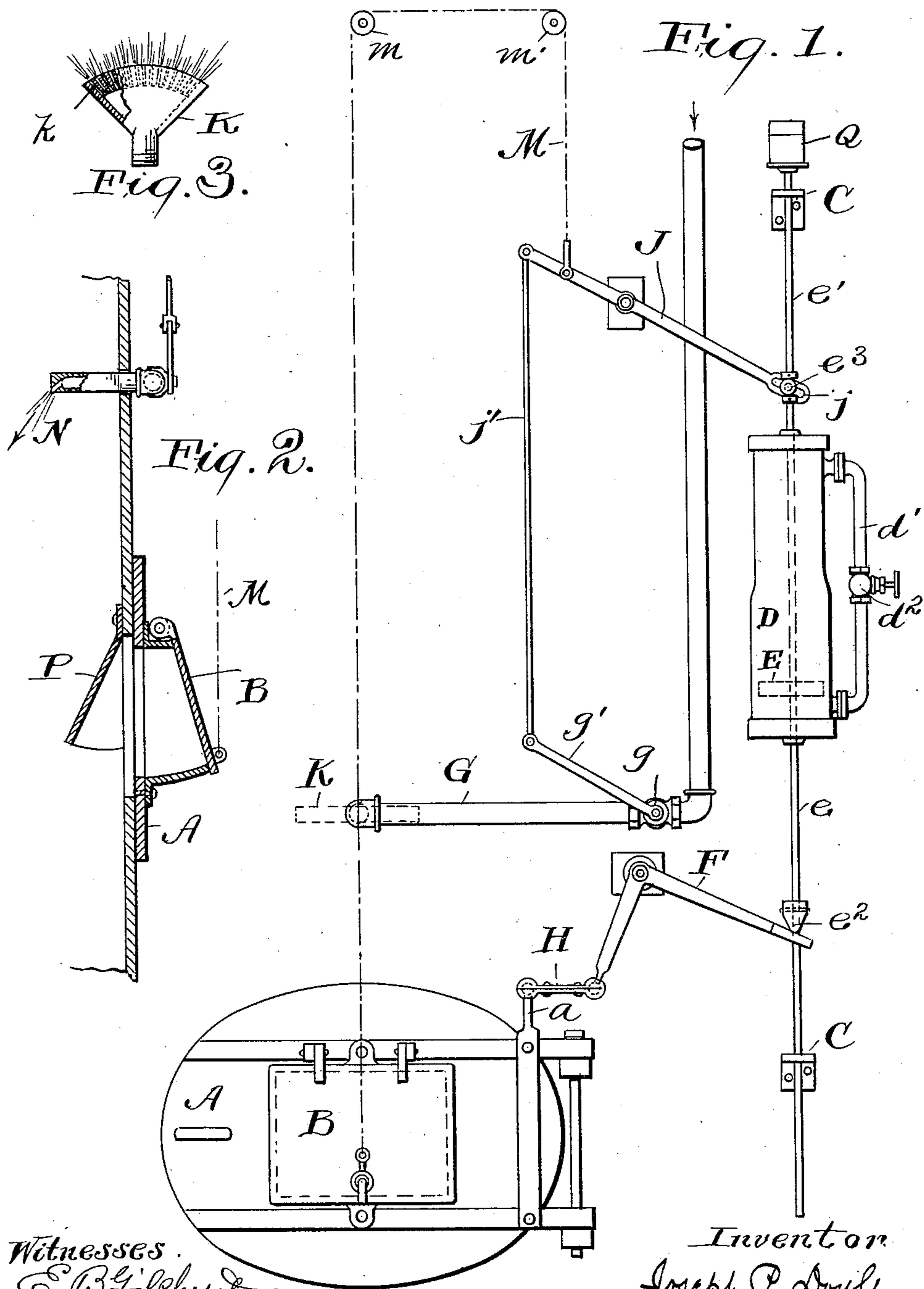


J. P. DOYLE.
SMOKE PREVENTING DEVICE.
APPLICATION FILED NOV. 4, 1908.

998,962.

Patented July 25, 1911.

2 SHEETS—SHEET 1.



Witnesses.

E. B. Gilchrist

H. P. Sullivan

Inventor

Joseph P. Doyle

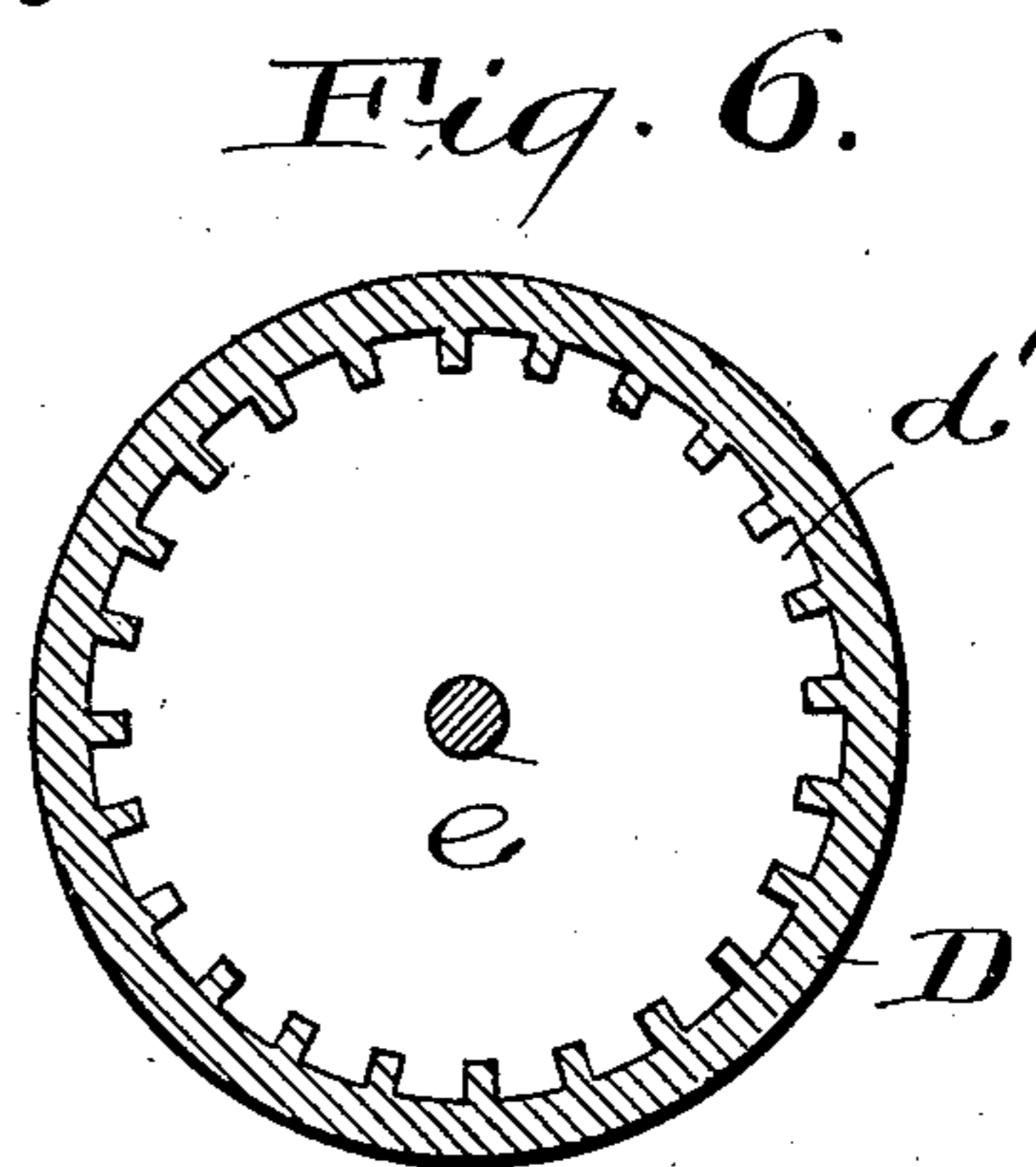
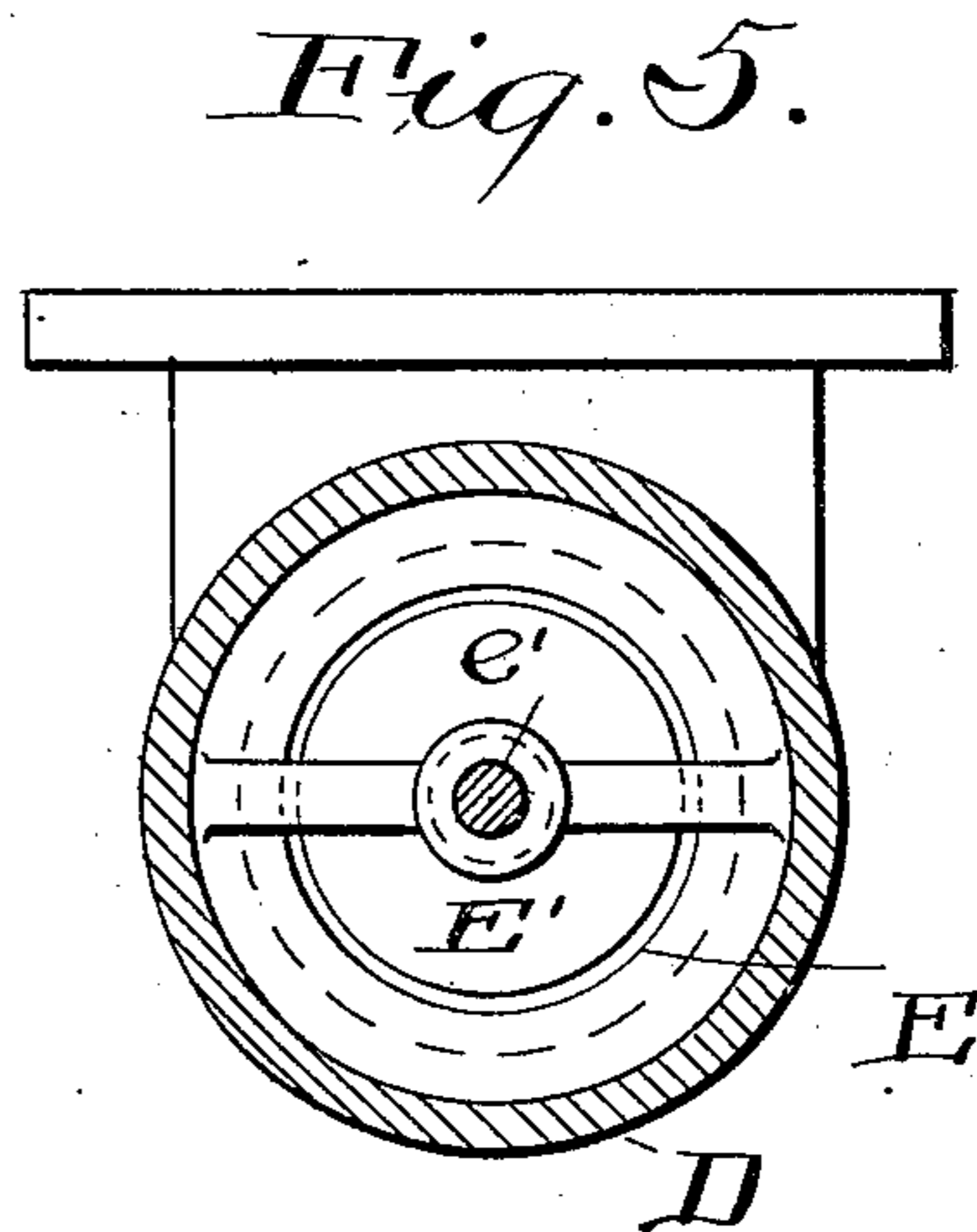
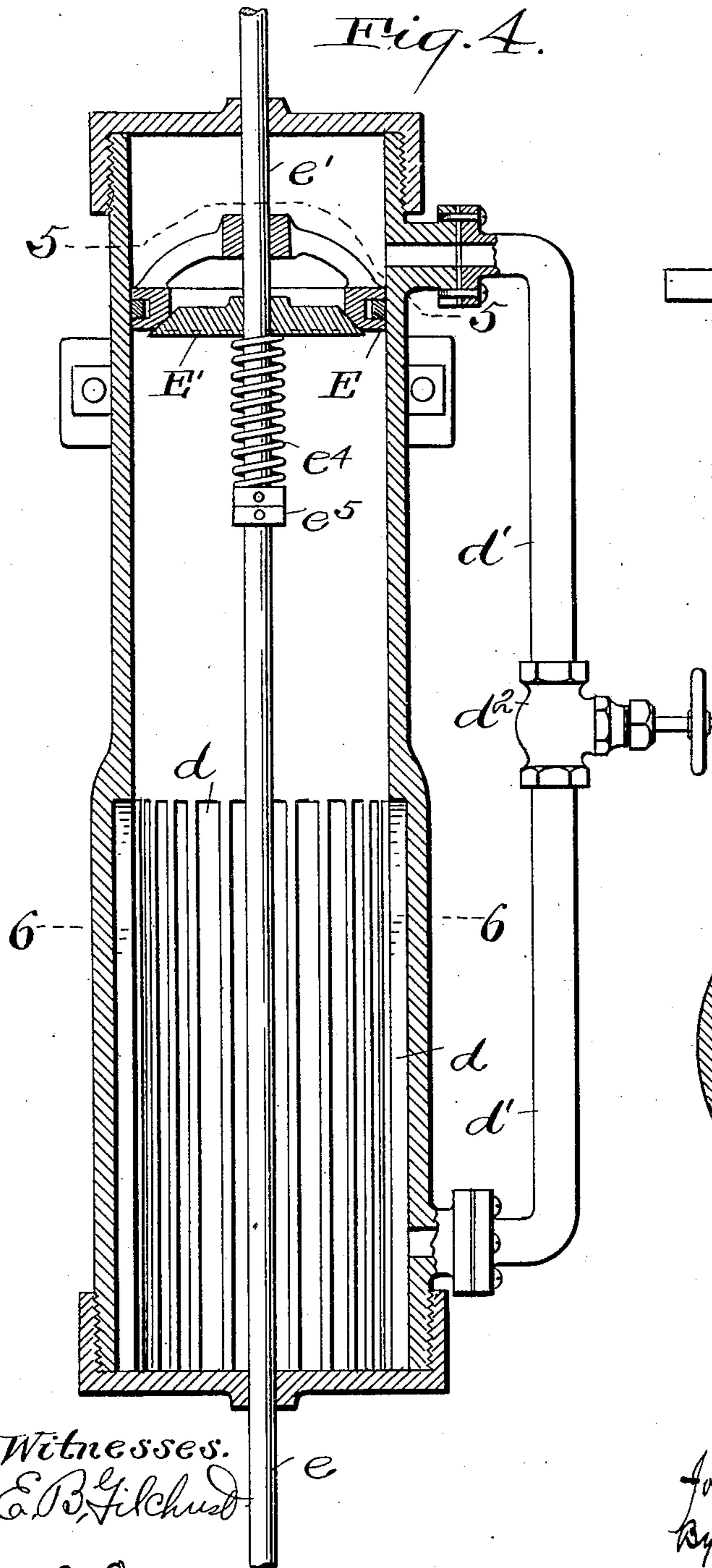
By Thurston Woodward
Attorney

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UNITED STATES PATENT OFFICE.

JOSEPH P. DOYLE, OF CLEVELAND, OHIO.

SMOKE-PREVENTING DEVICE.

998,962.

Specification of Letters Patent.

Patented July 25, 1911.

Application filed November 4, 1908. Serial No. 461,031.

To all whom it may concern:

Be it known that I, JOSEPH P. DOYLE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Smoke-Preventing Devices, of which the following is a full, clear, and exact description.

The object of this invention is to minimize the formation of smoke by promoting practically complete combustion of fuel in a furnace,—particularly when fresh fuel is put into said furnace.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a somewhat diagrammatic front view of the invention. Fig. 2 is a sectional side elevation of a portion of the furnace front. Fig. 3 is a detailed view partly broken away of the steam injecting nozzle. Fig. 4 is a longitudinal section of the dash pot and its parts, employed as a part of the apparatus. Fig. 5 is a sectional view thereof in the plane of line 5—5 of Fig. 4; and Fig. 6 is a sectional view in the plane of line 6—6 of Fig. 4.

Referring to the parts by letters, A represents the door which closes the opening through which fuel is fed to the furnace,—this door being hinged on a vertical axis. B is a damper for closing an opening through the door A, said damper being hinged at its top on a horizontal axis to said door, whereby the gravity will close the damper when permitted so to do.

D represents a dash pot cylinder, the specific construction of which will be presently described. It is secured in an upright position to any suitable support, as, for example, the front of the furnace. The piston thereof has one rod *e*, extending through the bottom of the dashpot; and another *e'* extending through the top of the dash pot, which rods are suitably guided as by passing through perforated plates C, C. Secured to the rod *e* is a tappet *e*² which is adapted to engage with one arm of a pivoted lever F. A link H having suitable ball joints at its ends connects the other arm of lever F with an upwardly projecting arm *a*, fixed to the furnace door.

G represents a steam pipe which passes through the front wall of the furnace, and has at its inner end one or more injector heads K having a plurality of small discharge openings *k* which are inclined so that

the steam issuing from them will be directed at an inclination downward substantially as indicated by the arrow N in Fig. 2 so as to impinge upon the bed of fuel. In the steam pipe is a valve *g* having an operating arm *g'*.

J represents a lever pivoted to a fixed point. One arm of this lever has in it a slot *j* into which projects a pin *e*³ projecting laterally from the piston rod *e'*. The opposite end of this lever arm is connected by a link *j'* with the operating valve arm *g'*, and is also connected by means of a chain or cable M with the damper B, said chain passing over one or more directing sheaves *m*, *m'*.

When the furnace door is open it will cause such a rocking of the lever F as will push the piston rod *e* upward carrying the piston with it in the dash pot cylinder. The upward movement of this piston and its two rods will rock lever J with the result of opening valve *g*, and of likewise lifting the damper B. By reason of the opening of valve *g*, many small jets of steam will be discharged into the furnace down against the bed of burning fuel therein. The operator now puts in fresh fuel and closes the door. So long as the dash pot piston remains in the position to which it was moved, the damper B will be held up and thereby air will rush into the furnace through the opening *a*, will be deflected down unto the bed of fuel by the deflector plate P, and this air in conjunction with the steam discharged into the furnace from the perforated head K will cause a complete combustion of the fresh fuel, or rather will substantially prevent the formation of smoke as said fuel is ignited and initially burned.

Referring now, particularly, to Fig. 4, the dash pot will be described. It is an ordinary cylinder except that the lower end is fluted vertically by a plurality of longitudinal grooves *d*. The piston E comprises a ring which is fixed to the piston rod, said ring having a central opening which is adapted to be closed by the conical valve E', said valve being held up against the seat around the inner lower edge of the piston by means of a spring *e*⁴ compressed between said valve and a shoulder *e*⁵ on the piston rod. This dash pot is filled with oil or some suitable slow moving fluid. When the piston rod and piston are pushed upward by the opening of the furnace door, the valve E' will yield downward so that the fluid

in the dash pot may pass from the upper to the lower side of the piston through the opening in the piston ring uncovered by said action of valve E. The upper and lower ends of the cylinder are connected by the pipe d in which is a valve d' capable of being adjusted so as to regulate the rapidity with which the fluid in the cylinder may flow around the piston from one end to the other. The rate at which the piston will move down will depend upon the adjustment of this valve. Under ordinary conditions, it is thought that an adjustment which will require about three and one half minutes for the descent of the piston from the upper end of the cylinder to the fluted part thereof will give efficient results in most cases. As the piston is descending, it slowly closes the valve g' and the damper B. When the piston reaches the fluted part of the cylinder, it will thereafter descend very rapidly since the fluid in the cylinder may pass around the piston through the longitudinal grooves. The piston and piston rod must be subject to a force constantly acting to push the piston downward. I prefer to employ for this purpose a number of weights Q secured upon the upper end of the piston rod.

30 Having described my invention, I claim:

1. In a smoke preventing device, the combination of a furnace door hinged at one side on a vertical axis and having an opening through it, a movable damper covering said opening and hinged along its top edge to said door on a horizontal axis, a steam pipe entering the furnace and having a jet discharging head therein, the valve in said steam pipe having an external operating arm, a dash pot cylinder containing a fluid, a piston movable therein and having rods connected therewith projecting through both ends of said cylinder, a pivoted lever having an operative connection with one of said rods, a link connecting said lever with the operating arm of the steam valve, a cord connecting said lever with the damper, guide sheaves over which said cord extends, and mechanism intermediate the furnace

door and the lower projecting piston rod whereby the latter is moved upward when the furnace door is opened. 50

2. In a smoke preventing device, the combination of a furnace having a fuel opening, and a deflector plate inside the furnace adjacent to said opening, a furnace door having an opening, a damper for closing and opening, a steam pipe entering said furnace and having therein a jet discharging head, and a valve in said steam pipe, with a dash pot cylinder internally grooved longitudinally at its lower end, a piston in said cylinder having an opening through it, a spring-actuated valve moving upward to its seat to close said opening, a piston rod connected with the piston and extended out of the ends of the cylinder, a lever operatively connected with said piston rod, a connection between said lever and both the steam valve and damper, and means whereby the opening of the furnace door moves the piston up in said cylinder. 55 60 65 70

3. In a smoke preventing device, the combination with a furnace door having an opening therethrough, a movable closure for the opening, a steam pipe extending into the furnace and provided with a discharge nozzle, a valve in said steam pipe, a lever connected to said valve, a pivoted lever, means for securing one end of said pivoted lever to the valve lever, a flexible connection between the pivoted lever and the closure for the opening of the door, a rod, the free end of said pivoted lever being operatively connected to the rod, connections between the door and the rod to raise the same as the door is opened, means for retarding the downward movement of the rod and for permitting the same to move quickly when the rod is near the end of its downward movement for the purpose described. 75 80 85 90

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

JOSEPH P. DOYLE.

Witnesses:

H. R. SULLIVAN,
E. L. THURSTON.