

(No Model.)

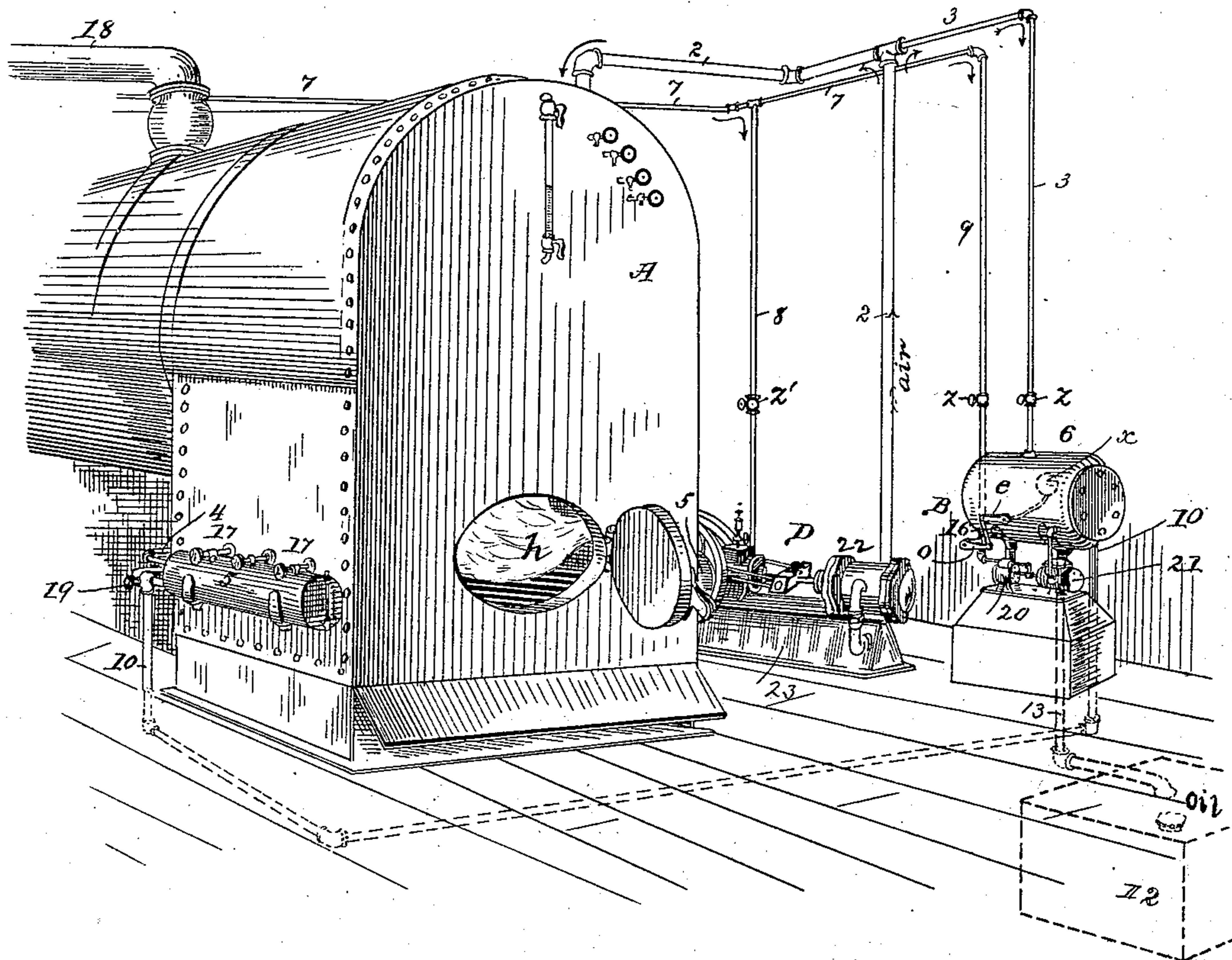
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APPARATUS FOR BURNING HYDROCARBONS AS FUEL.

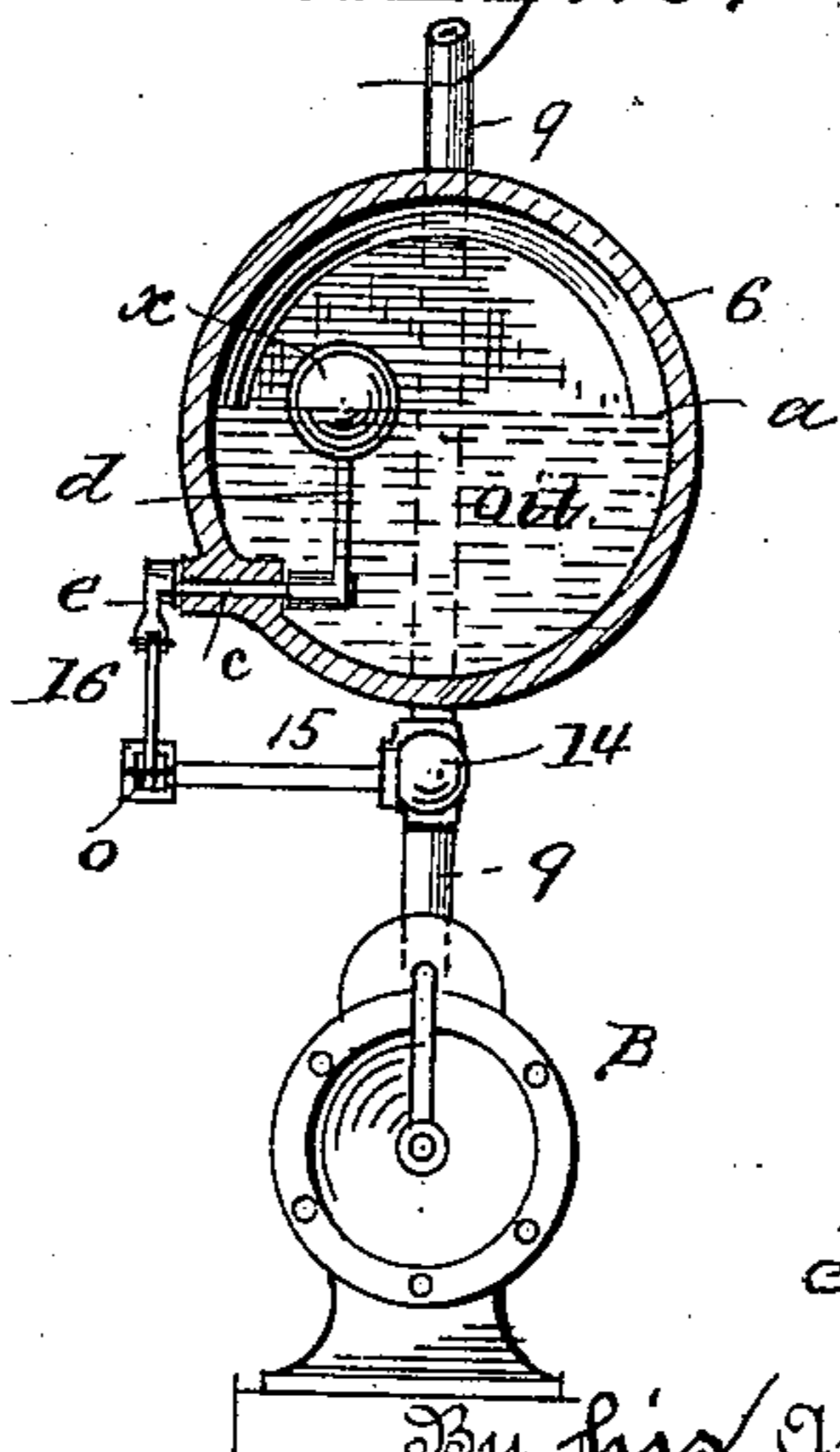
No. 407,638.

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*Fig. 1.*



*Fig. 2.*



Witnesses

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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR BURNING HYDROCARBONS AS FUEL.

SPECIFICATION forming part of Letters Patent No. 407,638, dated July 23, 1889.

Application filed February 6, 1888. Serial No. 263,128. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES H. BULLARD, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Apparatus for Burning Hydrocarbons as Fuel, of which the following is a specification.

This invention relates to apparatus for burning hydrocarbons as fuel, the object being to provide an improved hydrocarbon-burning system in which said hydrocarbons are introduced to the combustion-chamber in conjunction with air under pressure; and the invention consists in the peculiar construction and arrangement of the below-described operating devices, all as hereinafter fully described, and pointed out in the claims.

In the drawings forming part of this specification, Figure 1 is a perspective view of a portion of a steam-boiler having applied thereto and connected therewith apparatus for burning hydrocarbons embodying my improvements. Fig. 2 is an end elevation of the oil-pump, showing the oil-tank thereon in vertical section.

The within-described improvements relate, principally, to means for controlling the oil-supply for hydrocarbon-burners of the class in which the hydrocarbon is introduced through said burners to the furnace or place of combustion in connection with air under pressure, whereby the supply of the hydrocarbon to the burners is caused to be uniform, and the devices required are very considerably simplified.

In the drawings, A indicates a boiler of the usual locomotive type, having a burner and oil-tank 5 attached to the opposite outer sides of the fire-box thereof. Said tanks 5 each consist of a hollow cylinder, having connected therewith one or more hydrocarbon-burners 17, one end of which extends into openings through the side of the fire-box of the boiler, and the opposite end thereof communicates with an air-space and with hydrocarbon contained in said tanks, in the manner substantially shown and described in my patent, No. 365,789, dated July 5, 1887. A regulated and constant supply of hydrocar-

bon is furnished to said burner-tanks, whereby they are kept partially filled while the said burners are in operation, by means of an oil-pump B, having a connection, by means of a suction-pipe 13, with an oil-reservoir 12, said pipe and reservoir being shown in dotted lines in Fig. 1. The said oil-reservoir is located, preferably, in the ground in convenient proximity to the oil-pump, in order that it may be supplied by gravity from oil-tank cars or from tank-carts. An oil-conducting pipe 10 conveys oil from said pump to the burner-tanks, as shown, said pipe 10 being run, preferably, beneath the floor of the boiler-room, as shown, and rising therefrom near the rear side of the fire-box of the boiler, and extending behind said fire-box and having a connection with one end of each burner-tank, in the manner shown in Fig. 1. A stop-valve 19 is connected in the oil-pipe 10 near each burner-tank, in order to provide means for cutting off the supply of oil thereto at will. The said oil-pump consists of a steam-cylinder 20, having a connection with the boiler A by the steam-pipe 9 and a pump-cylinder 21, said steam-pumping devices being substantially those embodied in the well-known Knowles pump.

Heretofore in hydrocarbon-burning systems similar to that herein shown it has been customary to employ an oil-reservoir (in addition to the said main reservoir 12) located in or near the boiler-room, into which oil is pumped, and from whence it flows by gravity into the burner-tanks, but possessing no automatic means for regulating the supply of oil to said tanks, whereby it is maintained at a certain level therein, said regulated supply being essential to the delivery of a uniform quantity of oil to the burners, whereby waste is avoided and a uniform fire is produced.

To avoid the inconveniences above enumerated, and to automatically govern the action of the oil-pump, so that it shall draw oil as needed and supply the same to said burner-tanks, the below-described devices are connected with said pump. Suitable vertical supports, as shown, are fixed over said cylinders of the pump, on which is placed an oil-tank 6, into which said pumping-cylinder 21 deliv-

ers oil, which is drawn from said reservoir 12, and said pipe 10, which conveys oil to the burner-tanks 5, has one end connected with the tank 6. In practice the oil-pump B is so  
 5 set as to bring the said tank 6 to substantially the same level as the burner-tanks 5, in order that oil may flow from said tank 6 to the tanks 5, and that a uniform oil-level may be maintained therein, which level is about as shown  
 10 at *a*, Fig. 2. Said oil-tank 6 is provided with a passage through one side thereof, in which is inserted a spindle *c*, which is capable of a free rocking movement therein, and to the inner end thereof is secured one end of an  
 15 arm or lever *d*, (see Fig. 2 and the dotted-line indication in Fig. 1,) and to the free end of said lever is fixed a hollow metal sphere *x*, constituting what is commonly termed a "ball-float," which is floated on the oil in said tank,  
 20 and any variations of the level thereof cause a corresponding movement of said float and a rocking movement of said spindle *c*, on the outer end of which is secured the arm *e*.

A regulator-valve 14 is connected in said  
 25 steam-pipe 9, which supplies steam for running the oil-pump, and to the end of the spindle 15 thereof is secured an arm *o*, and the ends of the latter and of said arm *e* are connected by a link 16, so that the movements  
 30 of the arm *e*, induced by the movements of the float *x*, are communicated to the arm *o*, thereby rocking the spindle of the valve 14, and so regulating the flow of steam to the pump as to cause it to act when oil is required  
 35 in tank 6 to maintain the required level thereof in the burner-tanks, and to cease acting when the requisite amount of oil is carried into said tank.

The requisite air-supply for the oil-burning  
 40 apparatus is provided by an air-pump D, of any suitable construction, which may be run by steam from the boiler A or by connection with running machinery. In this case the  
 45 air-pump shown indicates one run by steam supplied thereto by the pipe 8, which has one end connected with the steam-cylinder of the pump, and its opposite end is connected with the steam-pipe 7, which is connected with said  
 50 boiler. The air-pumping cylinder 22 of the air-pump is connected with the hollow base 23 of the latter, and an air-conducting pipe 2 leads from said base to and is connected with one of the burner-tanks 5, and a branch 4 (see  
 55 Fig. 1) leads from said pipe 2 to the other burner-tank. A branch air-pipe 3 is connected with said pipe 2 and with the tank 6 on the oil-pump. Stop-valves *z z* are placed in said  
 60 pipes 9 and 3, and a like valve *z'* is placed in the steam-pipe 8.

From the above description it is seen that the hydrocarbon-burning system herein referred to consists of a boiler and a furnace; one or more burner-tanks located near said  
 65 furnace; one or more burners attached to said tank or tanks and arranged to inject commingled oil and air thereinto; an oil-pump driven by steam, having an oil-tank thereon

or near the same, having pipe communication with the pumping-cylinder of said pump and with said burner-tanks, a ball-float within  
 70 said oil-tank, and regulating devices connected therewith, whereby the action of the oil-pump is governed and the supply of oil for the burners is regulated, and an air-pump having pipe communication with said oil and  
 75 burner tanks, whereby an equal air-pressure is maintained in all of said tanks.

The operation of the within-described improved system for burning hydrocarbon for fuel is as follows: There being sufficient steam  
 80 in the boiler to run the air and the oil pumps, both of the latter are set in operation by opening the stop-valves in the steam-pipes connected therewith, and should the oil in the tank 6 be below the required level, whereby  
 85 the ball-float *x* is permitted to swing downward and open the regulator-valve 14, the oil-pump will start and run until it shall have pumped sufficient oil from the reservoir 12 to bring the oil in said tank 6 and in the burner-  
 90 tanks 5 to the proper corresponding level, when said ball-float will rise and operate the valve 14 to shut off the steam and stop the pump. Meanwhile the air-pump continues to operate, forcing air and oil together from  
 95 the burner-tanks through the burners 17 and through the side walls of the furnace of the boiler, and by placing any blazing substance into said furnace the atomized hydrocarbon therein becomes lighted, creating an intensely-  
 100 hot flame, which is indicated in said furnace by *h*. The equalization of the air-pressure in the tank 6 and in the burner-tanks by connecting the same to a common air-supply, as described, causes the oil contained in said  
 105 tanks to flow to a common level, and hence when there is a suitable oil-supply in tank 6 such supply will invariably be found in the burner-tanks 5; but when the oil-level in the tank 6 is drawn below its normal height the  
 110 oil-pump is caused to be set in motion automatically by the action of said ball-float and its connected devices, as above set forth.

What I claim as my invention is—

1. An apparatus for securing the combustion of hydrocarbons for fuel, consisting of a  
 115 burner-tank and one or more burners connected therewith and a pipe leading to said tank from an air-compressor, a steam oil-pump having a pipe for conveying steam thereto  
 120 and having therein a regulating-valve, an oil-tank connected by a pipe with said burner-tank and located at such a height relative to that of said burner-tank that a common oil-level may be maintained in each by the hy-  
 125 drostatic pressure of the oil, and a ball-cock in said oil-tank having a connection, as described, with said steam-pipe regulating-valve, substantially as described.

2. Apparatus for burning hydrocarbons for  
 130 fuel, consisting of one or more burner-tanks, one or more burners attached to each of said tanks, combined with an oil-pump actuated by steam, having an oil-tank connected there-

with supplied by said pump and connected  
with said burner-tanks by an oil-pipe, a steam-  
pipe conveying steam to said pump, a regu-  
lating-valve in said steam-pipe, and a ball-  
5 float in said oil-tank having a connection, as  
described, with said regulating-valve, and an  
air-pump having air-pipe connections with

said burner-tanks and with said oil-tank, sub-  
stantially as set forth.

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