(No Model.) 2 Sheets—Sheet 1.

J. H. BULLARD.

APPARATUS FOR BURNING HYDROCARBONS.

No. 463,854. Patented Nov. 24, 1891.

Fig. 2.

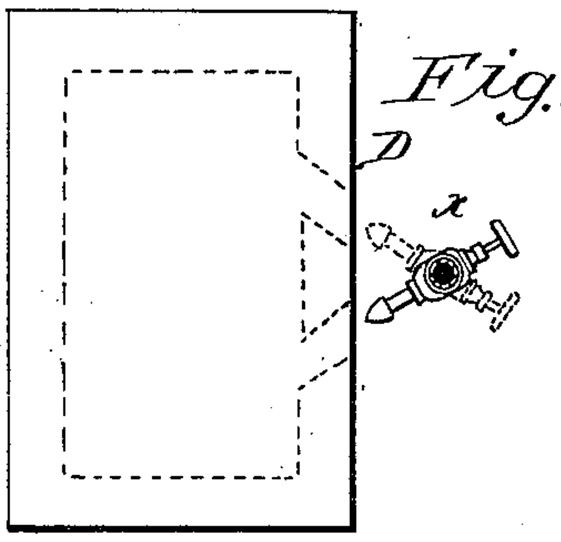


Fig. 1.

Fig. 3.

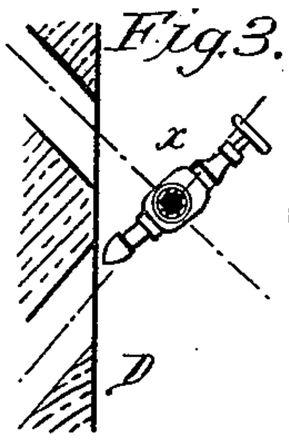
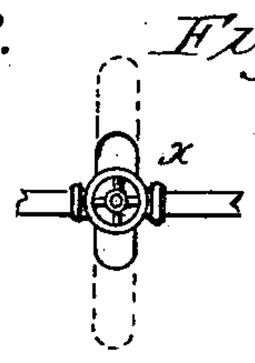
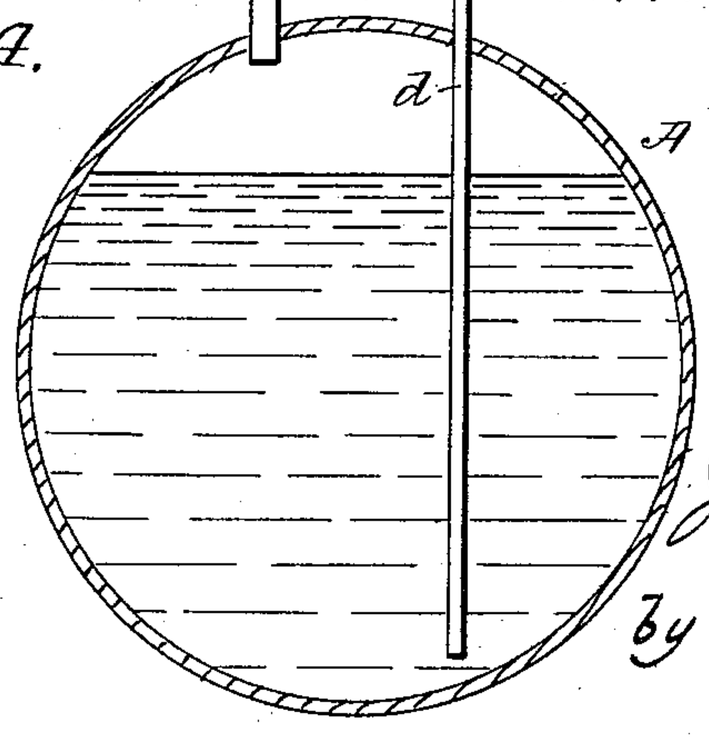


Fig. 4.





Witnesses
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(No Model.) 2 Sheets—Sheet 2.

J. H. BULLARD.

APPARATUS FOR BURNING HYDROCARBONS.

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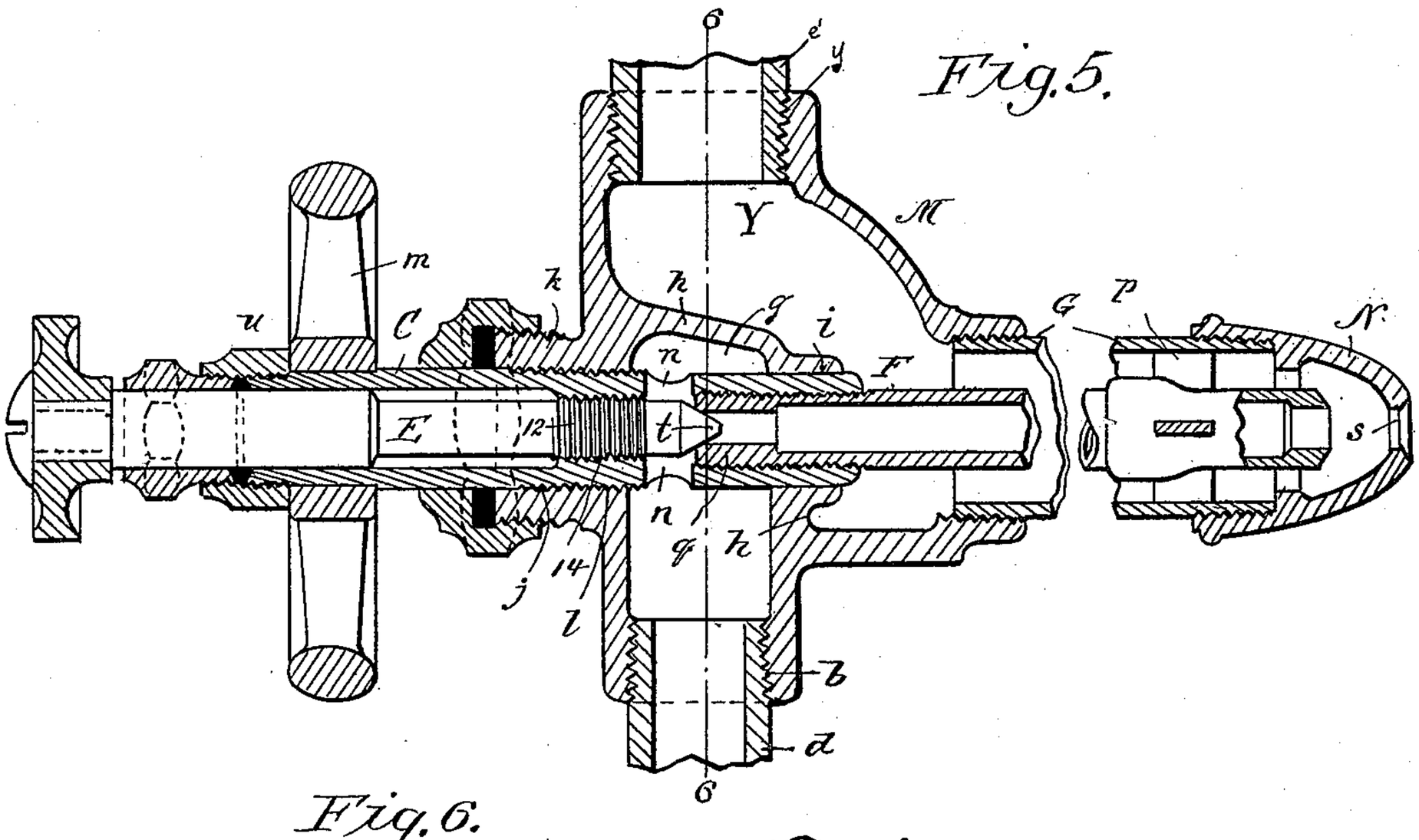

Fig. 5.

Fig. 6.

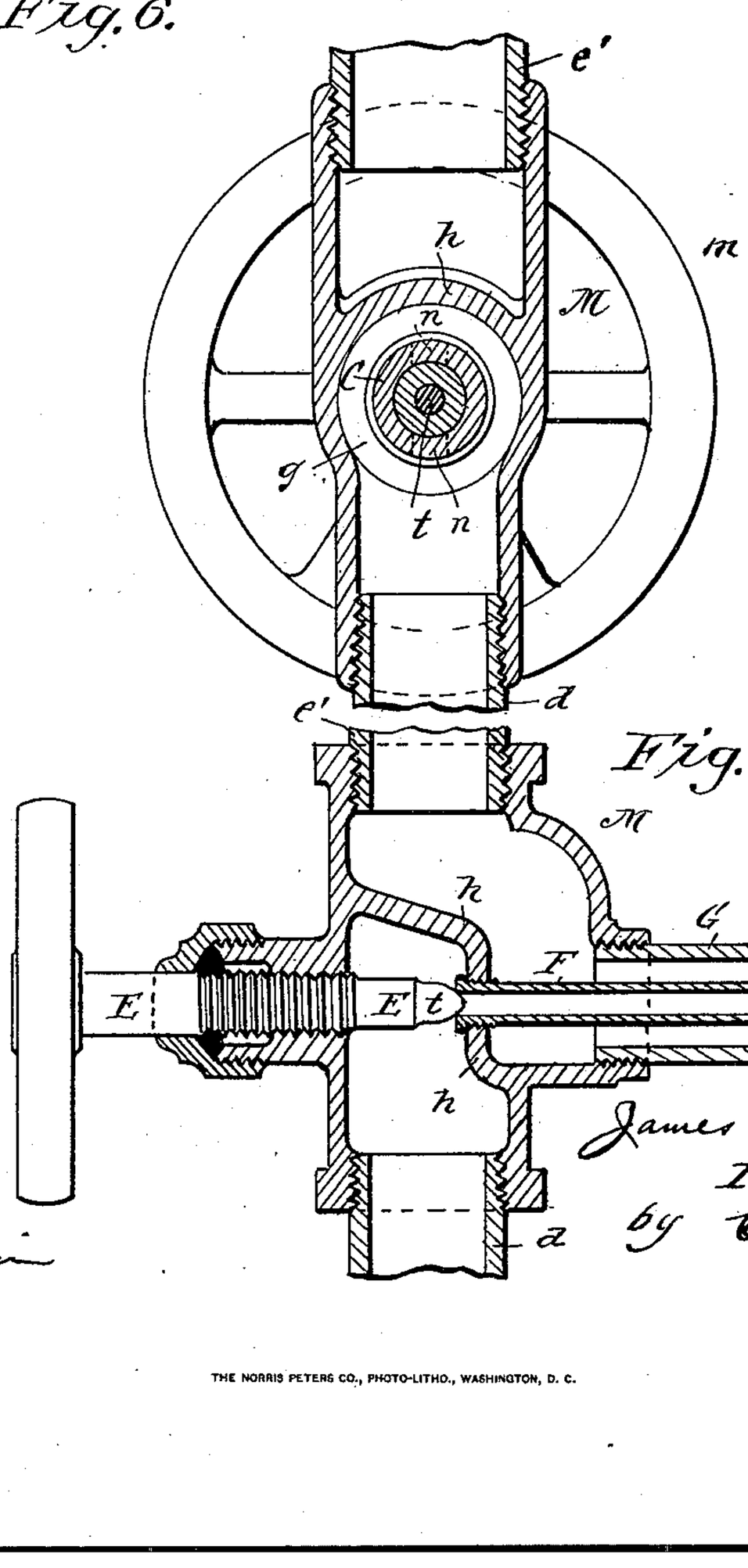

Fig. 7.

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UNITED STATES PATENT OFFICE.

JAMES H. BULLARD, OF SPRINGFIELD, MASSACHUSETTS.

APPARATUS FOR BURNING HYDROCARBONS.

SPECIFICATION forming part of Letters Patent No. 463,854, dated November 24, 1891.

Application filed March 31, 1890. Serial No. 345,964. (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 Hydrocarbon, of which the following is a specification.

This invention has for its object to provide a new and improved apparatus for burning liquid hydrocarbon in conjunction with air under pressure, whereby a gang of hydrocarbon-injector burners arranged at different levels are susceptible of being employed to heat a series of furnaces located on different floors of a building in such manner that the furnaces may be heated to different degrees of temperature through the medium of a single air-compressor and an oil storage or service tank, while the burners, with their oil-supplying pipes, will be effectually drained when the action of the apparatus ceases, for the purpose of rendering the system safe, reliable, effective, and economical, and fulfilling all the conditions for safety required by insurance companies on property where oil-burning systems are used.

To accomplish this object my invention involves the features of construction and the novel combination or arrangement of devices hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a sectional elevation of an oil-burning apparatus embodying my invention. Fig. 2 is a plan view of one of the furnaces and a hydrocarbon-injector burner adjustably arranged in proximity thereto for deflecting the flame in different directions in a horizontal plane. Fig. 3 is a detail sectional view showing a burner arranged to deflect the flame in different directions in a vertical plane. Fig. 4 is a projection of Fig. 3 in a plane at right angles thereto. Fig. 5 is a longitudinal sectional view of a hydrocarbon-injector burner especially adapted for use in my improved apparatus. Fig. 6 is a sectional view taken on the line 6 6, Fig. 5; and Fig. 7 is a longitudinal sectional view showing a modified construction of burner.

In order to enable those skilled in the art to make and use my invention, I will now describe the same in detail, referring to the drawings, wherein—

The letters *x* indicate a gang of hydrocarbon-injector burners arranged at different levels or heights, for heating a corresponding number of furnaces D, which are located on different floors of a building. The burners are each composed of a casing M, having at its upper side an air-inlet opening *y* and at its lower side an oil-inlet opening *b*. The air-inlet opening is extended forwardly and communicates with an air-pipe G, having a contracted nozzle N, provided with a small aperture *s* in its apex. The oil-inlet opening *b* communicates with a chamber *g* in the burner-casing and is separated from the air-opening *y* through the medium of a partition or wall *h*, having in its forward portion an orifice *i*, which is axially coincident with the forwardly-extending pipe G.

The burner-casing is provided in rear of the orifice *i* with an opening *j*, into which screws a tube C, having screw-threads *l* for this purpose. The forward portion of the tube C extends through the orifice *i*, and its rear portion is provided with a hand-wheel *m*, by which to rotate such tube. A tube F is screwed into the forward end of the tube C to constitute an axial extension thereof, and terminates in proximity to the aperture *s* of the nozzle N. That portion of the tube C which extends across the chamber *g* is formed with a series of oil-inlet orifices *n* for the flow of oil from such chamber into the forward portion of the tube, and in advance of the oil-inlet orifices *n* is arranged a tubular bushing *q*, screwed into the tube C and forming an axial continuation of the tube F. The rear extremity of the tubular bushing is formed with a valve-seat to receive the conical valve *t* on the end of a spindle E, which is screw-threaded, as at 12, into engagement with a screw-threaded portion 14, formed on the interior of the tube C, so that by turning the spindle E through the medium of its handle or knob such spindle is adjusted longitudinally to open and close the valve *t* or to adjust it to suit the conditions required. By turning the tube C it will be adjusted longitudinally, and consequently the tube F and spindle E will also be adjusted longitudinally, so that the forward extremity of the tube F can be moved

to and from the aperture *s* in the nozzle N for the purpose of regulating the flow of air to the nozzle-aperture.

In Fig. 7 a modified construction of burner is exhibited, and it is composed, essentially, of a burner-casing M, a pipe G, having a nozzle N, an oil-conducting pipe F, supported by a partition *h*, and a valve-spindle E, having a conical valve *t* for controlling the flow of oil to the pipe F.

The oil storage or service tank A is located at some low place, usually underground, and preferably outside of the building, and the oil is supplied to this tank to such a level as to provide an air-chamber in the top portion of the tank. An oil-delivery pipe *d* leads from the bottom portion of the tank, and at a point above the latter the oil-delivery pipe is provided with a gang of oil-distributing branches *d' d''*, of different length, which connect, respectively, with the oil-inlet openings at the lower sides of the hydrocarbon-injector burners, located at different levels, as before explained. The oil-distributing branches *d' d''* are each provided with a cock or valve *f*, for controlling the flow of oil to the burners, so that the supply of oil to any burner can be cut off without affecting the other burner or burners.

The air compressor or pump B, of any construction suitable for the conditions required, is located in a suitable position on the lower floor of the building or at some other point, and from this air-compressor rises an air-delivery pipe *e*, having a gang of air-distributing branches *e' e'''*, which connect, respectively, with the air-inlet openings in the upper sides of the hydrocarbon-injector burners *x* for the purpose of supplying the burners with air under pressure. The air-delivery pipe *e* of the air compressor or pump is also provided with a vertical air-pipe *e''*, which terminates at its lower extremity in the air-chamber above the level of the oil in the storage or service-tank, in such manner that when the air compressor or pump is in action air will be forced through the system of air-pipes and not only supply the burners with the requisite amount of air under pressure, but also force the oil to ascend from the tank through the oil-delivery pipe *d* into the oil-distributing branches *d' d''*, for supplying the burners with the requisite quantity of oil under pressure.

The air-distributing branches *e' e'''* are each provided with a cock or valve *f''* for controlling the flow of air to the burners and enabling the supply of air to any one of the burners to be cut off without affecting the other burner or burners.

The oil-distributing branch *d''* is in practice, provided with a supplementary branch *d'''* for connecting with a hydrocarbon-injector burner at a higher level, and likewise the air-distributing branch *e'''* is provided with a supplementary branch for connecting with a hydrocarbon-injector burner at a higher level, so that any desired number of burners can be arranged above the different floors of a building; but inasmuch as the operation of all is identical the description of a pair of burners at different levels is sufficient to enable my invention to be clearly understood.

In practice the air-pressure maintained by the air compressor or pump B is such as to force the oil from the storage or service tank to a point above the highest burner in the system, and the burners are variously regulated according to the character of the work to be performed by properly manipulating the burner-valves.

The construction above described is simple, efficient, economical, and effective, and enables the burners and furnaces to be located on different floors of a building, while all the burners are supplied with oil and air under pressure through the medium of a single service-tank and a single air compressor or pump, all having capabilities for such regulation of the issue of oil and air in conjunction that either similar or widely-different intensities of fire may be afforded to the various furnaces.

The special vertical arrangement of oil-distributing branches is important, in that they not only feed the burners, but when the air-pressure ceases the oil will flow back through the oil-distributing branches into the service-tank, whereby such oil-distributing branches serve to drain the burners of all oil when the system is not in action.

The burners are preferably so coupled to the oil and air distributing branches that the burners are susceptible of being moved in a horizontal plane to direct the flame in different directions, as indicated by Fig. 2, or the arrangement may be such that the burners can be adjusted to deflect the flame in different directions in a vertical plane, as indicated by Figs. 3 and 4.

It will be obvious that the flow of oil and air to the hydrocarbon-injector burners can be controlled at the will of the operator through the medium of the cocks or valves *f f'*, and that the capacity of the flame can be controlled by the burner-valves.

The gang of hydrocarbon-injector burners constructed and arranged as described is important in that it enables a series of furnaces on different floors of a building to be heated to different degrees of temperature as occasion may demand, and both the oil and air are supplied to the burners under pressure through the medium of a single air compressor or pump and a single storage or service tank.

The several furnaces can be heated by the one system to different degrees of temperature according to the work to be performed, so that the respective workmen can control the heat of their furnaces to meet the conditions required.

The special arrangement described and shown provides a force-feed system for the oil and air, whereby the objection to the gravity-feed system is entirely avoided, while the ver-

tical arrangement of the oil-distributing and burner-draining branches effectually and thoroughly drain the burners for the purpose of avoiding leakage of oil when the apparatus is not in operation and to carry back all surplus oil to the storage or service tank, thereby entirely avoiding the presence of any considerable quantity of oil in the pipe system when the apparatus is inactive. These features of arrangement are important in that they meet all the conditions required for safety by insurance companies on property employing oil-burning systems.

The arrangement of the parts comprising the plant is such as to materially simplify its construction and arrangement and render the same economical, while providing for safety, reliability, and effectiveness.

By the action of the air compressor or pump the air in the air-chamber above the oil in the storage or service tank becomes compressed to the degree required for forcing the oil into and through the oil-distributing branches to the burners, air in proportionate quantities being also supplied through the air-distributing branches to the burners for the proper working of the apparatus.

The invention provides a single plant for burning hydrocarbon fuel which is capable of being extended to the various floors of a factory, all of the burners being capable of regulation to the proper degree and all being supplied with air under pressure by the same air-compressor which forces the oil from the service-tank. Any one of the burners is capable of being cut out at the will of the operator without in any way affecting the operation of any other burner or burners, and all of the oil-distributing branches are so arranged in conjunction with the service-tank that a complete drainage is insured back to the service-tank at the end of a day's work.

I am aware that burners arranged at different levels have been supplied with oil from oil-reservoirs located at different levels and having communication with an air compressor or pump; but such is not claimed by me.

I am also aware that a burner has been connected by a pipe with an oil-tank and the air-chamber of an air-compressor, which also communicates with the oil-tank in such manner as to force the oil to the burner and at the same time supply the requisite quantity of air thereto; but such I do not broadly claim.

Having thus described my invention, what I claim is—

The combination, with an oil-service tank and an air-compressor, of a gang of hydrocarbon-injector burners located at different levels or heights above the oil-service tank, an oil-delivery pipe leading from the bottom portion of the service-tank and having a gang of vertical oil distributing and draining branches of different lengths connected, respectively, with the lower sides of the injector-burners and each provided with a cock or valve, an air-delivery pipe leading from the air-compressor and having a gang of air-distributing branches projecting to and connected, respectively, with the upper sides of the injector-burners and each provided with a cock or valve, and an air-pipe leading from the air-delivery pipe and terminating above the oil-level in the service-tank, the whole organized and arranged for conjoint action, substantially as and for the purposes described.

JAMES H. BULLARD.

Witnesses:
H. A. CHAPIN,
WM. S. BELLOWS.