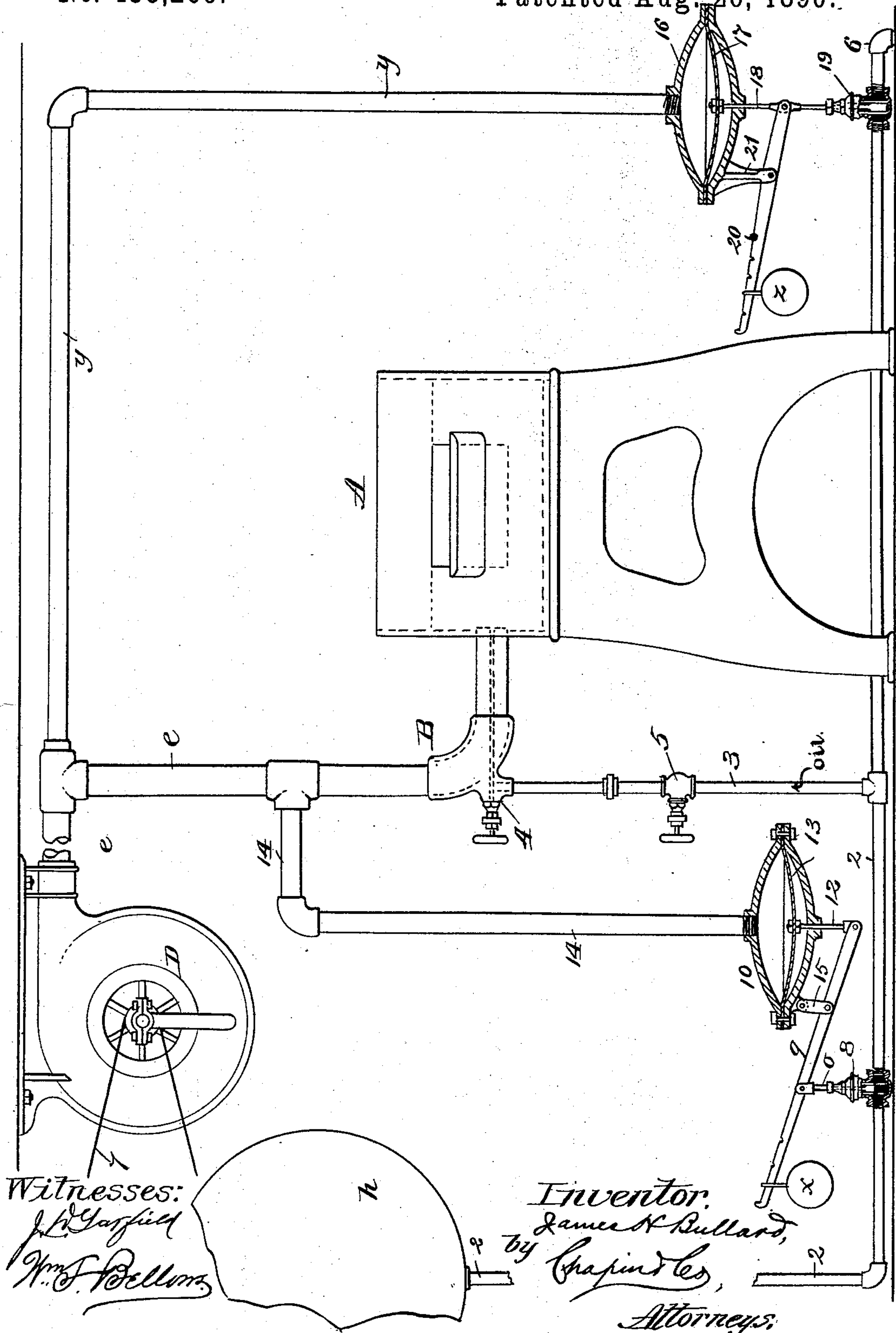


(No Model.)

J. H. BULLARD.
APPARATUS FOR BURNING HYDROCARBONS.

No. 435,269.

Patented Aug. 26, 1890.



UNITED STATES PATENT OFFICE.

JAMES HERBERT BULLARD, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR
TO THE AERATED FUEL COMPANY, OF SAME PLACE.

APPARATUS FOR BURNING HYDROCARBONS.

SPECIFICATION forming part of Letters Patent No. 435,269, dated August 26, 1890.

Application filed October 3, 1889. Serial No. 325,917. (No model.)

To all whom it may concern:

Be it known that I, JAMES HERBERT 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, of which the following is a specification.

This invention relates to apparatus for burning hydrocarbon as fuel, the object being to provide in such apparatus improved means for automatically stopping the flow of oil from the storage-tank to the burner or burners and for draining the oil from the parts of the system or apparatus directly connected with the burner when the air-pressure under which the burner operates ceases, to the end that said parts of the system from which the oil is shut off and drained shall contain no oil that can cause any accidental fire when the air-pressure devices are not in operation.

In the drawing forming part of this specification is illustrated in side elevation, partly in section, a hydrocarbon-burning apparatus constructed according to my invention.

In the drawing, A indicates a suitable furnace for heating iron or other material, having in communication therewith a hydrocarbon-burner B, of any of the well-known constructions which are adapted to burn a hydrocarbon in connection with compressed air, which is introduced thereto through a suitable pipe-connection with an air-compressing device.

D indicates a fan of any suitable well-known construction having an air-pipe *e* connected therewith and with the said burner B, whereby air under more or less pressure is supplied to and driven through the said burner into the forge A. A storage-tank *h*, for the reception of crude petroleum or other hydrocarbon, is located at any convenient place in proximity to the said burner and forge and at such height relative to said burner that the hydrocarbon contained therein may flow by gravity to and through said burner, said storage-tank having connected thereto a pipe 2, which serves as a conduit therefrom to convey oil to a burner or burners B, and with said conduit 2 a branch pipe

3 is connected, which communicates with a valve 4 on said burner, a stop-valve 5 being connected in said branch pipe 3. The said conduit 2 (a part of which near the storage-tank *h* is shown broken away) extends past said forge or other place where said burner or burners may be located, and at its extreme end or at some point therein a connection is made, as at 6, leading downward to form a drain-connection therefrom into any suitable drainage-tank located so far beneath said conduit that all of the contents thereof may be drained therefrom whenever a suitable valve to permit it shall be opened. For the purpose of supplying compressed air to the pipe *e*, and thence to said burner, said fan D may be employed; or instead thereof, if preferred, any suitable air-pump may be used. The said fan is driven by a belt in the usual way, a portion of which 7 is shown in the drawing. The above-referred-to means for automatically shutting off the flow of oil from the storage-tank *h* to said burner, when from any cause there is a cessation of the supply of compressed air thereto, consists of the following instrumentalities: An air-pipe 14 is connected with said air-pipe *e*, and has connected thereto, as shown, a diaphragm-governor 10, provided with a flexible diaphragm 13, to which is connected a pending rod 12, which extends through the lower side of the case of said governor, and to the under side of said case near its border is pivoted by one end a link 15, which serves as a fulcrum to which a lever 9 is pivoted, one end of said lever being pivotally connected with said post 12. A gate-valve 8 is placed in said oil-conduit 2, having a gate therein attached to a spindle *o*, which is pivotally connected with said lever 9, and between said spindle-connection and the free end of said lever is hung a weight *x*. The gate of said valve 8 is shown in the drawing in a raised or open position, whereby oil is permitted to flow freely from the tank *h* through the conduit 2 and the branch 3 to the burner B, and the lever 9 and the diaphragm of the governor occupy corresponding positions, these being those which they occupy when the fan D or other air-compressing device is operating to supply

compressed air to the burner through the pipe *e* and through said branch pipe 14 to the diaphragm-governor 10, said air-pressure serving to depress the diaphragm 13 of said governor, thereby swinging the free end of the lever 9 upward and causing it to lift and maintain the gate of said valve 8 in said open position so long as said air-pressure is exerted against the upper side of said diaphragm 13; but should said air-pressure cease from any cause, be it by the stoppage of the air-compressing device or some stoppage in the air-pipes, whereby the oil which is supplied to the burner cannot receive its requisite admixture of air to produce proper combustion of the hydrocarbon, or should a person in charge of the burners fail to shut off the oil-supply thereto by the valve 5 in the branch pipe 3 after the stoppage of the machinery whereby the air-compressor is operated, then, by reason of the absence of said air-pressure from the upper side of the diaphragm in said governor, the weight *x* on lever 9 will draw said lever downward, and with it the gate of the valve 8, and shut off said oil-supply through the conduit 2.

The above-described means for automatically shutting off the supply of oil to hydrocarbon-burners obviates the danger of conflagrations in places where hydrocarbon is used as a fuel by permitting oil to flow into the fires or heated forges after the air-pressure has ceased to act, thereby inevitably causing large quantities of crude petroleum to be burned, and oftentimes with disastrous results.

In order to provide a complete protection in oil-burning systems against fires which may accidentally occur from the presence of large quantities of petroleum in and around the burners and pipes thereof after working-hours and when the usual supervision is not exercised thereover, provision is made for the automatic operation of a valve or gate in said supply-conduit 2, which shall open and allow said conduit to be completely drained, as aforesaid, when the said gate of the valve 8 shall be closed, and to accomplish this result a second diaphragm-governor 16 is connected with the air-pipe *e* by a branch *y*, to the diaphragm 17 of which a rod 18 is connected, which is connected directly to or is a part of the gate-spindle of a second gate-valve 19, so that when air-pressure is exerted upon the pipes *e* and *y* said diaphragm 17 is by said pressure deflected, as shown, and acts directly upon the gate of the valve 19 to shut it, this being the position of said gate when the burner B is in operation,

as above described, the said deflection of the diaphragm 17 and the downward motion of the rod 18 serving to swing upward the free end of a lever 20, which is pivoted to an arm 21 on the case of the governor 16 and pivotally connected by one end to said rod 18, and at the same time lifting a weight *z* on said lever 20. When, however, the air-pressure ceases, as before described, letting the gate of valve 8 be shut by the action of the weight *x* on lever 9, the same conditions of air-pressure result in permitting the diaphragm 17 to rise in the valve-case, and the action of the weight *z* on the lever 20 causes the spindle 18 and the gate of the valve 19 to be lifted substantially simultaneously with the downward motion of the gate of the valve 8, and therefore at the same time that the oil is shut off from flowing through the conduit 2 to the burner or burners the gate of the valve 19 is lifted, opening a free discharge from said conduit and all of the pipes connected thereto for all of the oil that may be contained therein through the connection at 6 or other suitable place in said conduit into any suitable drainage-tank below the level of said conduit. The said weights *x* and *z* on levers 9 and 20 may be adjusted at different positions thereon to act suitably under varying air-pressures.

In practice, employing six ounces of air-pressure per square inch, the lifting-power on a diaphragm of six inches diameter is equal to about ten pounds, so that it is obvious that with a moderate pressure of air the gate and lever devices above described may be effectually operated, for the purposes set forth.

What I claim as my invention is—

In an apparatus for burning hydrocarbon, the combination of a burner, a device for supplying air under pressure to said burner, an air-conduit between said air-supplying device and burner, a tank for hydrocarbon, a pipe 2, through which hydrocarbon flows from said tank to said burner, two stop-valves 8 and 19, connected in said pipe 2, two diaphragm-governors 10 and 16, each having a weighted lever-connection, substantially as described, with said stop-valves, and branch pipes connecting said air-conduit with said governors, whereby the action of air-pressure on the diaphragms of said governors causes a reverse action of said valves, substantially as and for the purpose set forth.

JAMES HERBERT BULLARD.

Witnesses:

WM. S. BELLOWS,
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