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PATENTED NOV. 28, 1905.

L. K. LEAHY.
INJECTOR BURNER.

APPLICATION FILED NOV. 28, 1904.

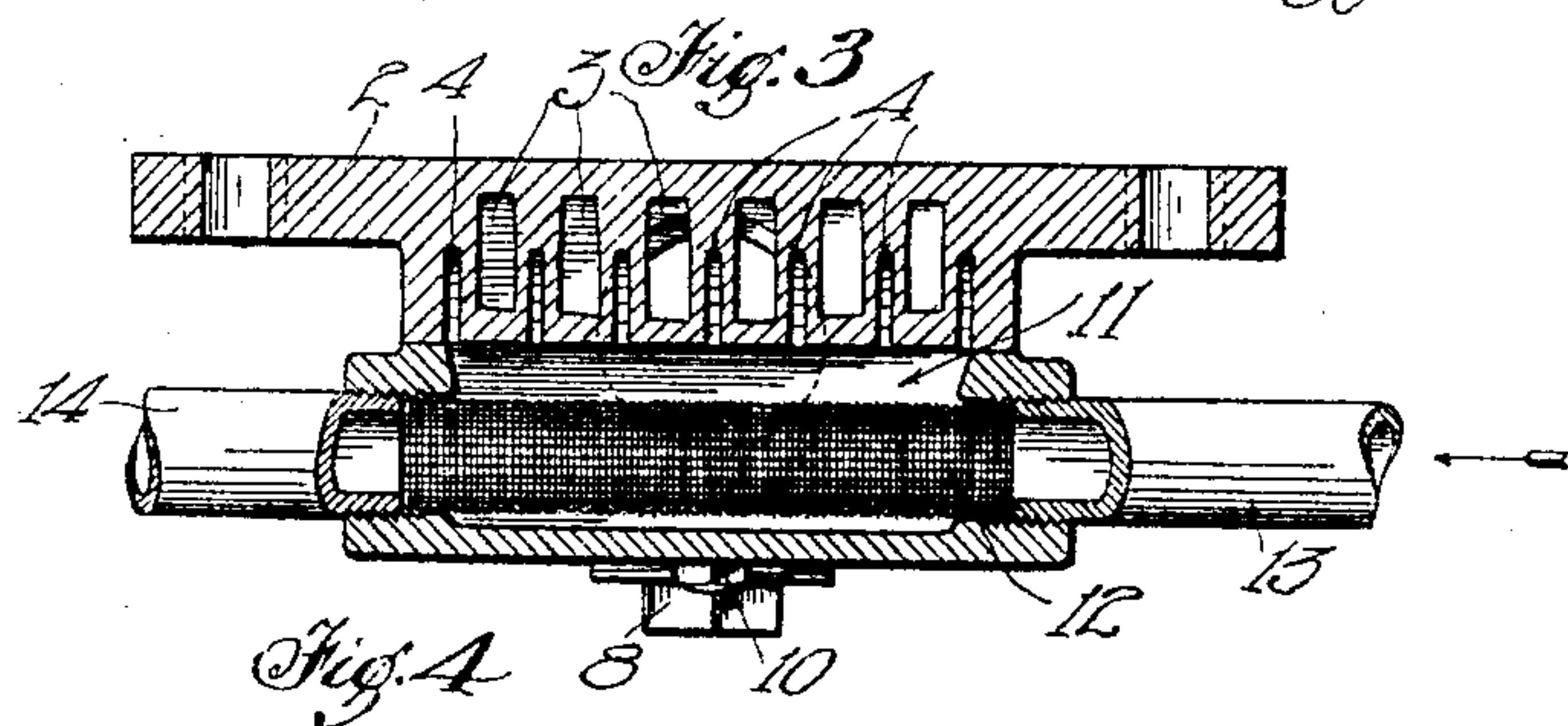
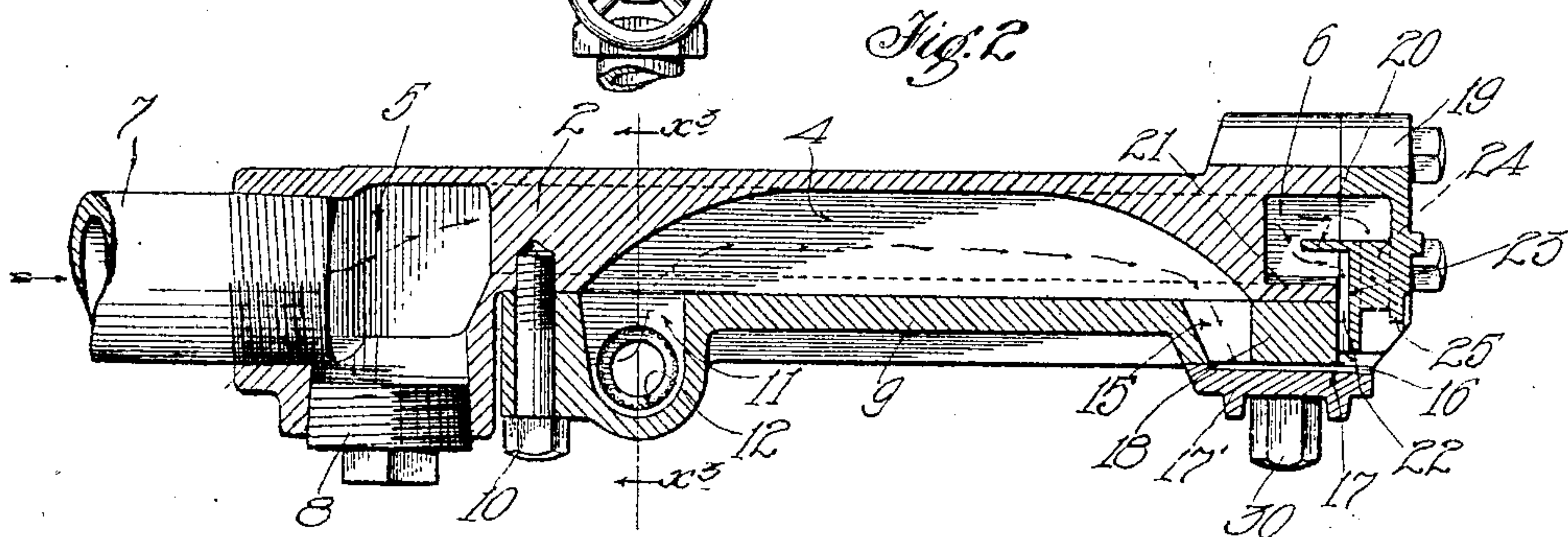
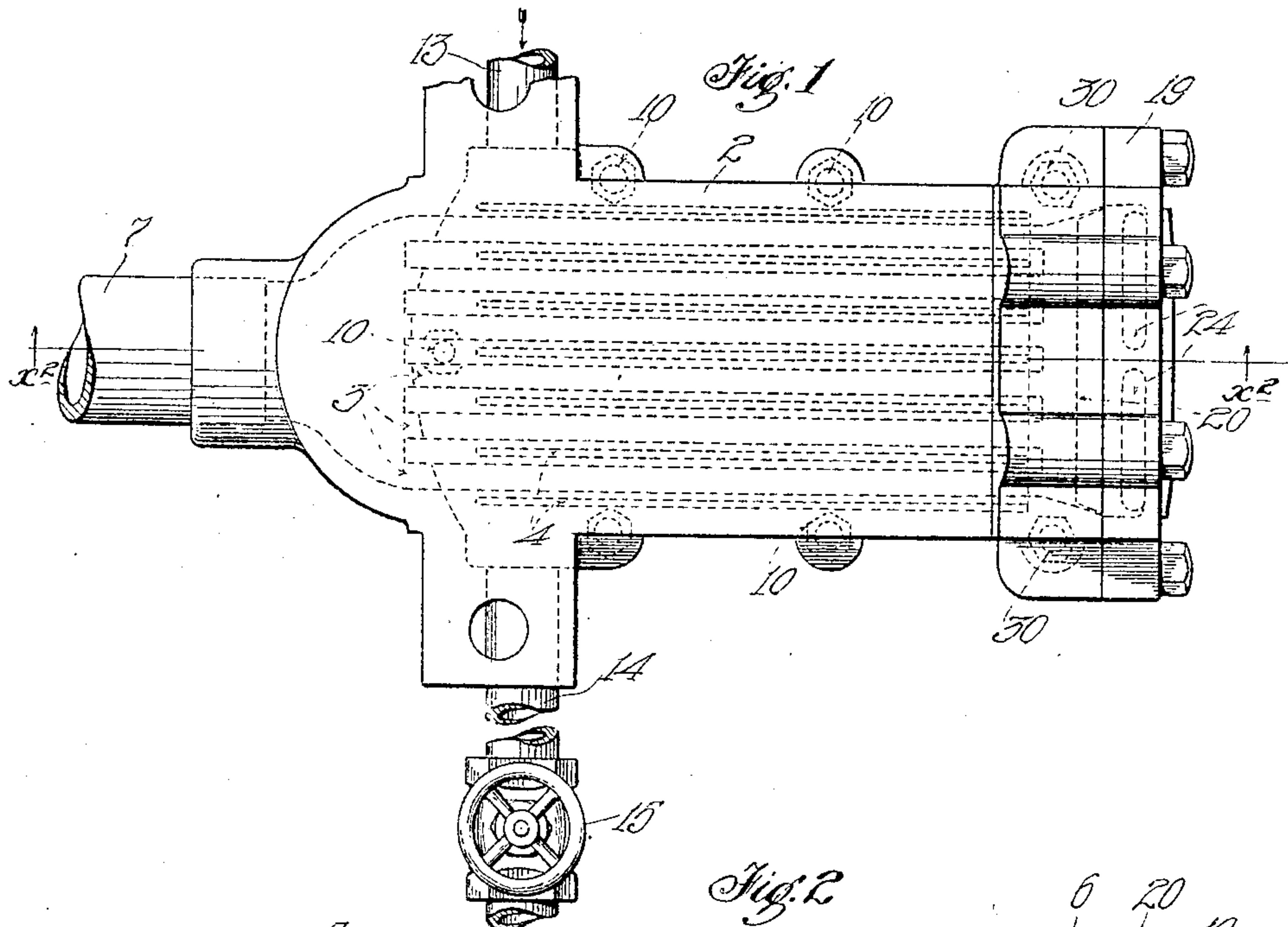
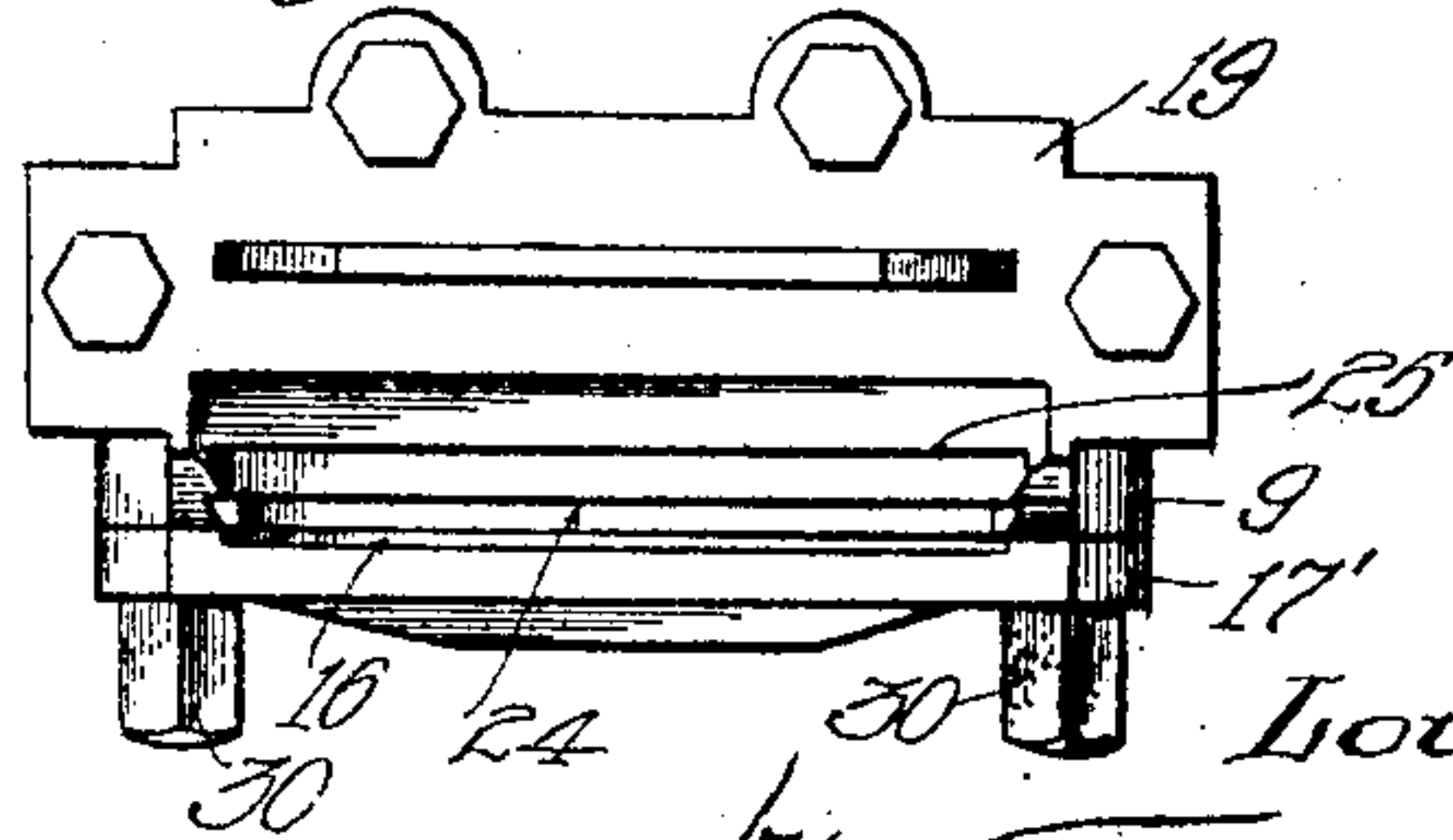


Fig. 4



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UNITED STATES PATENT OFFICE.

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INJECTOR-BURNER.

No. 805,864.

Specification of Letters Patent.

Patented Nov. 28, 1905.

Application filed November 28, 1904. Serial No. 234,512.

To all whom it may concern:

Be it known that I, LOUIS K. LEAHY, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented certain new and useful Improvements in Injector-Burners, of which the following is a specification.

This invention relates to means for burning hydrocarbon oils, and particularly to improvements upon the invention set forth in application Serial No. 172,249, filed September 8, 1903, and has for its general object the provision of improved means for burning crude or heavy hydrocarbon oils as fuel under locomotive-boilers, being particularly adapted for such use, although the burner may be utilized wherever it is desired to use an injector-burner.

Another object is to provide a burner by the use of which the necessity of heating the oil may be obviated.

Another object is to provide means for preventing the clogging of the steamway and for easily cleaning the same.

Other and further objects and ends in view will hereinafter appear from a detailed description of the construction and operation.

In general the invention consists in an injector-burner comprising means for furnishing a steam-jet and means for delivering oil into the steam-jet, the arrangement of these means being such that the steam is conducted through a series of long, thin, but wide channels arranged between a series of thin oil-ducts, so that the heat of the steam heats the oil as the same passes through the oil-ducts to the oil-outlet.

The invention consists, further, in the constructions and combination of parts hereinafter set forth, and particularly pointed out in the claims.

The invention will be more readily understood by reference to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a plan view of a hydrocarbon-burner embodying my invention, the steam and oil ducts or ways being shown in dotted lines. Fig. 2 is a longitudinal section on the line $x^2 x^2$ of Fig. 1. Fig. 3 is a transverse section on the line $x^3 x^3$ of Fig. 2 looking in the direction of the arrows. Fig. 4 is an end view of the front end of the burner.

As shown in the drawings, 2 represents the

body of the burner, which is provided with a series of oilways 3 and a series of steamways 4, the steamways and oilways alternating and being spaced apart by common walls, so that the heat from the steam in ways 4 will heat the oil in the ways 3. The ways 3 extend from the oil-chamber 5 and extend through the body 2 to the outlet-chamber 6. An oil-supply pipe 7 is connected with the oil-chamber 5, and a clean-out plug 8 is also connected with the said chamber 5. The oilways 3 extend longitudinally through the body 2 from the chamber 5 into the chamber 6, so that oil from the chamber 5 flows into and through the oilways 3 and from these ways 3 passes directly into the oil-outlet chamber 6 at the front or discharge end of the burner, the oil being heated during its passage through these ways 3 by the heated walls thereof, these walls being thin and heated to high temperature by the steam passing through the steamways 4, formed between the thin walls of the oilways 3. For convenience of construction the steamways 4 terminate a short distance from the chambers 5 and 6 and do not communicate therein and are open at the bottom, being completed by a separate casting 9, adapted to be bolted or otherwise secured to the body 2 by suitable bolts 10. The surface of the central portion of this casting 9 forms the bottoms of the steamways 4.

In one end of the casting 9 is formed the steam-expansion chamber 11 in communication with the rear ends of the steamways 4, and in this expansion-chamber 11 I preferably provide a screen 12, of wire-cloth, to catch any impurities or solid matter contained by the steam.

In one end of the steam-chamber 11 screws the steam-supply pipe 13, and into the other end of the steam-chamber 11 a blow-out pipe 14 is connected, having a suitable valve 15, so that any impurities lodging in the screen may be blown out of the steam-chamber through the pipe 14.

At the front end of the casting 9 is provided a chamber 15 in communication with the steamways 4 and opening into the steam-discharge slot 16, formed between the lip 17 of the casting 17' and the under edge or face of the flange 18 of the casting 9. As shown, this lip 17 is extended out beyond the end or front edge of the casting 2 for the purpose hereinafter set forth.

Preferably the burner is constructed with a removable end plate 19, having a horizontal flange or lip 20, which extends into the oil-chamber 6 above the bottom 21 thereof, and the primary oil-discharge slot 22 is formed between the end of the body portion and the inner face of the wall 23 of the removable end block 19. This primary oil-outlet discharges right-angularly downward on the straight horizontal lip 17, and the oil is precipitated directly upon the outgoing jet of steam. The inwardly-projecting lip or partition 20 thus extending over the outlet from the chamber 6 into the primary oil-discharge duct or slot 22 separates the two oil-discharge ducts 22 and 24 and requires all the oil to pass through the slot 22 unless the supply thereof is too great therefor. The volatilized portion of the oil all passes out over the lip or partition 20 and through the slot 24. As shown, the wall 23 terminates somewhat above the lower face or edge of the flange 18, so that the discharge-slot for the intermingling steam from the slot 16 and oil from the slot 22 is increased beyond the flange 18, allowing the steam to expand upwardly to meet the oil as the same is delivered downwardly from the slot 22, thus avoiding any tendency of the steam to expand or "back up" into the oil-discharge slot 22. The end block 19 is cored out to form a second oil-discharge slot 24. Shown in dotted lines in Fig. 2). This second discharge-slot 24 is of greater width than the primary oil-discharge slot 22, and the lower edge 25 of the block 19 is cut away to provide for the upward expansion of the steam. By this construction I secure all the advantages of both internal and external admixture of the expansive fluid with the oil and secure a most thorough atomization of the oil, effecting perfect combustion.

It will be noted that when the supply of oil is low for a low fire any gas or vapor arising from the oil in oil-chamber 5 or oilways 3 will be drawn out through the duct 24 by the suction caused by the passage of steam across the mouth of said oil-duct.

By thus forming a series of oilways 3, separated by steam passages or ducts 4, the oil is heated as it passes through the burner, and in practice it has been found that by so constructing and arranging the oil and steam ducts the expense and inconvenience of heating the oil in the oil-tank of the locomotive may be avoided, as well as danger from explosion, and also the inconvenience of flexible connections between the oil-tank and the boiler for heating the oil.

The steam-discharge slot 16 is preferably formed by the use of a separate casting 17', although, if desired, the part 17' might be made integral with the casting 9; but I prefer to use a separate casting with long set screws or bolts 30, so that by loosening the set screws

or bolts 30 the casting 17' may be allowed to drop down thereon, so that the steam-slot 16 and the discharge-orifice of the burner may be readily cleaned without necessitating the taking of the burner down and out of the fire-box. The casting 17' may be allowed to hang on the ends of the partially-withdrawn bolts 30 during such cleaning operation. By extending the rod to the valve 15 of the blow-out pipe up into the cab within reach of the fireman therein the valve 15 may be operated to blow out the chamber 11 and screen 12 free from any sediment or heavy particles or scale formed by the steam therein, and this may be accomplished without stopping the engine and without shutting down the burner or lessening the fire therefrom, as it may be accomplished substantially instantaneously.

It has been found in burning oil in locomotive-engines that the gaskets from the unions disintegrate and block up the steamways and the alkaline waters form a scale which also blocks up the steamways, and by providing the expansion-chamber 11 with a screen 12 to catch such impurities and scale and means whereby such screen may be blown clean without either stopping the engine or shutting off the burner the difficulty heretofore experienced in keeping steam up in heavy oil-burning engines is greatly lessened.

It is obvious that, if desired, a steam by-pass could be formed by a pipe from the boiler or from the supply-pipe 13 into the oil-chamber 5, and, if desired, a connection with a valve in such by-pass could be also extended up into the cab of the locomotive, so that the oil-chamber 5 and oilways could be blown clear without necessitating the stopping of the engine.

Another advantage of providing a series of longitudinal oilways 3 which are narrow or thin, but long and wide, is that the crude oil contains often waste and heavy material, and any such material flowing through the oil-supply pipe 7 into the chamber 5 would be retained in the chamber 5 and float therein and would not pass through the oilways 3 and into the outlet-ducts 22 and 24, obstructing portions of the same and giving an uneven or split flame, as has been the result with numerous burners heretofore, the walls between the ways 3 forming, in effect, a screen for catching any such waste or impurities.

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

1. A burner comprising a body provided with a series of oilways terminating in two parallel discharge slots or ducts, and a series of steamways arranged between said oilways for heating the same, said steamways connected with a steam-discharge slot, and said ducts being arranged beyond the discharge-opening of said steam-discharge duct and dis-

charging across the plane of discharge therefrom.

2. An injector-burner comprising a body provided with oilways, inner and outer oil-discharge slots or ducts and steamways arranged between said oilways, said ducts discharging right-angularly across the plane of discharge from said steamways, the end of the outer wall of the inner duct terminating above the plane of the upper edge of the steamway and the outer wall of the outer duct terminating above the plane of the edge of said outer wall of said inner duct.

3. An injector-burner comprising a body provided with oil and steam ways, inner and outer oil-discharge ducts and a steam-discharge slot, said oil and steam ways being arranged alternately and side by side in said body, the lower wall of the steam-discharge slot extending outwardly across the plane of the inner duct, the outer wall of the inner duct terminating above the plane of the upper edge of the discharge-slot.

4. An injector-burner comprising a body provided with oil and steam ways arranged alternately side by side adapting the steam to heat the oil, inner and outer oil-discharge ducts and a steam-discharge duct, the lower wall of the steam-discharge slot extending outwardly across the plane of the inner duct, the outer wall of the inner duct terminating above the plane of the discharge-slot, and the outer wall of the outer duct terminating above the plane of the edge of said outer wall of said inner duct.

5. An injector-burner comprising a body provided with oilways terminating in two discharge slots or ducts with steamways arranged between the oilways and terminating in a thin, wide discharge-outlet, one of said oil-discharge ducts communicating into the steam-discharge slot, the other duct discharging across the plane of discharge from said steam-discharge slot.

6. An injector-burner comprising a body having oilways terminating in two discharge-slots separated by an inwardly-projecting lip or partition extending above one of said slots, and with steamways arranged between alternate oilways adapting the steam to pass through said ways to heat the oil in said oilways, said steamways terminating in a thin discharge-slot, one of said oil-ducts communicating into the steam-discharge slot, the other duct discharging across the plane of discharge from said steam-discharge slot.

7. An injector-burner having an oil-chamber and a series of longitudinal oilways leading therefrom, the wall of said chamber forming a screen for straining the oil passing into said oilways, a series of longitudinal steamways arranged between the oilways and adapted to heat the same, an oil-outlet chamber into which said oilways discharge, an oil-dis-

charge from said chamber, and a steam-discharge, an oil-pipe connected with the oilways, and a steam-pipe connected with the steamways.

8. A hydrocarbon-burner having longitudinal oilways and steamways extending between said oilways, an expansion-chamber connected with said steamways, a screen in said expansion-chamber, a steam-supply pipe connected with said expansion-chamber, a blow-out pipe connected with said expansion-chamber, a valve for said blow-out pipe, an oil-supply pipe connected with said oilways and steam and oil discharge slots.

9. An injector-burner having a series of long, wide, thin oilways and steamways between the walls thereof, an oil-outlet chamber into which said oilways discharge, an oil-discharge from said chamber and a steam-discharge, means for supplying oil to said oilways, and means for supplying steam to said steamways, said oil-discharge positioned with respect to said steam-discharge to project the oil therefrom into the steam from said steam-discharge outside the burner.

10. An injector-burner having an oil-chamber and a series of wide, thin oilways leading therefrom having thin walls spaced apart to form alternate steamways between said oilways, the wall of said chamber forming a screen for straining the oil passing into said oilways, an outlet-chamber into which said oilways discharge, an oil-discharge from said chamber, a steam-discharge, means for supplying oil to said oilways, and means for supplying steam to said steamways.

11. An injector-burner having a series of wide, thin oilways and steamways arranged between alternate oilways, a steam-discharge, an oil-discharge, and a steam-chamber communicating into said steamways, means for supplying steam to said steam-chamber, means for supplying oil to said oilways, means for straining the steam supplied to said chamber, and means for blowing out said steam-chamber to clear the same.

12. An injector-burner having series of alternate oil and steam ways, a steam-discharge, an oil-discharge, and a steam-chamber communicating into said steamways, means for supplying steam to said steam-chamber and oil to said oilways, a cylindrical screen in said steam-chamber inside of which said steam-supplying means communicates, and a regulable blow-out connection with said steam-chamber.

13. An injector-burner comprising a body having series of alternate oil and steam ways, a steam-chamber communicating into said steamways, in combination with means for supplying steam to said steam-chamber, and oil to said oilways, a screen in said steam-chamber, a regulable blow-out connection with

said steam-chamber, said body provided with
a steam-discharge slot into which said steam-
ways communicate and with an oil-discharge
slot into which said oilways communicate,
5 said oil-discharge slot arranged to discharge
across the plane of discharge from said steam-
discharge slot.

In testimony whereof I have hereunto set
my hand, at Los Angeles, California, this 21st
day of November, 1904.

LOUIS K. LEAHY.

In presence of—

FREDERICK S. LYON,
JULIA TOWNSEND.