

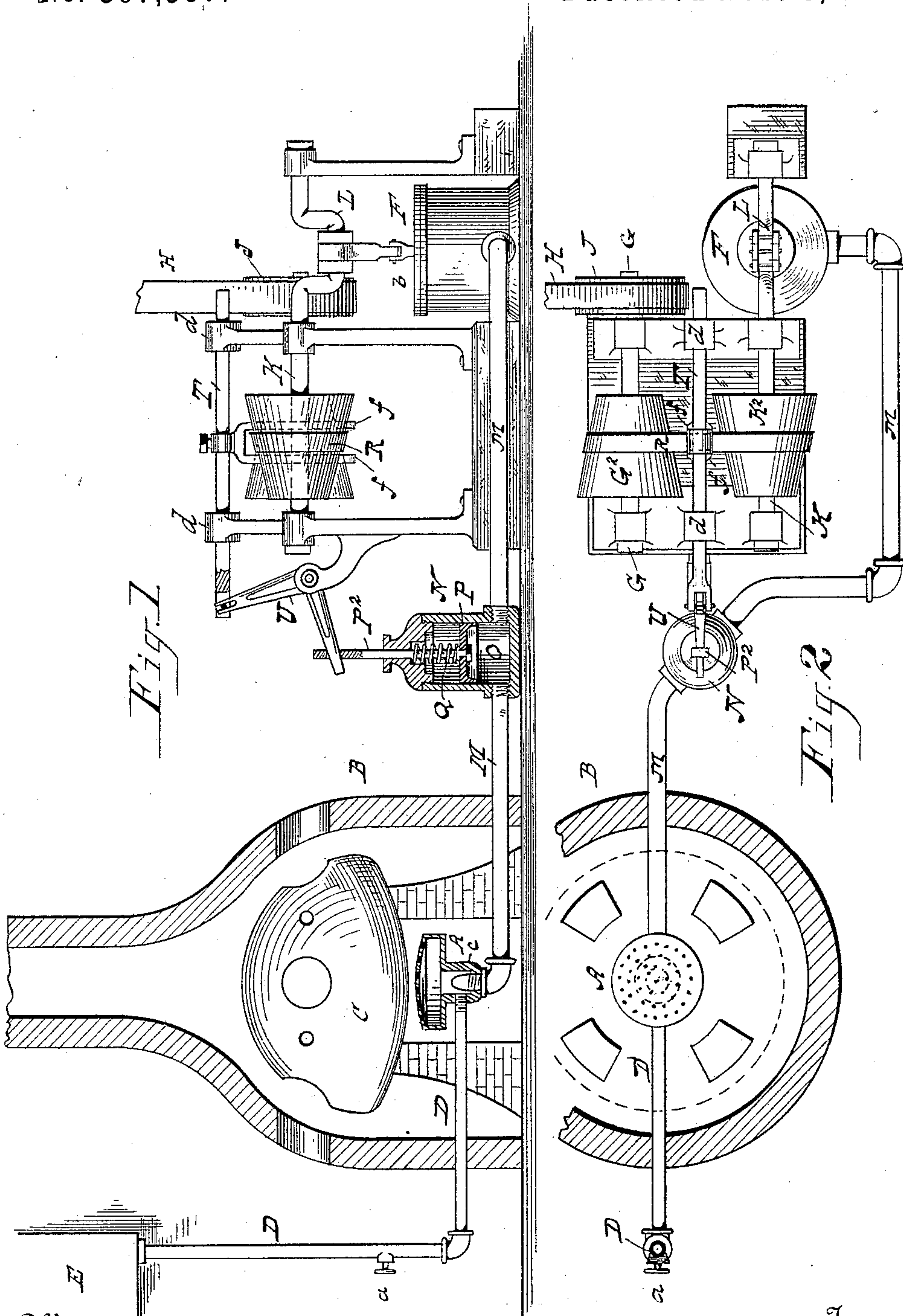
(No Model.)

J. H. BULLARD.

APPARATUS FOR BURNING HYDROCARBONS.

No. 397,337.

Patented Feb. 5, 1889.



Witnesses

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# UNITED STATES PATENT OFFICE.

JAMES H. BULLARD, OF SPRINGFIELD, MASSACHUSETTS.

## APPARATUS FOR BURNING HYDROCARBONS.

SPECIFICATION forming part of Letter's Patent No. 397,337, dated February 5, 1889.

Application filed December 21, 1887. Serial No. 258,580. (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, of which the following is a specification.

This invention relates to an apparatus for securing and regulating the combustion of liquid fuel in connection with suitable furnaces, and particularly to one in and by which air is introduced to the burner in conjunction with the hydrocarbon, the object whereof being especially to secure a controlling and regulation of the air-supply to said burner; and it consists in the combination and arrangement of the various parts of the apparatus, all substantially as will be hereinafter more fully described, and set forth in the claims.

In the accompanying sheet of drawings, Figure 1 represents the apparatus of the present invention in partial side elevation and central vertical section as applied in relation to a glass-heating furnace and its glass-melting crucible, and Fig. 2 is a plan view of Fig. 1.

In the drawings, A represents a burner of any suitable shape, in the present instance of a form especially applicable for use in relation to a glass-heating furnace, B, and the melting vessel or crucible C, and shown as consisting of a circular casing or chamber, perforated at its upper side and being provided at its under side with a suitable fitting, c, with which an oil-supply pipe, D, leading from a suitable oil-tank, E, is connected, said oil-pipe at an intermediate portion thereof being provided with a cock, a, for regulating the passage and supply of the oil to the burner.

F represents an air-pump, of any desirable construction, provided with a reciprocating piston-rod, b, and mechanism is provided for operating said air-pump, (here shown as consisting of a main shaft, G, driven by belt H and pulley J, a counter-shaft, K, arranged parallel with said driving-shaft, and cone-pulleys G<sup>2</sup> K<sup>2</sup>, fixed on said shafts, connected by a belt, R, said counter-shaft being provided with a crank, L, connected by a pitman-rod with the piston-rod of the air-pump.)

M represents an air-pipe leading from said air-pump to and connected with the burner A at its fitting c, and at an intermediate position of said air-pipe M is located and secured a pressure-regulator, N, the main chamber O of which is in communication with the air-pipe M, a reciprocating piston, P, playing vertically therein, with and against a spiral spring, Q, its piston-rod P<sup>2</sup> being upwardly projected.

T represents a shaft arranged between and slightly above the shafts G K, adapted to slide longitudinally in suitable bearings, d; therefor, having secured thereon downwardly-extended branched arms f f, embracing the transverse belt between the cone-pulleys.

A bell-crank lever, U, hung in suitable bearings therefor, is interposed between one end of said belt-shifting shaft T and the outer end of said regulator piston-rod. Under the rotation of the driving-shaft and the consequent operation of the air-pump, should the air-supply and pressure thereof from said pump to the burner be too great for proper combustion and sufficient to raise the piston of the regulator against its spring properly adjusted therefor, through the bell-crank lever, the belt-shifter is moved to carry the belt to a position on the cone-pulley of the driving-shaft of less circumference, and to a position on the cone-pulley of the counter-shaft of greater circumference, thereby retarding the operation of the pump-plunger and diminishing the air-pressure, all as is plain.

While a particular arrangement of belt and pulleys and of a belt-shifting device has been particularly shown and described, the invention is not to be limited thereto, as other forms of belts and pulleys and of belt-shifting devices therefor may be employed, if desired, in conjunction with an air-pump and in relation to and to be effected by the reciprocating piston-rod of the regulator for the air-pipe.

What I claim as my invention is—

1. An apparatus for securing and regulating the combustion of liquid fuel, comprising a hydrocarbon-burner, a liquid-fuel tank, a pipe connecting said tank and burner, an air-pump, a driving-shaft, and intervening movable driving-connections between said driving-



shaft and said air-pump capable of variable speed, a pipe connecting said air-pump and burner, and a regulator in communication with said air-pipe having a reciprocating piston-rod, and a connection between said regulator piston-rod and said movable driving-connections between said driving-shaft and air-pump, substantially as and for the purpose described.

10 2. An apparatus for securing and regulating the combustion of liquid fuel, comprising a hydrocarbon-burner, a liquid-fuel tank, a pipe connecting said tank and burner, an air-pump, a driving-shaft provided with a cone-pulley, a counter-shaft connected with said  
15 air-pump, having a cone-pulley, a belt connecting said cone-pulleys, a pipe connecting said air-pump and burner, and a regulator in communication with said air-pipe, having a reciprocating piston-rod, and a connection between  
20 said regulator piston-rod and the belt connecting said cone-pulleys, substantially as and for the purpose described.

3. An apparatus for securing and regulating the combustion of liquid fuel, comprising 25 a hydrocarbon-burner, a liquid-fuel tank, a pipe connecting said tank and burner, an air-pump, a driving-shaft provided with a cone-pulley, a counter-shaft connected with said air-pump, having a cone-pulley, a belt connecting  
30 said cone-pulleys, and a shaft, T, capable of sliding longitudinally, provided with the belt embracing and shifting arms *f f*, a pipe connecting said air-pump and burner, and a regulator in communication with said  
35 air-pipe, having a reciprocating piston-rod, P<sup>2</sup>, and a pivoted bell-crank lever by its one end engaging said regulator piston-rod and by its other end engaging said sliding shaft T, substantially as and for the purpose described.

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Witnesses:

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