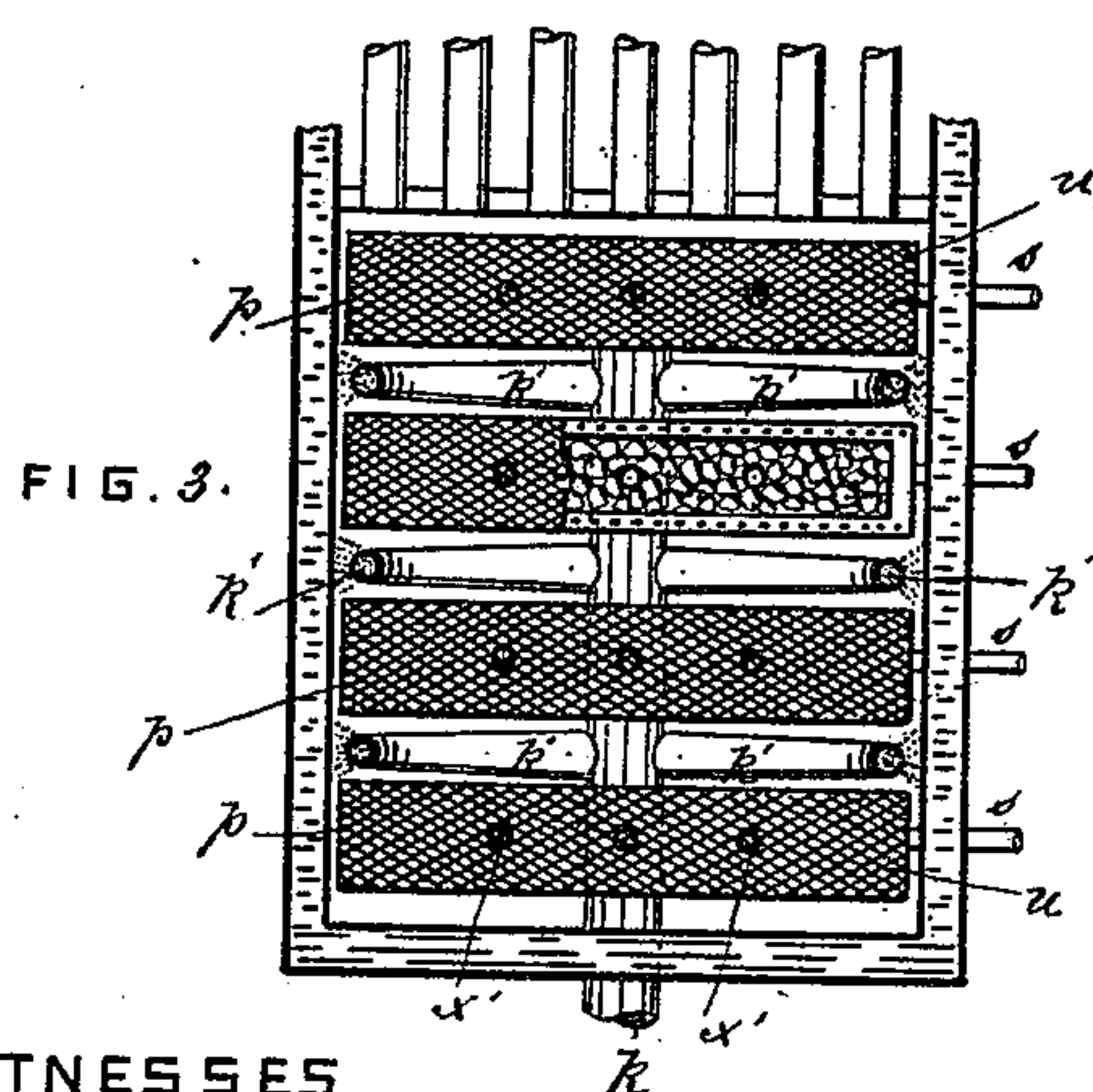
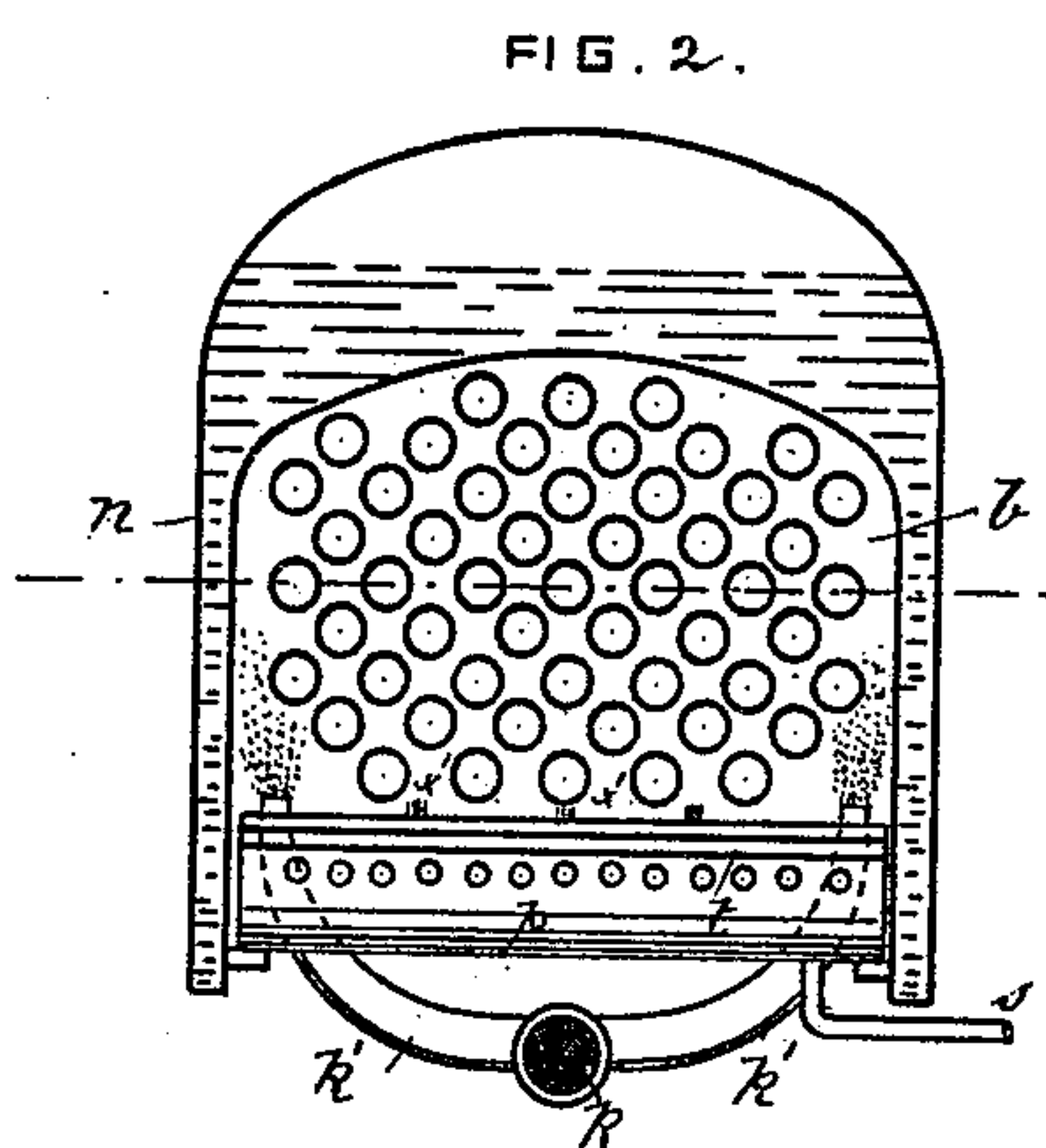
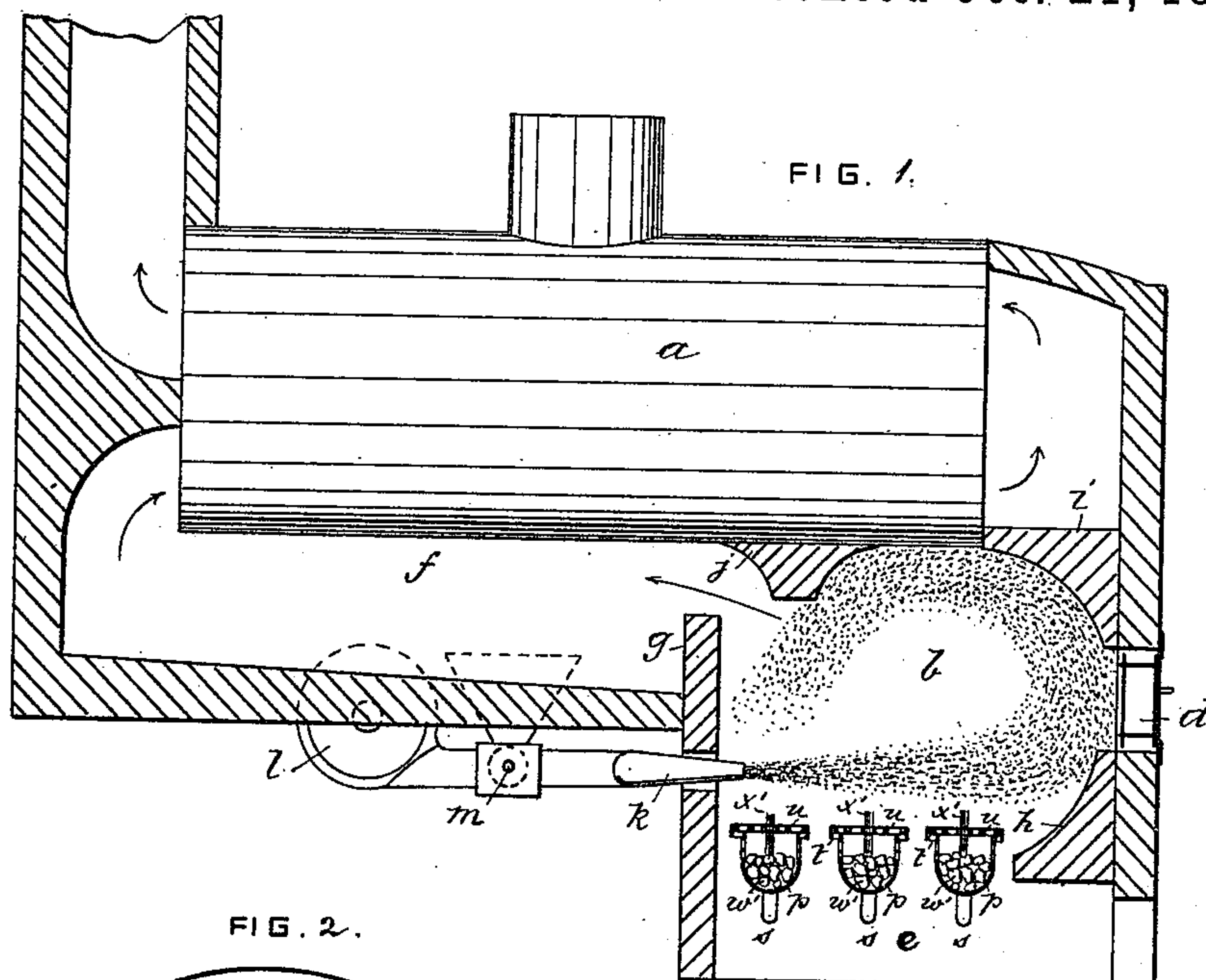


(No Model.)

A. MASON.
APPARATUS FOR BURNING COAL AND HYDROCARBON FUEL IN COMBINATION.

No. 438,852.

Patented Oct. 21, 1890.



WITNESSES

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APPARATUS FOR BURNING COAL AND HYDROCARBON FUEL IN COMBINATION.

SPECIFICATION forming part of Letters Patent No. 438,852, dated October 21, 1890.

Application filed March 8, 1888. Serial No. 266,557. (No model.)

To all whom it may concern:

Be it known that I, ALLAN MASON, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Apparatus for Burning Coal and Hydrocarbon Fuel in Combination; and I do 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, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My improved apparatus for burning coal and hydrocarbon fuel in combination consists of contrivances for burning the oil or oil vapors or gas in one or more suitable burners therefor located in the furnace-chamber somewhat higher than the ash-pit, with ample surrounding space for the ashes to descend into the pit without clogging these burners, and at the same time maintaining a fire of coal around and above the oil or vapor burner or burners with pulverized coal atoms in suspension and general distribution throughout the chamber, together with the requisite amount of air for the support of combustion, so that the mixture and union of atoms is in process of operation among and throughout the moving particles in all the space and in far greater amount and intensity than as burned in a mass or bed on the coal-grate, with correspondingly more effective or perfect combustion and greater production and intensity of heat in a given space. In the apparatus by which air jets or blasts may be introduced in such manner as to produce currents, counter-currents, eddies, and cycles calculated to bear up and distribute the coal till consumed, the coal being preferably introduced along with and by said jets, but may be otherwise introduced, if desired, and for supplying the oil or other hydrocarbon or gas fuel, I will employ sectional burners for the oil or gas—that is, burners located in different sections or localities of the lower portion of the furnace-chamber—with ample space between and below them for the precipitation of the

ashes below them from the coal fire, all as hereinafter described, reference being made to the accompanying drawings, the apparatus being the same as is represented in another application now pending, in which I claim the process or method of operation.

Figure 1 is a longitudinal sectional elevation of an ordinary boiler-furnace with apparatus for injecting and maintaining the suspension of the coal atoms, together with apparatus for maintaining a sectional auxiliary fire of hydrocarbon fuel in the lower portion of the combustion-chamber. Fig. 2 is a transverse sectional elevation of a locomotive-boiler furnace with similar apparatus. Fig. 3 is a horizontal section of Fig. 2.

In Fig. 1, *a* represents an ordinary return-flue boiler; *b*, the combustion-chamber of the furnace; *d*, the fire-door; *e*, the ash-pit, and *f* the flue back of the bridge-wall *g*. In such a furnace I provide deflectors *h i j*, of refractory material, as shown, or in any approved arrangement, with an injector *k* for air to be forced in, preferably, at the back of the chamber by a fan *l* or other means, and coal-dust charged into the air-spout by a screw-feeder *m* or other means, to be carried along for feeding the furnace and for being mixed and combined with the air and held in suspension for combustion by it. It will be seen that the blast first traverses the chamber a little above the ash-pit, spreading more or less. Then it is turned upward violently by the deflector *h*, and, coming in contact with deflector *i*, is then projected forward against deflector *j*, which turns it downward into the incoming blast, which takes along with it any yet unconsumed particles and prevents them from falling into the ash-pit. It will also be seen that these appliances may be readily fitted to a common boiler-furnace already in use without material expense of fitting and may be as readily removed.

For adaptation of the same method of consuming coal atoms in suspension to the combustion-chamber *b* of a locomotive-boiler fire-box *n*, the injecting-nozzle may have numerous branches *k'* entering near each side from below the side walls of the fire-box and projecting upward into the opposite angles so as

to meet over the center of the chamber and produce gyrating cycles by their counter action adapted to maintain the suspension of the coal atoms until consumed. By this method all the combustible matters in the coal will be effectually consumed with greater economy of fuel, and an especial advantage is gained in the total prevention of clinker and slag. What ash is developed may fall in part into the ash-pit through some localities where the eddies favor it, while some may be carried over the bridge-wall and descend where the cycles have less suspending effect. Together with the fire of coal atoms thus maintained throughout the chamber, generally, I combine also an auxiliary fire of hydrocarbon or gas fuel in various ways, as ordinary gas-burners in the lower portion of the furnace at or about the locality of the ordinary fire-bed, or one or more injector-burners for the purpose of renewing the fire of coal-dust in cases of interruption to which it is liable by irregularity or clogging of the feed and other causes, and also of adding to the capacity of the furnace for useful effect. As an ordinary fire of uniform spread over the area of the chamber would fail of this purpose, because it would soon be clogged with ashes from the fire above, I employ sectional or separate burners *p*, with wide spaces between them, through which the falling ashes from the upper fire may descend into the pit, said burners being of such limited transverse extent as that the ascending currents from them will turn away into the pit such matters as might tend to fall into them, and thus be self-protecting so far as the falling matters of the upper fire are concerned. These burners may consist of trough-shaped drawers *p*, adapted to slide in and out of the furnace through one side for withdrawing them from time to time for clearing and repairs; but it is not essential to have them draw out. To these troughs oil may be supplied by suitable feed-pipes *s* from any suitable source of supply. The troughs will be perforated in the upper portions of the sides for the supply of air, and the upper edges will preferably be flanged over horizontally, as at *t*, which flanges will be perforated with numerous small holes, through which air will be distributed in jets

from below for the better admixture with the gases and vapors rising from the burners. The troughs will also be covered with wire gauze *u* and will be charged with refractory or refractory and absorbent material, as porous stone or asbestos *W'*, some portions of which may extend up through holes in the wire-gauze for wicks *x'* to take up the oil and vapors.

I am aware that coal and oil have been burned or attempted to be burned by injecting oil upon the coal-bed in the furnace-chamber, which, it is to be noted, is the reverse of the improved process which I claim—that is, injecting the (pulverized) coal into, upon, or above the oil fire. When oil is projected on a coal fire to be consumed, it seems to suddenly extract from the coal the more volatile portions, which consume readily and leave it hard and slatey, which residue does not burn readily, but soon dies out and has been found impractical and so ineffective as to be too expensive as compared with coal alone in the usual methods.

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

1. The combination, with a furnace-chamber, of an air and pulverized-coal injector and a series of hydrocarbon-burners separately arranged in the lower portion of the chamber, but above a lower space for reception of ashes, and with intervals of space between them, through which the ashes are precipitated into the space below, substantially as described.

2. The combination, with a furnace-chamber, of an air and pulverized-coal injector and a series of oil-burners separately arranged with intervals of space between them and a space below for reception of the ashes, said burners consisting of trough-shaped drawers or receptacles and being covered with reticulated material having one or more burner-wick openings, substantially as described.

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

ALLAN MASON.

Witnesses:

W. J. MORGAN,
A. P. THAYER.