

(No Model.)

J. WILSON & A. MASON.
APPARATUS FOR BURNING PETROLEUM.

No. 408,643.

Patented Aug. 6, 1889.

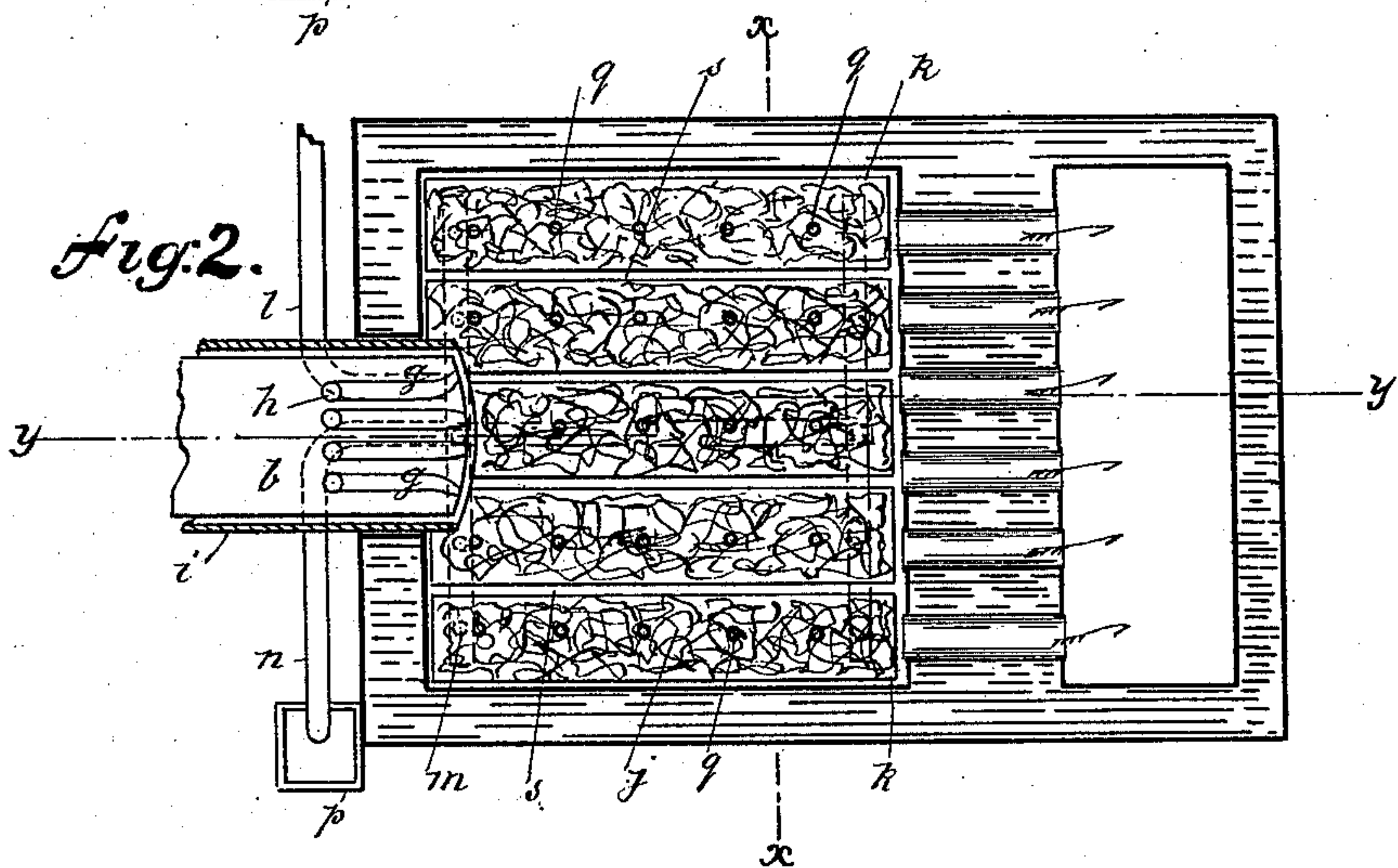
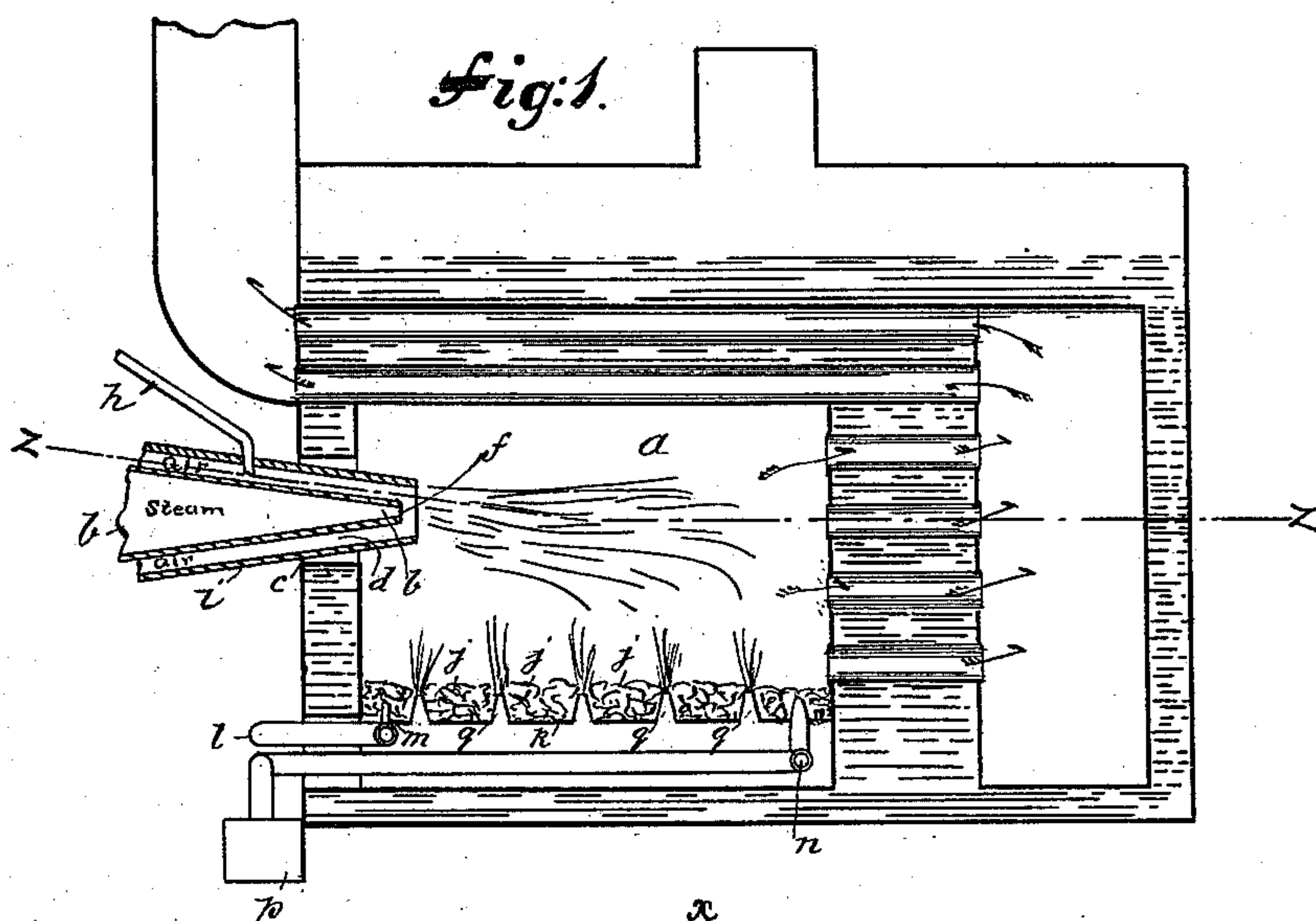
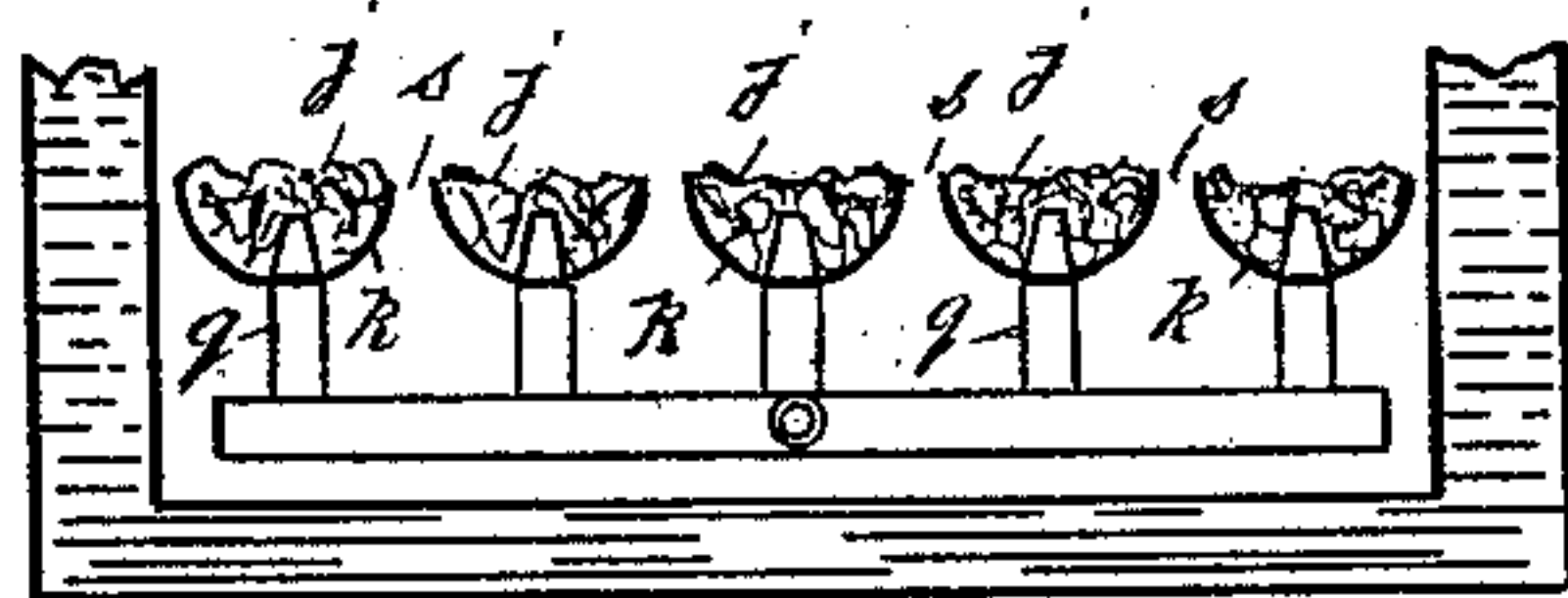
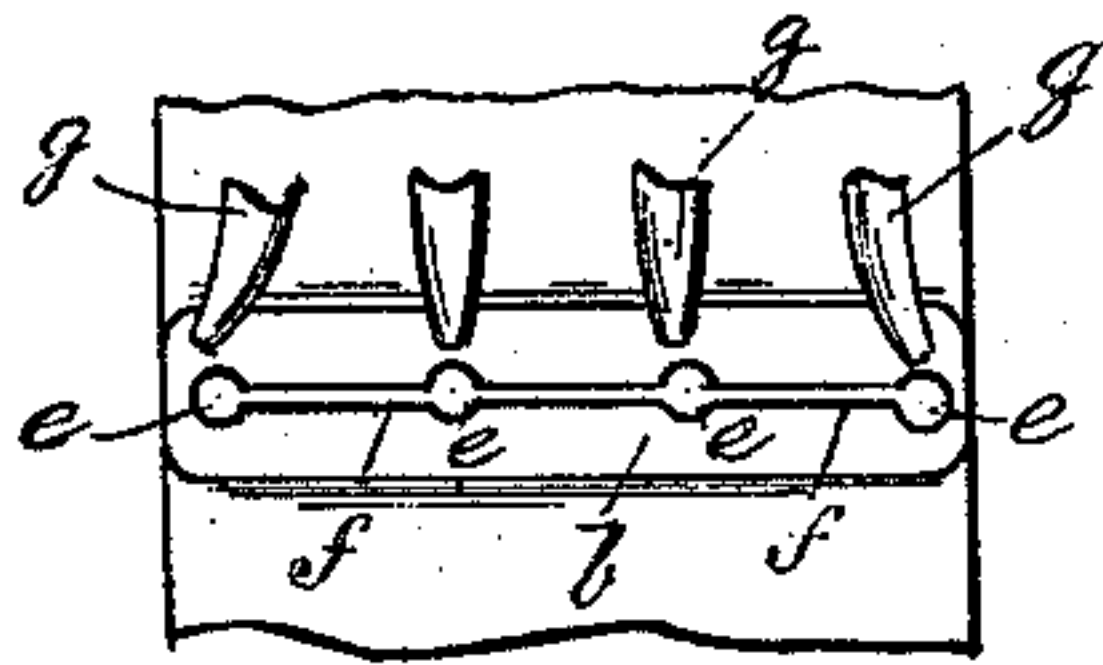


Fig. 3.



WITNESSES:

W. H. Morgan,
[Signature]



INVENTORS
Fig. 4. John Wilson & A. Mason
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UNITED STATES PATENT OFFICE.

JOHN WILSON, OF NEW YORK, AND ALLAN MASON, OF BROOKLYN, ASSIGN-
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APPARATUS FOR BURNING PETROLEUM.

SPECIFICATION forming part of Letters Patent No. 408,643, dated August 6, 1889.

Application filed March 8, 1888. Serial No. 266,564. (No model.)

To all whom it may concern:

Be it known that we, JOHN WILSON and ALLAN MASON, citizens of the United States, residing at New York city, New York, and Brooklyn, New York, respectively, have invented certain new and useful Improvements in Apparatus for Burning Petroleum; and we 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 ap-
10 pertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

15 The object of our invention is to so present the oil to the heating apparatus that perfect combustion is obtained, and to obtain more heat from a given quantity of the material than by the usual means of supplying heat to atomize the petroleum, so that continuous
20 uninterrupted combustion is obtained; also to obtain a safe, continual, and economical heat for mechanical and other purposes.

We introduce petroleum or other oil or fatty substance, steam, and air in proper proportion and thoroughly atomize the oil and mix it with steam by impinging steam or air upon it, or oil upon steam or air on its way to the flame. The air makes the combustion
30 perfect, and may, when used without steam, be injected to produce the draft and spray the oil. The steam, when used, supplies the drawing or forcing power, and, in addition, the steam decomposes in the flame and gives
35 an additional element of heat in the evolving of hydrogen and oxygen. We can assist or stimulate this decomposition and the vaporizing of the oil by the use of superheated steam and hot air.

40 The apparatus comprises the means, hereinafter described and claimed, of effecting a lateral diffusion of the injected and atomized or vaporized oil and its due measure of forcing and atomizing steam and air for supporting combustion coextensive with the breadth
45 of the combustion-chamber, or thereabout, containing a bed of refractory, or refractory and absorbent, substance a suitable distance beneath the inlet of the injected film of combustibles for the combustion of the drippings
50 of oil from the inlet, or the same and oil other-

wise supplied to it in combination with the direct combustion from the said inlet either by the air of the lower portion of the injected film or with other air introduced separately
55 to the porous bed, whereby a double process results, in which one fire diffuses laterally and along the combustion-chamber and the other upward from the lower bed, and each helps the other by crossing and intermixing of the
60 combustible matters more intimately and effectively than as in the common process, and so that the uncertainty of accidental extinction of the flame of either source, and especially of the upper inlet, to which such
65 burners are more or less liable by excessive or inadequate supply of either of the elements and other causes, is avoided and continuous combustion secured, the temporary interruption of either being instantly overcome by
70 ignition again from the other. The said apparatus, which we claim in this application for a patent, is represented in the accompanying drawings, in which—

Figure 1 represents a sectional elevation of
75 a boiler-furnace of ordinary construction for burning coal with our improved apparatus applied so that oil-fuel may be readily substituted for coal, and vice versa, without any change of the furnace. Fig. 2 is a horizontal
80 section of the same. Fig. 3 is a detail in transverse section of the furnace, and Fig. 4 is a section of the injector for introducing and spraying the oil and producing the draft.

To produce the broad flame in the upper
85 portion of the furnace-chamber *a*, we employ the broad flat steam-injector nozzle *b*, about as wide as will enter the ordinary fire-door *c*, but sufficiently contracted vertically to allow an air-space *d* above and below for the inflow
90 of air, and having a series of small steam-issues *e* and slits *f*, if desired, at the end, with slight grooves or troughs *g* in the upper surface, in which the oil from suitable supply-pipes *h*, discharging into said grooves, may be
95 conducted off the end of the nozzle into the steam-jets, which nozzle we insert in the fire-door about as shown, with any suitable exterior support, and such pipe-connection with the boiler as is necessary for supplying the
100 steam, and with the funnel *i* for facilitating the introduction of the air by the suction of

the steam-jet, and guiding and directing the same to the jet; or we may omit the steam and use air instead, as before stated. With this form of injector, having issues and oil-guides properly divergent, as indicated in Figs. 2 and 4, it will be readily seen that a film of combustible elements will be supplied coextensive with the length and breadth of the chamber, the oil being very thoroughly atomized for efficient combustion, and being especially disposed with relation to the upper portion of the steam and air jets for effective combustion in the upper part of the furnace-chamber, with which we also provide for like combustion in the lower part of said chamber and for more thorough intermixture of the combustible elements by the use of a bed of refractory, or refractory and absorbent, material *j* below—as asbestos, porous stone, or the like—for receiving and holding the drippings from the injector above for combustion, either alone or with other oil, and with the air of the lower portion of the injected draft, together with or without other air, or air and steam, admitted below said porous bed, whereby we have an upwardly-burning fire from the whole surface commingling transversely with the upper fire and thus insuring the more perfect admixture of the elements than with one fire alone, besides having in the cross-fires which support each other an effectual preventative of the sudden interruption of the fire, which is common in the burning of oil in one fire only, from various well-known causes, as the momentary interruption or material variation of the oil-supply by clogging or other causes.

For an efficient means of supplying oil to the refractory bed, in addition to the drippings from above, we employ a series of metallic troughs *k*, that can be readily introduced through the fire-door and located in about the position of the fire-grate in the ordinary furnace, on which the drippings will be well distributed, and to which oil may be supplied, through the feeder *l* and a branch *m*, to each trough with pipe-connections *n*, to prevent overflow and to conduct any excess into a receptacle *p*, and with air-tubes *q* for the supply of air from the space below, and, if desired, the troughs may be fitted with slight air-spaces *s* between them for better distribution of the air.

We have a refractory and absorbent substance beneath the inlet and flame, and as oil will burn readily when lighted in the presence of air the oil that drips from the inlet-pipe or other means of introducing the oil to the flame-chamber is immediately lighted and burns until all is consumed, and this will in turn light the highly atomized, vaporized, or gasified oil, should it be put out at any time by any accident or by having in combination too much steam or air, or both. Thus the whole system cannot fail to work steadily and surely, and is doubly automatic in that way, the drippings are lighted by the atomized oil,

vapor, or gas flame, which keeps the drippings constantly ignited, and in turn the fire from the drippings keeps the atomized oil, vapor, or gas constantly ignited.

The atomizing, vaporizing, and, whenever required, gasifying of the oil are so accomplished by our apparatus that combustion is so perfect that we have no smoke or lamp-black; there is no possibility of the fires becoming extinguished or being suddenly reduced or increased, except as desired by the operator; the flame is broad, covering the entire heating-surface, and has no tongue or jet that would cut, channel, or burn the metal.

The boiler will last as long as with coal or wood fires, and longer, because the heat is more uniform by this process than when a coal or wood fire is used. The flame being broad, covering the entire heating-surface, no brick-work or other protection is necessary to protect the surface being heated from any jet or tongue that by being concentrated on one point or part of the metal would burn through it or shorten its life, and which is also an element of danger, as by the boiler being burned through at the point of contact there is great danger of explosion.

In the case of small tubes we can put the living flame through each tube, thus insuring even heating and perfect combustion.

We are aware that oil has been injected into a coal-burning furnace over a fire bed of coal, and we do not claim such process, ours being mainly the utilization of the drippings of oil from the upper film not sufficiently atomized to be consumed in the upper fire, by the aid of a bed of hot refractory material to facilitate the vaporizing of the same, together with an additional supply of oil, when required. We find that the refractory material will retain sufficient heat for effectually vaporizing the oil; whereas our experience in the use of a coal fire in the lower part of the furnace is that it is impracticable with the oil fire above, because it is extinguished by the absorption of its carbon by the oil, so that effectual combustion is prevented, and by chilling when replenished, which is frequently required, also chills the oil fire above, and often extinguishes it.

We are also aware that oil has been injected directly onto a bed of refractory material; but this plan does not involve our process of the upper lateral fire and the lower upward fire, and is not effective, because when oil is injected on a bed of incandescent coal or refractory material a large proportion of lamp-black results.

We are aware that a series of small injectors have been arranged side by side along the front of the furnace for distributing the oil through numerous fine jets, and perforated pipes have been arranged across the interior front of the furnace for the issue of the material in very fine jets, which have correspondingly limited range, and similar perforated pipes have been distributed under or

in the locality of the fire-grate for distributing similar fine jets of gas or injected steam and oil upward, and we make no claim for such devices. We find that such fine injectors and
5 perforations clog so quickly with tar and other matters that they are impracticable for burning oil, and for the upper fire the range is so short as to have but little effect, and besides the amount of heat produced from a given
10 quantity of injected oil is much greater when burned *en masse* than when distributed, and the success of our invention is dependent upon so burning the injected oil; and we secure the success of the lower fire through the supply of the same to the absorbent bed in excess of and in reserve of the issue into the
15 flame, and we limit our claims to the apparatus as adapted for these qualities.

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

1. The combination, with a boiler-furnace, of the injector-nozzle having the laterally-expanded and vertically-contracted issue and provided with a series of troughs for distribut-

ing oil laterally in said injector, pipes for
25 supplying oil thereto, a series of oil-burners and supply-pipes, and an absorbent bed of non-combustible material in the lower portion of the furnace-chamber, said burners forming a grate to hold the absorbent material, substantially as described. 30

2. The combination, with a boiler-furnace, of the injector-nozzle having the laterally-expanded and vertically-contracted issue, orifices *e*, connected by narrower slits *f*, and provided with a series of troughs for distributing
35 oil laterally in said injector, and pipes for supplying oil thereto, said nozzle being detachably fitted in the fire-doorway, substantially as described. 40

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN WILSON.
ALLAN MASON.

Witnesses:

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