

No. 646,399.

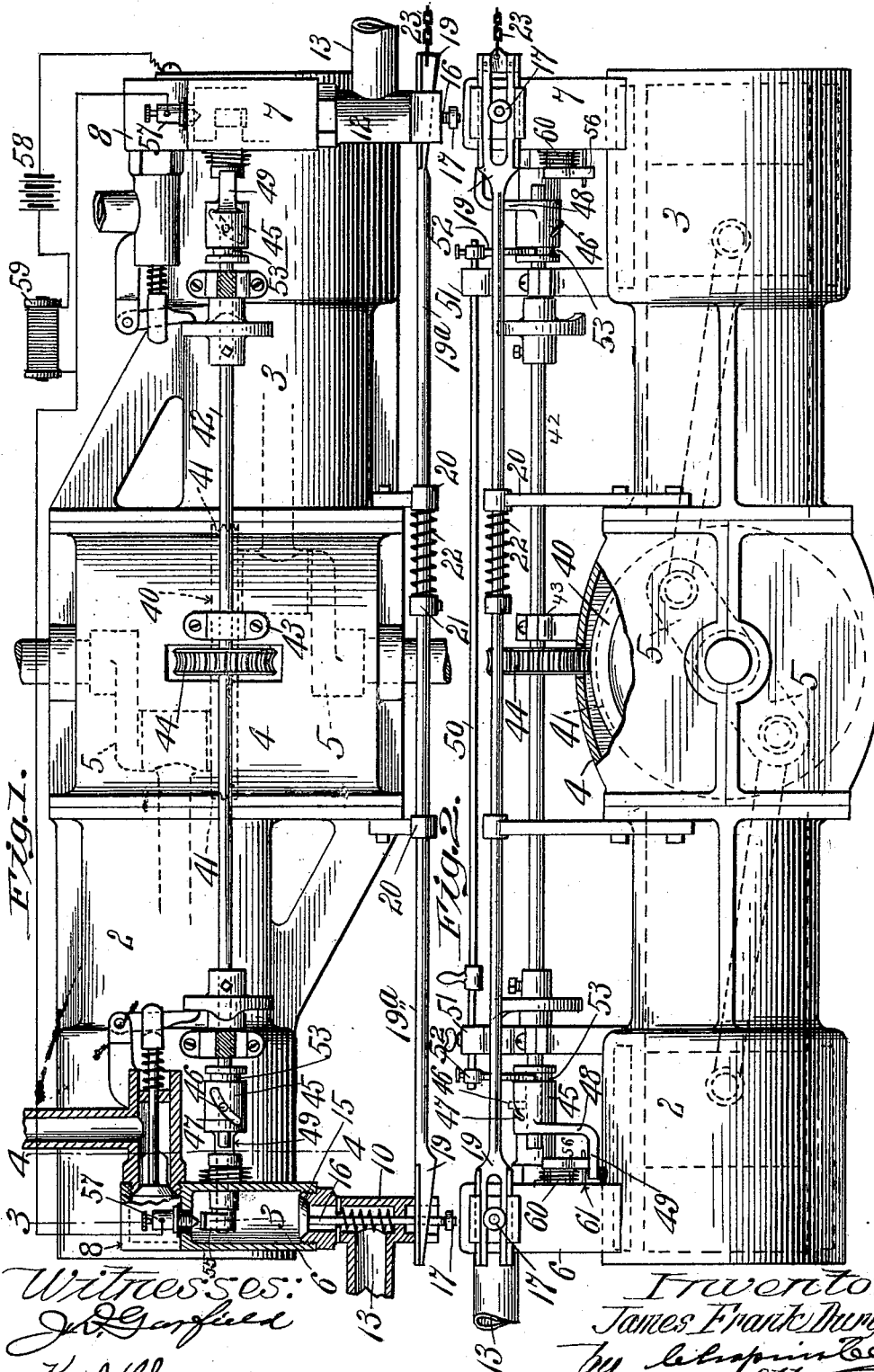
Patented Mar. 27, 1900.

J. F. DURYEA.  
EXPLOSIVE ENGINE.

(Application filed Sept. 19, 1898.)

(No Model.)

2 Sheets—Sheet 1.



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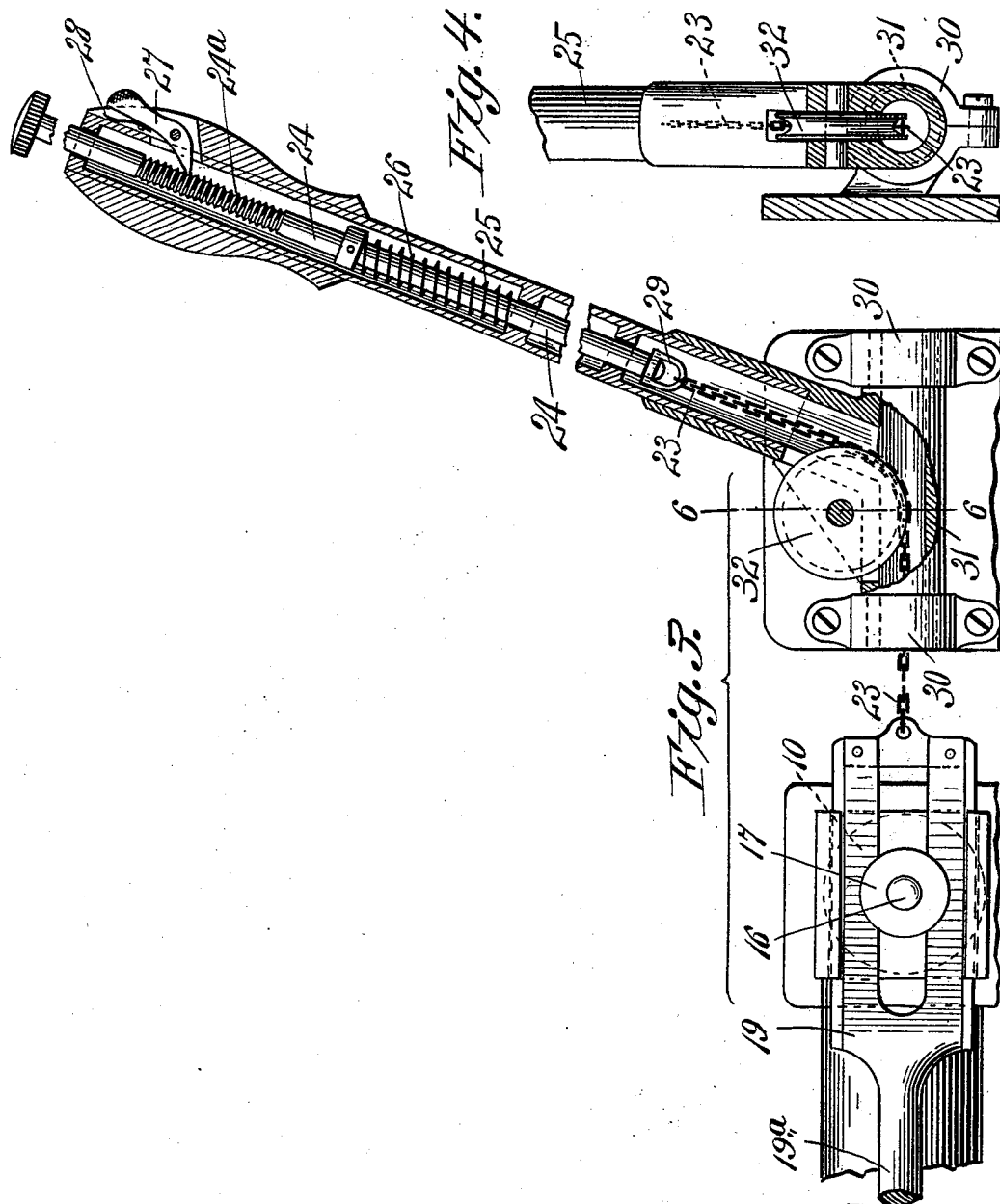
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(No Model.)

2 Sheets—Sheet 2.



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# UNITED STATES PATENT OFFICE.

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## EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 646,399, dated March 27, 1900.

Application filed September 19, 1898. Serial No. 691,309. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES FRANK DURYEA, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Explosive-Engines, of which the following is a specification.

This invention relates to hydrocarbon or other explosive gas engines, and has for its object the improvement in the construction of mechanism for controlling the degree of opening which is permitted to the inlet-valves through which the explosive charge is drawn into the cylinders by the movement of the pistons, and which mechanism may be actuated at will by the operator in charge of the engine, and which, in a measure, takes the place of a governor; and the invention consists in the construction and arrangement of the various parts, all as hereinafter described, and particularly pointed out in the claims.

In the drawings forming part of this specification, Figure 1 is a plan view of a double-cylinder explosive-engine embodying my improvements, a part thereof being in section. Fig. 2 is a side elevation of Fig. 1, the sectional parts of that figure being shown in full elevation, taken on line 4 4, Fig. 1, looking to the left, and showing in dotted lines, in two positions, a part of the mechanism lying to the right of said line 4 4. Fig. 3 is an elevation, partly in section, of a controlling-lever containing means for operating the inlet-valve-regulating mechanism and shows one of said inlet-valves and part of the explosion-chamber of one cylinder of an engine and a flexible connection running from said controlling-lever to said valve-regulating mechanism. Fig. 4 is a sectional view on line 6 6, Fig. 3.

The drawings show the improvements forming the subject of this application applied to a double-cylinder explosive-engine of a well-known type, in which the cylinders 2 and 3 are offset horizontally and connected to a common casing 4, inclosing an ordinary double-throw crank 5, the pistons and piston-rods connected directly to the said cranks being shown only in dotted lines. (See Fig.

2.) This engine is of the type usually employed for the propulsion of motor vehicles and launches, hoisting-engines, &c., and it is in connection with this class of motors that the valve-regulating devices shown in Figs. 3 and 4 are commonly used. When the engine is employed for the purposes just mentioned, the controlling-lever shown in Fig. 3 is generally provided for shifting from one speed to another or for reversing the engine and applying the brake, &c., and for this reason the valve-regulating devices forming part of this invention have been shown in their proper relation to such controlling-lever, the latter usually being located at some distance from the engine.

Referring now to the drawings, the construction and operation of the valve-regulating mechanism will first be described.

On each of the cylinders 2 and 3 of the engine the explosion-chambers 6 and 7 are cast in the usual manner. In the construction shown herein the exhaust-chamber 8 is cast integral with said explosion-chamber and separated therefrom by the dividing-wall 9, each of said chambers communicating with the interior of the cylinders. Valve-bodies 10 and 12 are screwed into the chambers 6 and 7, respectively, said bodies being provided with inlets 13 for admitting an explosive gaseous mixture to the cylinders through a passage controlled by a valve 15, spring-held against its seat and adapted to open by suction from within the cylinder produced by the movements of the piston. This construction is common to engines of this class. Said valve 15 in each of the explosion-chambers 6 and 7 has a stem 16 projecting through the end of the valve-bodies 10 and 12 and provided with a nut 17 on the end thereof, which has a screw adjustment on said stem.

In the outer end of each of the valve-bodies and transverse to the axis of the valve-stems 16 grooves 18 (see Fig. 3) are cut, which serve as guide for a sliding wedge 19, formed on each end of a rod 19<sup>a</sup>, extending lengthwise of the engine and supported in suitable standards 20, cast on or secured to the cylinders in any convenient place and in which standards said rod has a sliding movement. Each of

said wedges is slotted lengthwise, the stems 16 of the valves lying in this slot, thus permitting free sliding movements to said wedges. Between one of said standards and a collar 5 21 on the rod 19<sup>a</sup> is a spiral spring 22, which serves to hold the wedges normally in such position that the thin ends thereof will lie under the nuts 17. When said wedges are in this position, the valves 15 may open to their 10 fullest extent. From one end of said rod 19<sup>a</sup> a chain or other flexible connection 23 extends to a plunger-rod 24, located in the tubular controlling-lever 25, (see Figs. 3 and 4,) and which rod is held pressed upward toward 15 the handle of the said lever by a spring 26, which is of sufficient strength to actuate the rod 19<sup>a</sup> in its supports and compress the spring 22. Said plunger-rod 24 extends beyond the handle end of the controlling-lever 20 25 and is provided with a suitable head. Said plunger-rod is screw-threaded at 24<sup>a</sup> within the handle end of the controlling-lever 25 for a distance slightly exceeding the throw of the rod 19<sup>a</sup>. A pawl 27 is pivoted in a slot in said 25 handle of the controlling-lever and a spring 28 holds the said pawl in engagement with the threads of the screw cut on said plunger-rod 24, said pawl being so supported that the plunger-rod may be pressed downward, but 30 holding said rod against upward movement. On the lower end of the plunger-rod a swivel 29 is provided, to which is connected the chain 23.

As regards the particular engine shown in 35 the drawings, the controlling-lever has no particular function save as a support for the plunger-rod; but to serve the purposes of its construction when used in connection with a vehicle, as described, wherein it is desirable to control the shifting of the speed mechanism interposed between the engine and 40 driving-shaft of such vehicle, said lever must have a swinging movement, and to that end is supported in suitable bearings 30 (see Fig. 5) on a hollow hub 31, the interior bore of which communicates with the interior of the tubular controlling-lever 25, and to provide for the proper functioning of the flexible connection or chain 23 during the swinging movement of said lever said connection is taken 50 axially through said hub 31 and swung over a guide-wheel 32, whose periphery is tangent to the center of both said hub 31 and said controlling-lever 25, whereby proper movements may be communicated from the plunger-rod 24 to the rod 19<sup>a</sup> in whatever position 55 said controlling-lever 25 may be temporarily placed. This construction is incidental only to the location of the plunger-rod 24 in the controlling-lever 25; but said rod may be placed in any position convenient to the hand of the operator of the engine and provided with the returning-spring 26 and the pawl-and-ratchet devices above described. The ratchet 65 is made in the form of a screw-thread, because it affords means for a fine adjustment

of the plunger-rod 24, if desired, the end of the pawl in engagement with the screw-threaded part serving as a nut, and after the speed of the engine has been approximately 70 determined by the vertical manipulation of the rod by pressure of the thumb on the end thereof said rod may be screwed up or down, as desired, for a finer regulation of that speed. When the plunger-rod 24 is pushed down, the 75 spring 26 is compressed, and the spring 22 on the rod 19<sup>a</sup> is released from restraint and pushes the wedges 19 under the nuts on the valve-stems of the inlet-valves, thus controlling the degree of their opening under the suction effect of the moving pistons in the cylinders. By pressing on the end of the plunger-rod 80 with the thumb and releasing the pawl 27 the spring 26, being of greater power than the spring 22, forces said plunger-rod upward and draws said rod 19<sup>a</sup> in the direction opposite to that in which it was moved by the opposite movement of the rod. The operator of the engine thus has at all times under his command 85 means for obtaining the maximum efficiency of his machine or any such part thereof that he may desire. 90

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is— 95

1. The combination with the inlet-valves of an explosive-engine, valve-stems thereon, and an adjustable nut on said valve-stems, of a wedge having a sliding movement transverse to said valve-stems whereby the operative 100 movements of said valves are arrested by the contact of said nut with said wedge; a plunger-rod and suitable support therefor, a spring for moving said rod in one direction, a pawl-and-ratchet device for holding said rod 105 in a fixed position relative to its support, and a connection extending from one end of said plunger-rod to one end of said wedge, substantially as described.

2. The combination with the inlet-valves of 110 a multiple-cylinder explosive-engine, valve-stems on said valves, and an adjustable nut on said valve-stems, of a movable member extending between said valves, wedges on said movable member whereby, by the contact of 115 the nuts on the stems of said valves with said wedges, each inlet-valve of said cylinders is permitted to have the same range of operative movement; a plunger-rod and suitable support therefor, a spring for moving said rod in 120 one direction, a pawl-and-ratchet device for holding said rod in a fixed position relative to its support, and a connection extending from one end of said plunger-rod to one end of said wedge, substantially as described. 125

3. The combination with the inlet-valves of an explosive-engine having oppositely-located cylinders, valve-stems on said valves, and an adjustable nut on said valve-stems, of a suitably-supported rod extending between the 130 valves on said cylinders, wedges on said rod located under the nut on said valve-stems,

said rod having a sliding movement transverse  
to the line of movement of said valve-stems,  
whereby the said adjustable nuts may, by  
coming in contact with said wedges, arrest  
5 the movements of said valves, means outside  
of the engine for moving said wedge-bearing  
rod independently of the movement of any

other part of the engine, in one direction, and  
a spring on said rod for moving it in the op-  
posite direction, substantially as described.

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