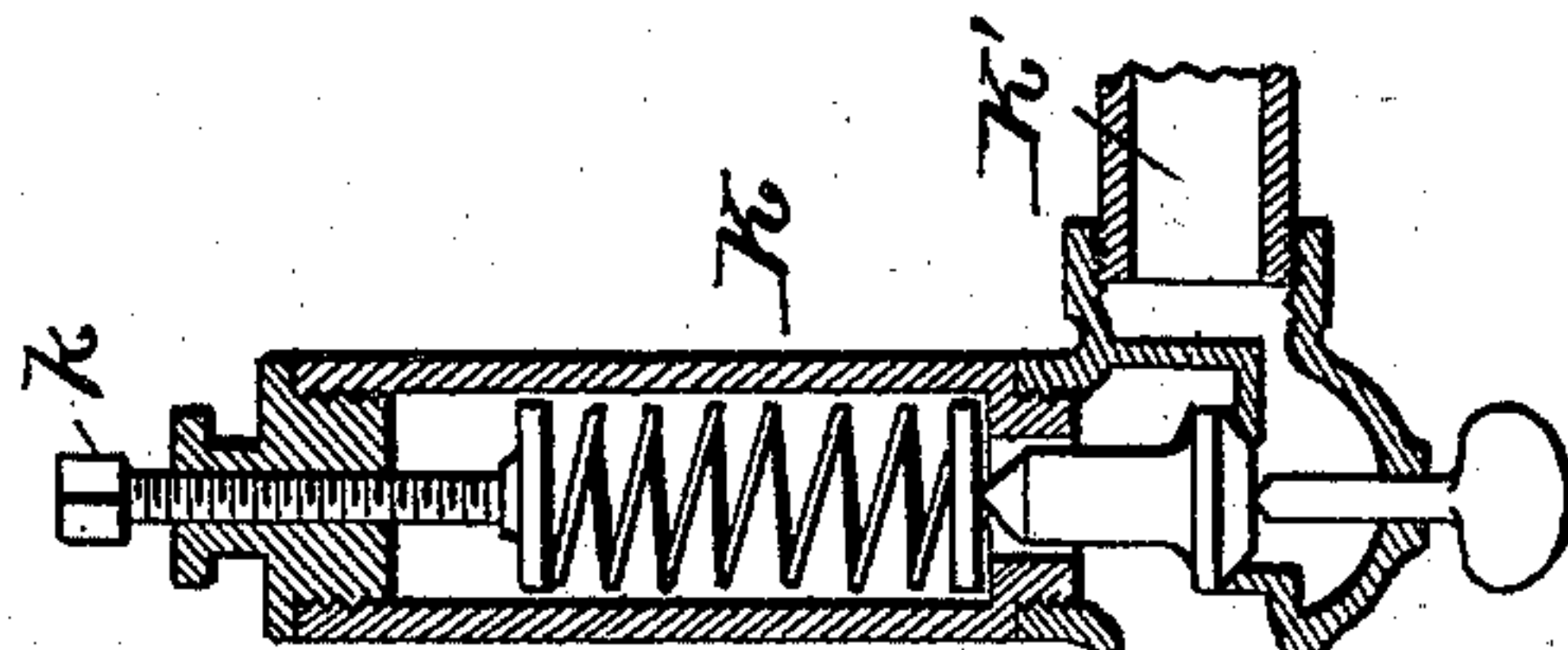


Fig. 5.

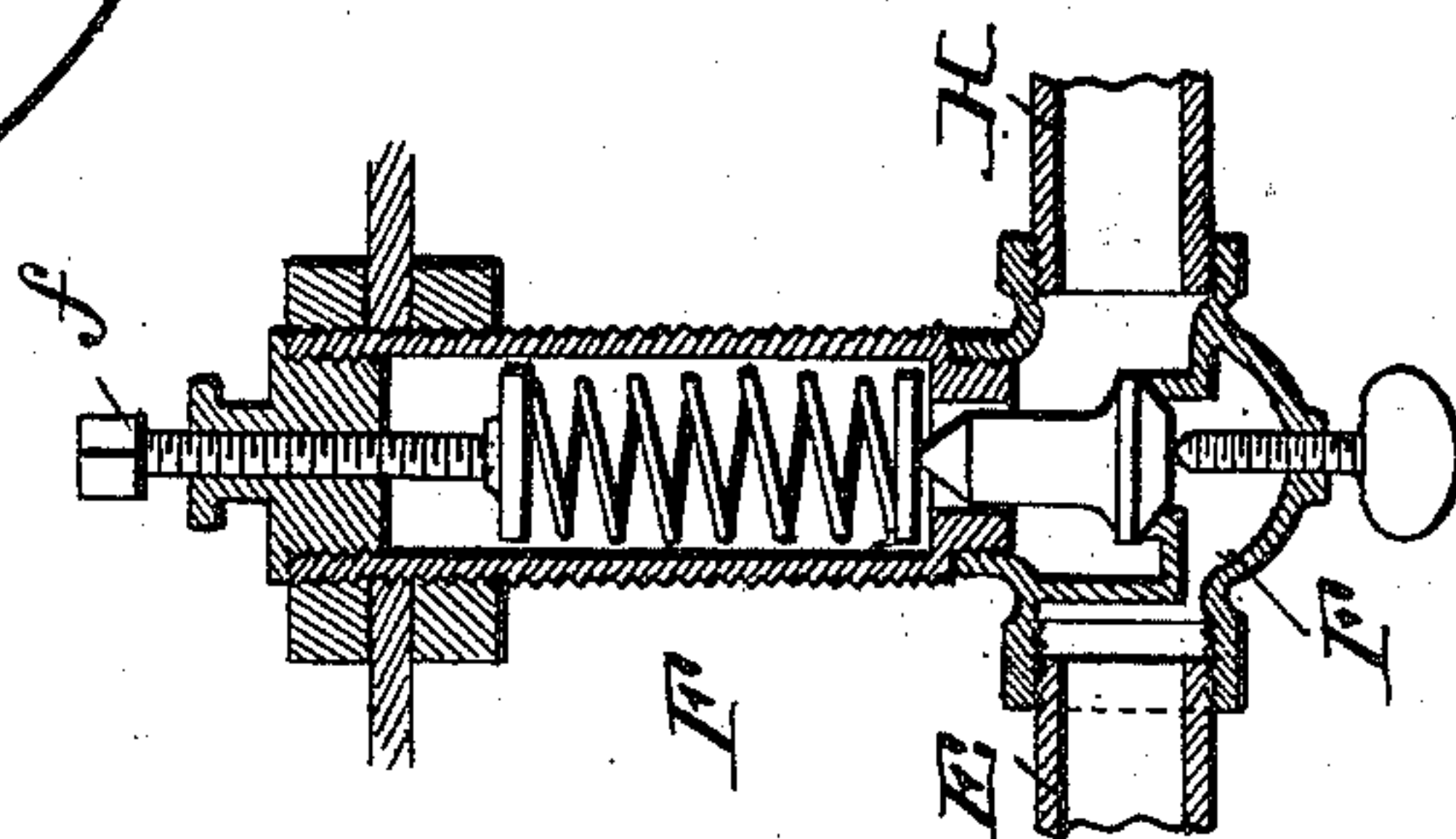
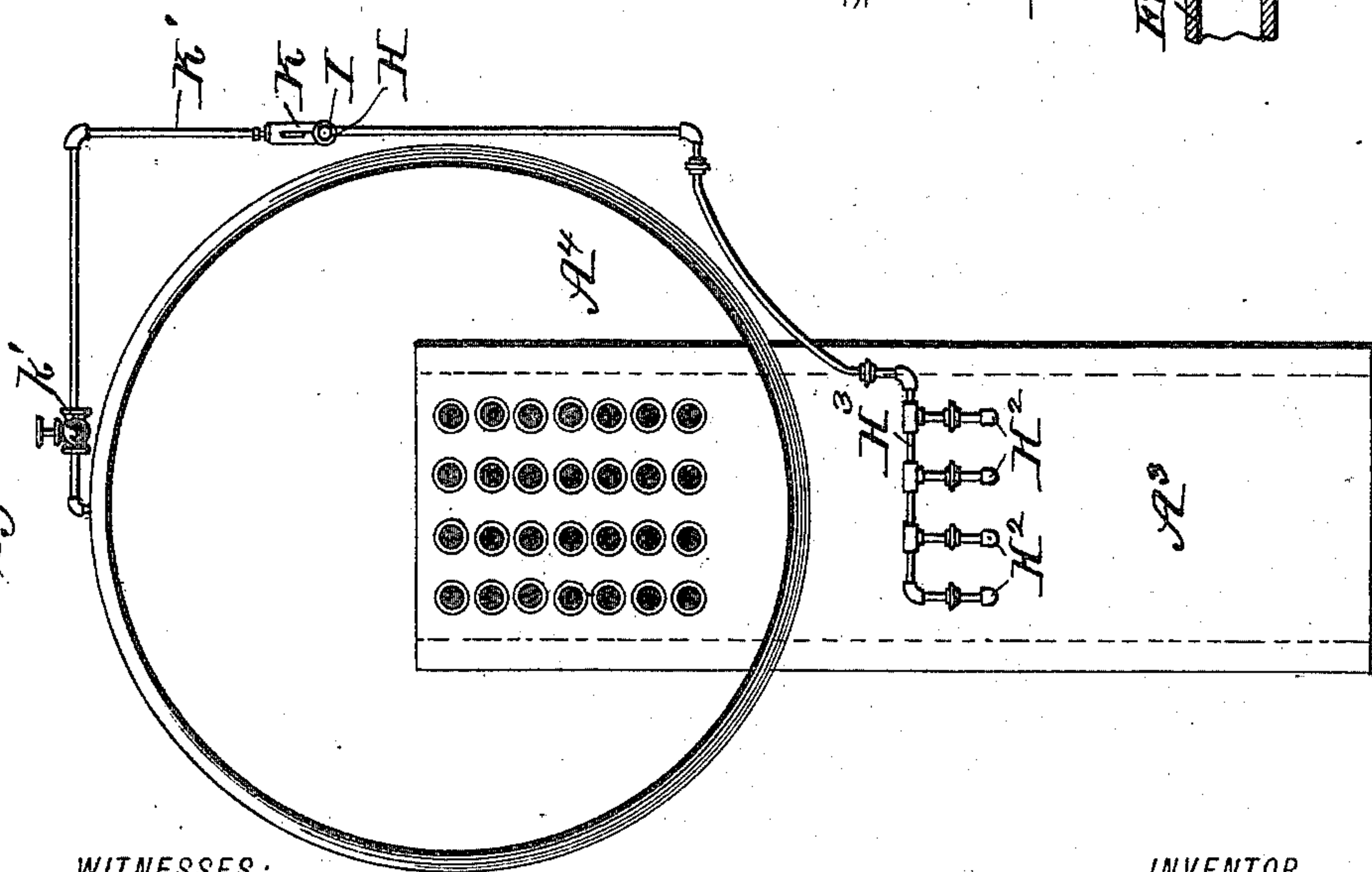


Fig. 4.



WITNESSES:

Joe. A. Ryan
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UNITED STATES PATENT OFFICE.

JOSEPH W. HOGAN, OF ATLANTA, GEORGIA.

SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 572,896, dated December 8, 1896.

Application filed March 30, 1896. Serial No. 585,371. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH W. HOGAN, a citizen of the United States, residing at Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Smoke-Consuming Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part thereof, in which—

Figure 1 is a side elevation of a locomotive-boiler furnace, partly in section, with my improvements applied. Fig. 2 is a sectional plan of the same. Fig. 3 is a transverse vertical section on line 3 3, Fig. 2. Fig. 4 is a similar view on line 4 4, Fig. 2. Figs. 5, 6, and 7 are detail views.

My invention relates to that class of smoke-consuming furnaces especially adapted for locomotive-boilers.

The object of the invention is to cause a better generation of heat and the consumption of smoke by utilizing as far as possible for such purposes exhaust-steam stored in a superheater or receiver, as well as utilizing live steam when the supply of exhaust-steam is insufficient.

The invention will be first described, and then specifically set forth in the claims.

A represents the usual exhaust-pipe within the locomotive smoke-box A', and A² is the fire-box. These parts and the boiler A⁴ are of the usual construction and need not be further described.

C is a receiver or superheater mounted on suitable supports c within the upper forward part of the smoke-box, and B B are the two pipes leading from opposite sides of the upper end of the exhaust pipe or nozzle A to the said receiver, into which they discharge the exhaust-steam, the pipes B B each having a check-valve D of any suitable construction. The receiver C is spaced at all sides from the walls of the smoke-box, so that the hot air and gases from the boiler-flues can pass around it and heat it to superheat the steam contained therein. The receiver is provided with an outlet-pipe E, having an automatically-operating governor-valve F, the regulating-screw f of which extends above the top of the smoke-box, so that it may be set to cause

the valve F to open whenever the steam in receiver C reaches a certain or predetermined pressure. G is a pipe leading from this valve F and provided at its lower end with a vertically-extending discharge nozzle or branch g, which is arranged at the upper end of the exhaust pipe or nozzle A.

The exhaust-steam forced into and held in the receiver C affords a reserved power which costs nothing to accumulate, as it has been reheated and expanded by the otherwise lost heat in the smoke-box. As soon as the steam in receiver C reaches a certain pressure the back-pressure governor-valve F will be forced open and the excess of steam will rush through the pipe G to the top of the exhaust-pipe A and be ejected upwardly through the center of the stack A² and serve as a blower to increase the draft. The effect of this will be that when the engine is working hard and the exhausts are a number of seconds apart a continuous vacuum will be kept up, thus causing a regular draft through the boiler flues and furnace at the time that it is most needed. Moreover, the jerky spasmodic draft that destroys the fire-bed and fills the flues with unburned coal, cinders, and clinkers will be obviated, and the steady draft obtained gives a clear fire, thereby consuming all such particles as can be converted into heat.

H is a pipe leading from the receiver C rearwardly along the boiler into the cab, where it is provided with a check-valve I, beyond which one end of a T-coupling J is attached, and to the opposite end of this coupling J is attached an automatically-operating regulating-valve K, from which a live-steam pipe K', having a globe-valve k', leads to the steam-space in the top of the boiler. From the lower end of the T-coupling J leads a pipe H', provided within the cab with a globe-valve L, said pipe H' extending outwardly and downwardly to the rear side of the fire-box, where it is coupled to a transverse pipe H², from which four discharge pipes or nozzles H² extend into the fire-box to discharge steam therein. The superheated steam passes from receiver C through pipe H past the check-valve I, thence through pipe H' into the nozzles H², the supply to pipe H' being regulated by valve L.

When there is sufficient pressure in the receiver C to open valve F, the check-valve I will be held open and the governor-valve K will be held closed by the column of steam. The closing of the valve K is effected by the back pressure in the pipes H and H', aided by the force of the valve-spring, which is regulated by screw *k*, and thus live steam is automatically shut off to pipe H'. At such times as long rolls or when the engine is standing at a station, when the supply of exhaust-steam in receiver C is consumed, then the pressure in pipe H' is reduced, and this allows the valve K to open and admit live steam from pipe K into pipe H', which leads to the furnace. The check-valve I prevents the live steam from passing through pipe H to the exhaust-receiver C. As soon as the engine is opened and a pressure from the exhaust A is again stored in the receiver C the pressure through pipe H to H' closes the governor-valve K to the column of live steam and supplies the pipe H', leading to the furnace, with superheated exhaust-steam. The tubes or nozzles H² enter the furnace through the boiler-leg and may be of any desired construction, they being shown in the shape and form of hollow stay-bolts, projecting outside the boiler about an inch, and are there coupled to the transverse pipe H³.

In every one of the couplings or unions *h'* which connect the nozzles or tubes H² to the pipe H³, I place a metal washer *h²*, having a central hole *h³*, and the holes in the respective washers increase in size from the end of the pipe H' toward the opposite end of pipe H³. The object of this is to regulate the flow through the four delivery nozzles or pipes H², so that an equal amount of steam will be ejected through each one into the furnace.

M and N are air-injectors connected to pipes H H', respectively, and which may be used at any time that a supply of air as well as steam in said pipes may be found necessary for perfect combustion of the gases in the fire-box or furnace.

The lower part of the check-valve I is provided with a small screw O, that can be screwed upwardly against the valve to raise it from its seat. This will permit live steam from pipe K' to be conveyed forwardly through pipe H to the receiver C and united, if desired, with air through the injector M. When the steam and air reaches the receiver, it is expanded and escapes through the regulating-valve F and pipe G, causing a blast up through the stack. This creates a vacuum in the smoke-box, which assists the draft through the flues, and, in connection with the discharge from the tubes H², affords a steady freely-moving draft and in such quantity as may be controlled, as shown.

It will be seen that the natural draft through the smoke-box is not interfered with in the slightest by the receiver C and pipes connected therewith.

Having thus described my invention, what

I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a boiler-furnace, of a receiver or superheater within the smoke-box, a pipe connecting the receiver with the exhaust-pipe and having a check-valve, and a discharge-pipe leading from the receiver to the desired point and provided with an automatic governor-valve to open when the steam in the receiver reaches a predetermined pressure, substantially as set forth.

2. The combination with the receiver or superheater, of means for charging it with exhaust-steam to constitute a reserve power, a pipe or pipes to carry the expanded steam from the receiver to the desired points, and an automatically-operating valve controlling said pipe substantially as set forth.

3. The combination with a boiler-furnace, of a receiver or superheater located in the smoke-box and having a check-valved supply pipe or pipes connecting it with the exhaust pipe or nozzle, and a discharge-pipe leading from the receiver, to discharge upwardly into the stack and provided with an automatic governor-valve to open when a predetermined pressure is reached, substantially as set forth.

4. The combination with the receiver located in the upper forward part of the smoke-box and spaced therefrom, of a check-valved supply pipe or pipes connecting said receiver with the upper contracted end of an exhaust-pipe, and a discharge-pipe leading downwardly from the receiver to the upper extremity of the exhaust and discharging upwardly therewith into the stack, said discharge-pipe being provided with a governor-valve opening automatically at a predetermined pressure from within the receiver, substantially as set forth.

5. The combination with the receiver or superheater within the smoke-box, and a check-valved supply pipe or pipes connecting it with the exhaust-pipe, of a pipe leading from said receiver and discharging the expanded exhaust-steam into the fire-box and the pipe connecting with the boiler, said pipe having an automatic-valve mechanism, substantially as set forth.

6. The combination with the receiver or superheater within the smoke-box and a check-valved supply pipe or pipes connecting it with the exhaust-pipe, of an offtake-pipe leading forwardly from the receiver and provided at the head of the boiler with a check-valve, a branch pipe leading to the fire-box an automatic regulating-valve beyond the branch pipe and a live-steam pipe connected with said regulating-valve to supply the branch pipe with steam for the fire-box when pressure decreases in the pipe leading from receiver, the check-valve in the latter pipe preventing live steam from passing to the receiver or superheater, substantially as set forth.

7. The combination with the receiver or superheater within the smoke-box, and a check-

valved pipe or pipes connecting it with the exhaust-pipe, of an offtake leading from the receiver and provided with an air-injector and a branch pipe discharging into the fire-box, substantially as set forth.

8. The combination with the receiver or superheater having a check-valved connection with the exhaust-pipe, of an offtake-pipe leading from the receiver to the head of the boiler and provided with a branch pipe discharging into the fire-box, air-injectors in the offtake-pipe and its branch, a check-valve between the offtake-pipe in advance of its branch pipe, an automatic regulating-valve at the other side of the branch pipe, and a live-steam pipe leading from the top of the boiler to said automatic regulating-valve to supply the branch pipe with live steam when said valve opens, substantially as set forth.

9. The combination with the receiver or superheater having a check-valved connection with the exhaust-pipe, of an offtake-pipe leading from the receiver to the head of the boiler and there provided with a check-valve having a screw to hold it raised from its seat when desired, a branch pipe leading from the check-valve provided with a hand-operated valve and discharging into the fire-box, a live-steam pipe leading from the top of the boiler to the branch pipe and having an automatic governor-valve opening to the live steam when the back pressure decreases sufficiently, the

offtake-pipe serving to carry live steam to the receiver or superheater when the check-valve is raised by said screw, substantially as set forth.

10. The combination with the receiver or superheater in the smoke-box and having a supply-pipe connecting it with the exhaust-pipe and provided with a check-valve, an offtake-pipe leading from the receiver to discharge a blast upwardly into the stack and provided with an automatic governor-valve, a second offtake-pipe leading from the receiver to the head of the boiler and there provided with a check-valve and a branch pipe discharging into the fire-box, and a live-steam pipe leading from the top of the boiler to the said branch pipe and provided with an automatic regulating-valve opening when back pressure in the branch pipe decreases sufficiently, substantially as set forth.

11. The combination with a series of steam or air discharging pipes or nozzles entering the fire-box, of a supply-pipe to which all of the nozzles are coupled, and a centrally-apertured washer or diaphragm within each coupling, the apertures increasing in size from the inlet end of the supply-pipe, substantially as set forth.

JOSEPH W. HOGAN.

Witnesses:

E. S. WHITTINGTON,
J. W. STAUFFACHER.