No. 775,243. PATENTED NOV. 15, 1904.

J. S. LOSCH.

EXPLOSIVE ENGINE.

APPLICATION FILED JAN. 19, 1904.

NO MODEL. 7 SHEETS—SHEET 1.

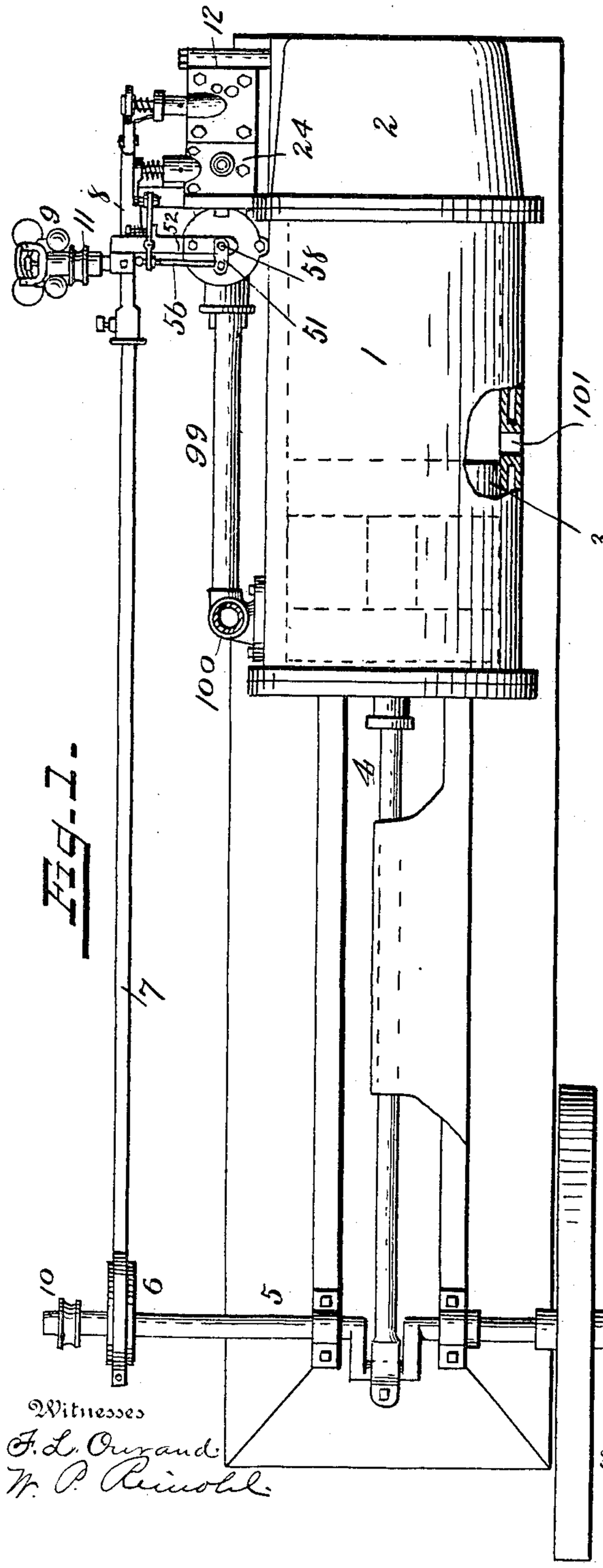

Fig. 1.

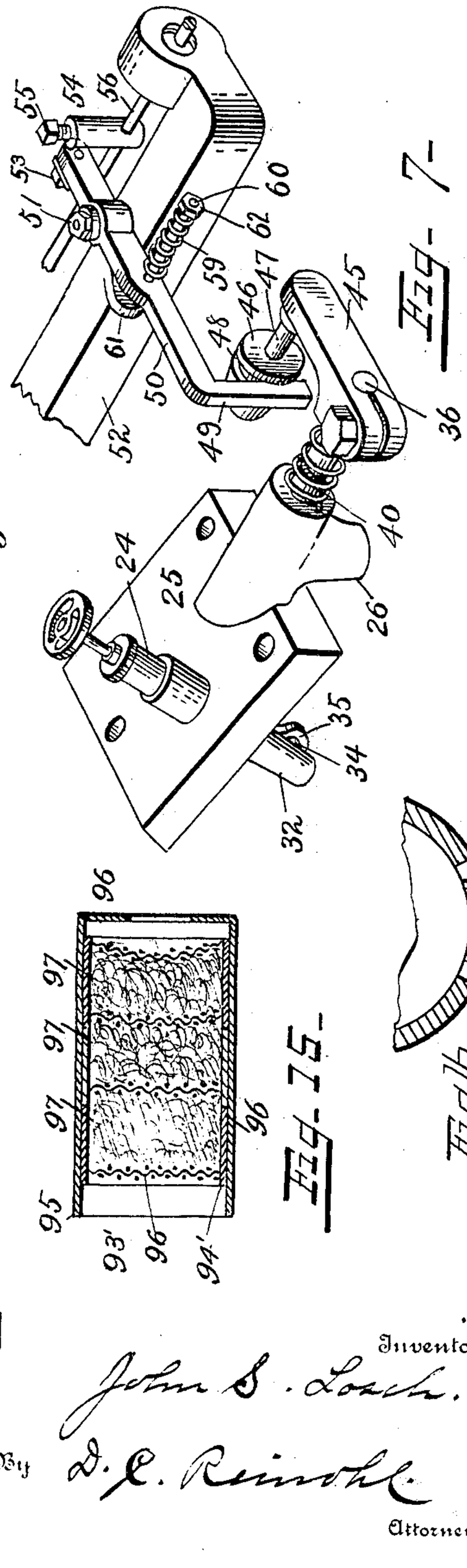

Fig. 7.

Fig. 15.

Fig. 16.

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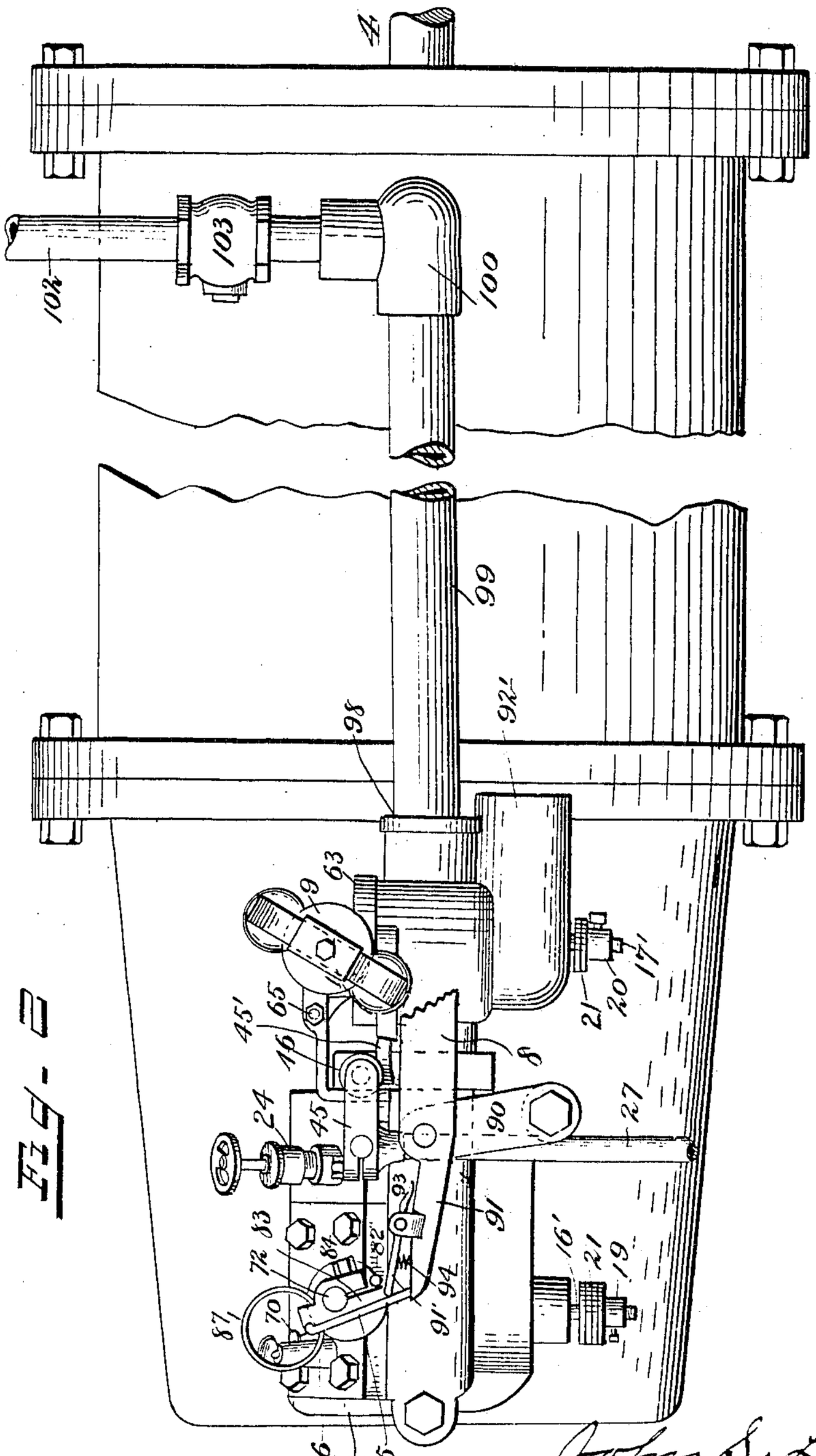
NO MODEL. 7 SHEETS—SHEET 2.



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NO MODEL. 7 SHEETS—SHEET 3.

FIG. 4.

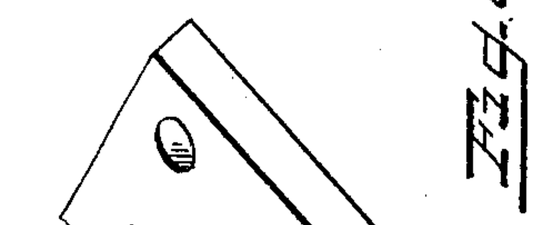

FIG. 7.

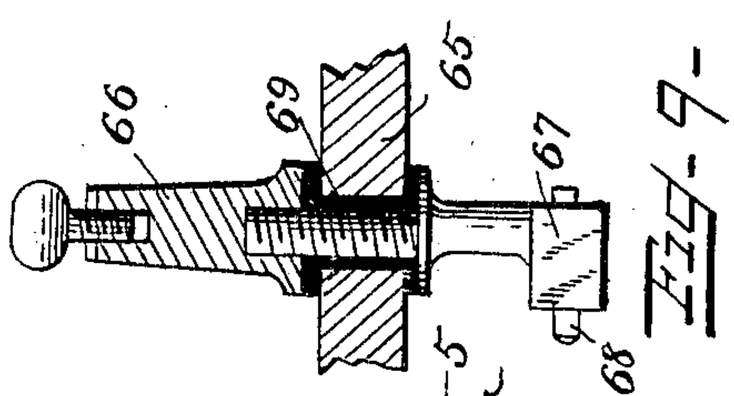

FIG. 3.

FIG. 13.

FIG. 12.

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NO MODEL. 7 SHEETS—SHEET 4.

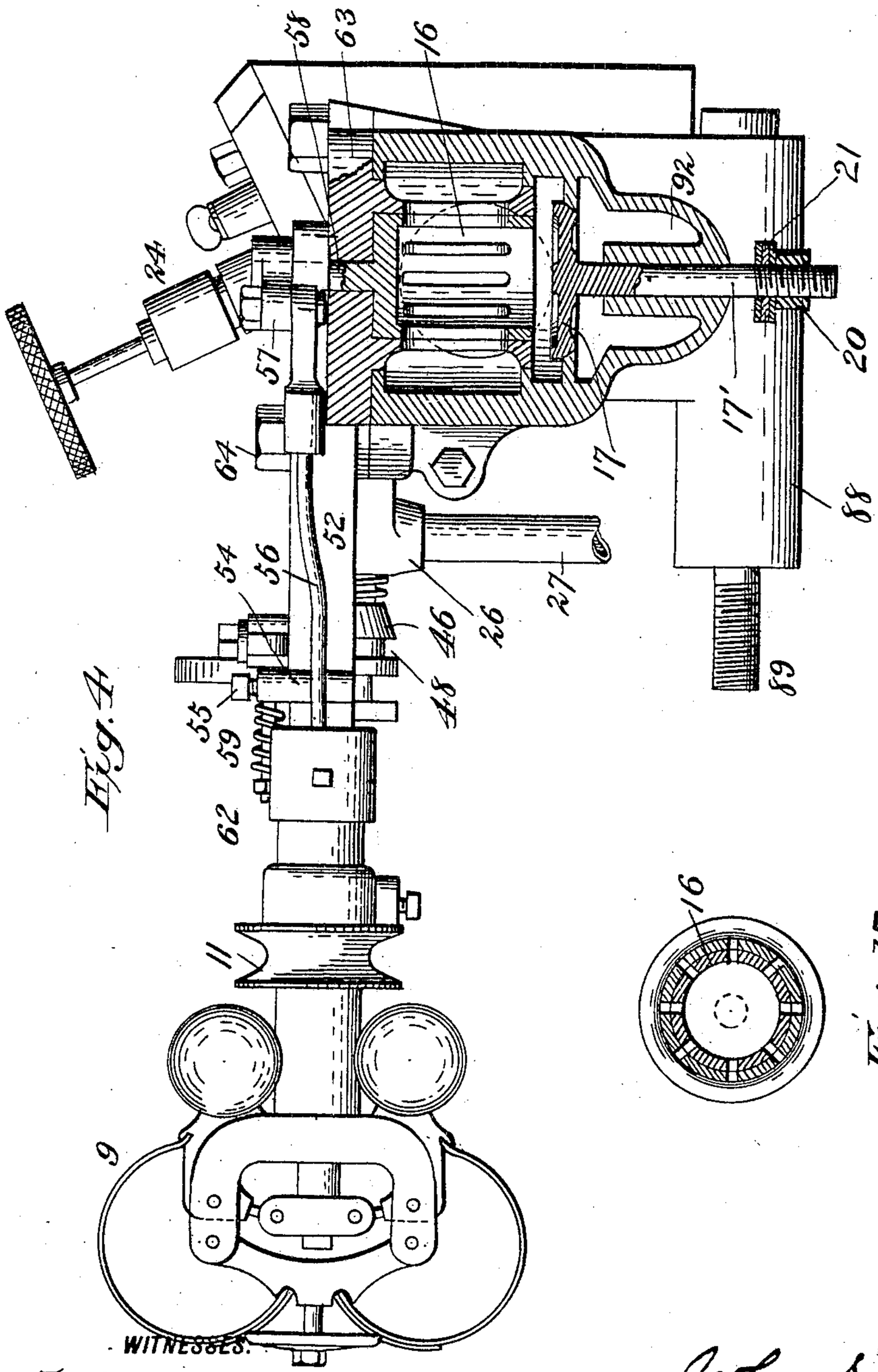

Fig. 4.

Fig. 17.

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NO MODEL. 7 SHEETS—SHEET 5.

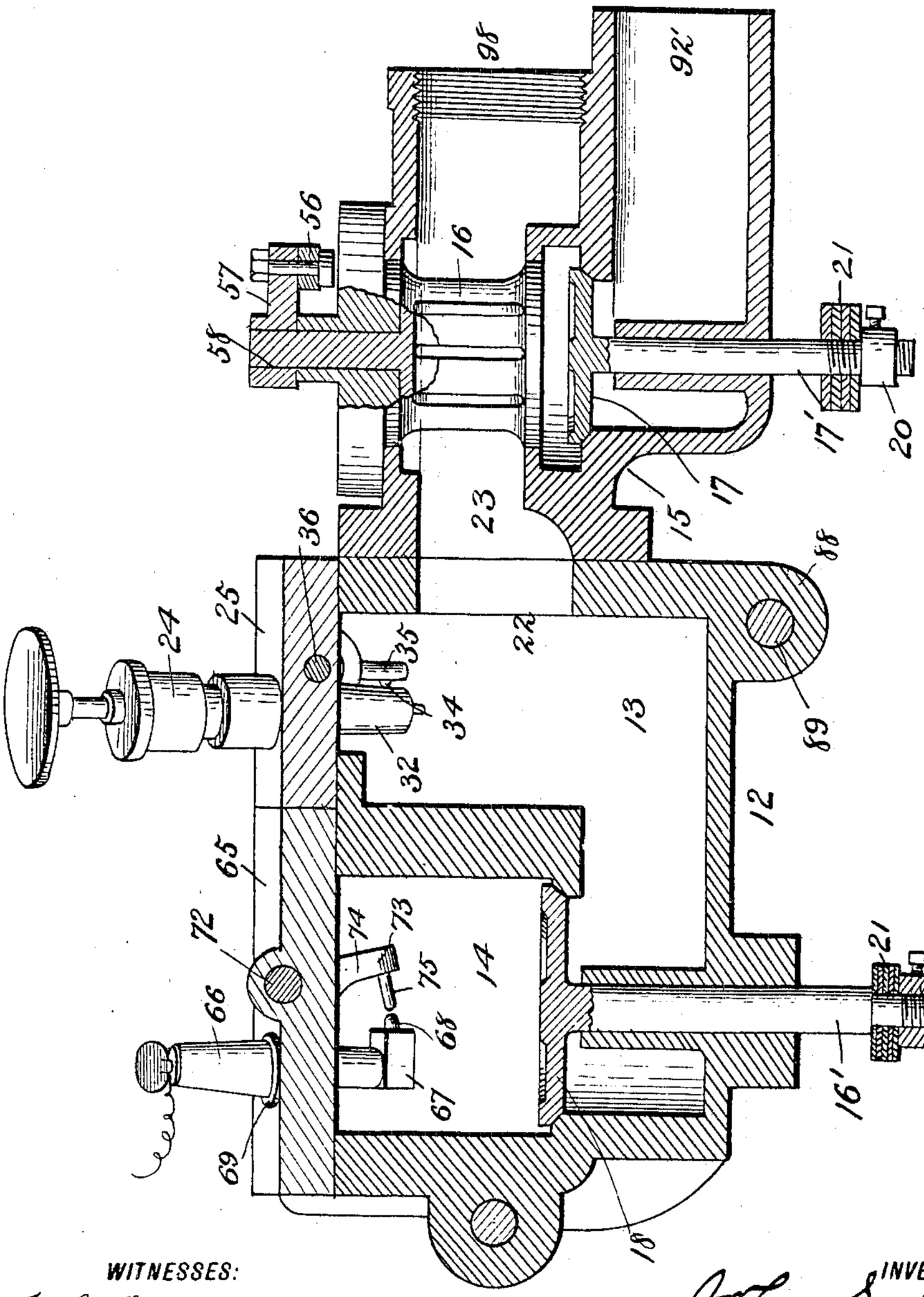

Fig. 5.

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APPLICATION FILED JAN. 19, 1904.

NO MODEL. 7 SHEETS—SHEET 6.

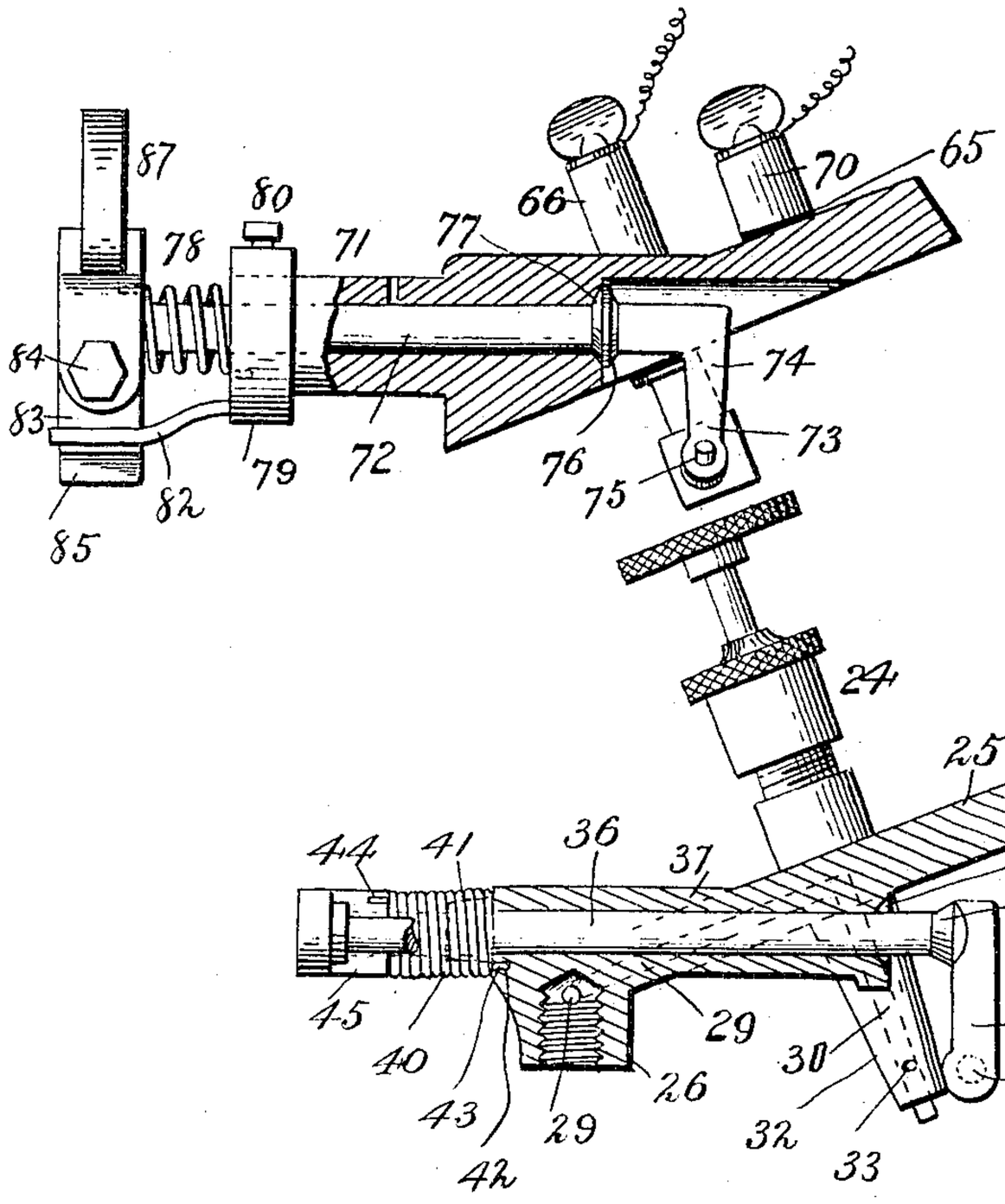

Fig. 8.

Fig. 10.

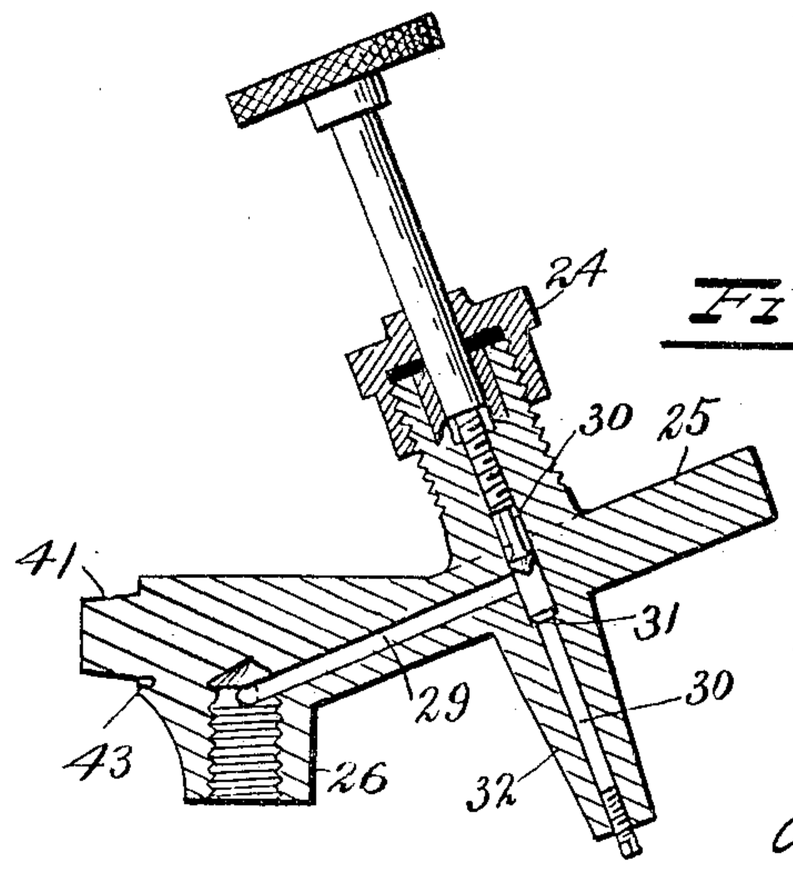

Fig. 11.

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APPLICATION FILED JAN. 19, 1904.

NO MODEL. 7 SHEETS—SHEET 7.

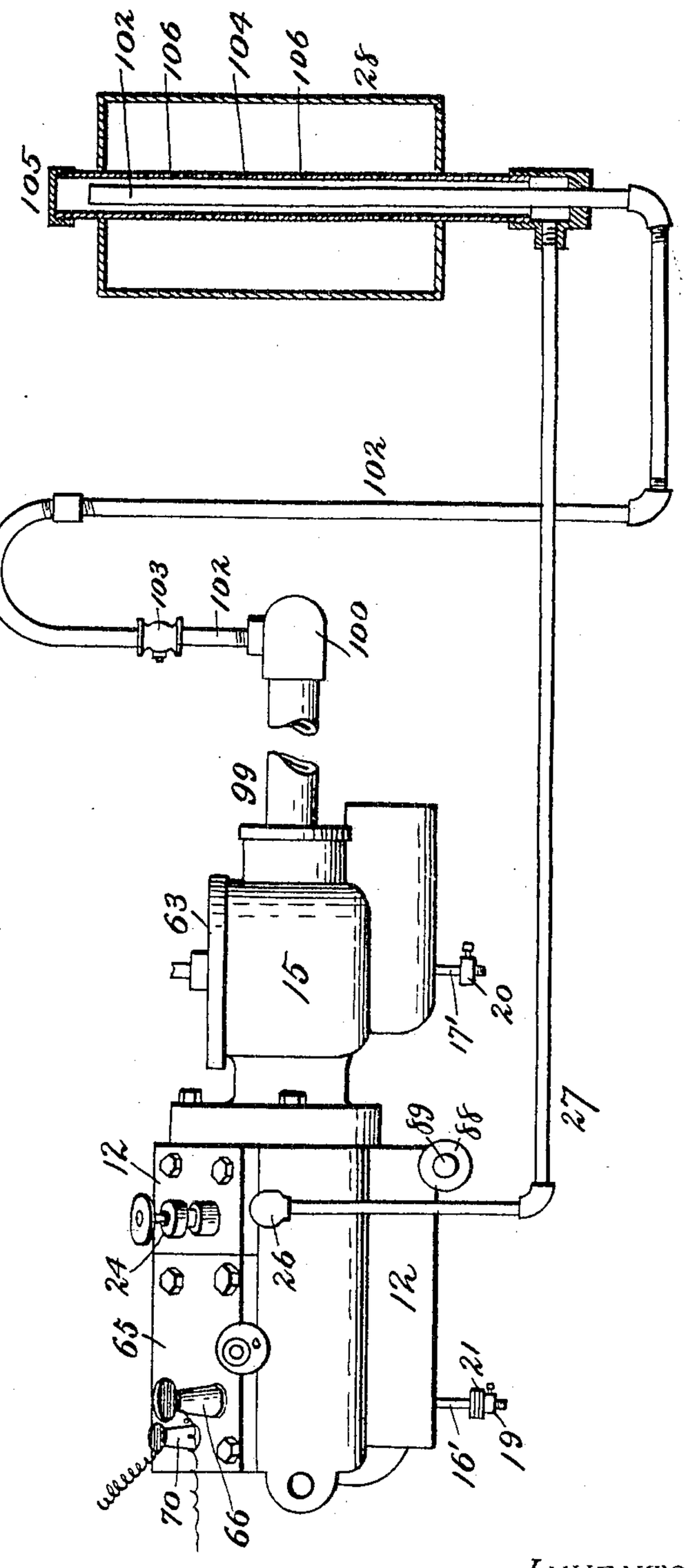

Fig. 14.

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No. 775,243. Patented November 15, 1904.

UNITED STATES PATENT OFFICE.

JOHN S. LOSCH, OF SCHUYLKILL HAVEN, PENNSYLVANIA.

EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 775,243, dated November 15, 1904.

Application filed January 19, 1904. Serial No. 189,695. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. LOSCH, a citizen of the United States, residing at Schuylkill Haven, in the county of Schuylkill and State of Pennsylvania, have invented certain new and useful Improvements in Explosive-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to explosive-engines in which an explosive mixture is produced from coal or refined petroleum oil or gas and atmospheric air admitted to the engine in proper proportions and in which the admission or supply of the oil and air is proportioned to and controlled by the work being done by the engine, so that there shall be an explosion in the cylinder at each cycle of the operation, but of varying power, as the load on the engine is increased or decreased.

The invention consists in certain improvements in construction, which will be fully disclosed in the following specification and claims.

In the accompanying drawings, which form part of this specification, Figure 1 represents a top plan view of my improved engine partly in section; Fig. 2, a side elevation, on an enlarged scale, showing the engine-cylinder and its operative parts at the end of the cylinder in which the explosion of the motor fluid is effected; Fig. 3, a top plan view showing the detachable carbureter, the governor, the governor-valve case, the fuel-mixing chamber, the ignition-chamber, and the operating parts thereof detached from the cylinder; Fig. 4, an end view of the same parts, showing the governor-valve in section on line 4 4, Fig. 3; Fig. 5, a vertical longitudinal section taken through the governor-valve, the mixing-chamber, and the ignition-chamber, on an enlarged scale, on line 5 5, Fig. 3; Fig. 6, a perspective view of the cover of the ignition-chamber detached, showing the shaft of the axially-movable electrode supported in the cover; Fig. 7, a perspective view of the cover of the mixing-chamber detached and part of the mechanism for operating the fuel or oil discharge valve; Fig. 8, a vertical transverse section of the cover of the ignition-chamber, showing the movable electrode and its operative parts in side elevation; Fig. 9, a detail, partly in section, showing part of the same cover and the fixed electrode in position thereon; Fig. 10, a vertical section of the cover of the mixing-chamber, showing the fuel-discharge valve in side elevation, with the valve-rod broken and the valve out of position to show the oil or fuel discharge port or orifice and the fuel-supply valve in side elevation; Fig. 11, a like view of said cover, taken through the oil or fuel passages and showing the oil-supply valve in side elevation; Fig. 12, a side elevation of the trip-arm, on an enlarged scale and detached from its actuating-rod; Fig. 13, a perspective view of the cam carried by the trip-arm; Fig. 14, a side elevation, partly in section, showing the connections between the engine and the fuel-supply tank, the chest being detached from the cylinder; Fig. 15, a vertical longitudinal section of the detachable carbureter for starting the engine; Fig. 16, a detail sectional view of the exhaust-port of the engine, and Fig. 17 a transverse section through the governor-valve.

Reference being had to the drawings and the designating characters thereon, 1 indicates the engine-cylinder; 2, a detachable head within which the explosion of the motor fluid is effected; 3, the piston; 4, the piston-rod; 5, the crank-shaft; 6, the eccentric; 7, the eccentric-rod; 8, an arm connected to and reciprocated by the eccentric-rod to operate the fuel-discharge valve and the movable electrode of the electrical igniter; 9, the governor, operated by a belt (not shown) driven by pulley 10 on shaft 5 and engaging pulley 11 on the governor.

On one side of the head 2 is a chest 12, in which is the mixing-chamber 13 (see Fig. 5) and the ignition-chamber 14, and to the front end of the chest is attached the governor-valve and air-supply-valve chest 15, communicating with the mixing-chamber through opening 22 and passage 23, the valves being designated, respectively, 16 and 17, (see Fig. 5,) and between the mixing-chamber and the ignition-chamber is a valve 18 for controlling the passage of the explosive mixture of fuel

and air from the former to the latter chamber and from which latter chamber the mixture flows into the cylinder-head 2.

The valve-stems 16′ and 17′ are provided with weights 19 and 20, and on the stems 16′ and 17′ are placed disks 21, of leather or like material, to form a cushion for the valve. These weights regulate the lift of the valves and the degree of pressure under which they rise and allow the air to enter the governor-valve case and the mixing-chamber and the explosive mixture under compression to enter the cylinder.

The atmospheric air admitted by the governor-valve 16 flows through pipe 99, fills the front end of the cylinder 1 during the return stroke of the piston, and also fills the mixing-chamber 13 through passage 23 and opening 22, and as the piston 3 makes its out or power stroke the air is compressed and transferred from the front end of the cylinder through said pipe 99 into the mixing-chamber, raises the valve 18, between the mixing-chamber and the ignition-chamber, and flows into the cylinder properly mixed with fuel and is compressed by the piston on its return stroke before the mixture is ignited.

The chamber 13 is supplied with fuel (hydrocarbon oil or gas, and preferably coal-oil of commerce) through a valve 24, formed in the cover 25 of the mixing-chamber 13, (see Figs. 10 and 11,) and on the cover is an internally-screw-threaded boss 26, to which connection is made by a pipe 27 with the fuel-tank 28 (see Fig. 14) for supplying fuel to the engine. From the interior of the boss 26 extends a port or passage 29 and communicates with a passage 30, in which is a valve-seat 31, below the passage 29, and at the inner end of passage 30, extending through the body 32, is a port 33 (shown in Fig. 10) and is controlled by a soft-metal discharge-valve 34 to discharge the fuel into the mixing-chamber 13 in a fine spray and where it is instantly converted into gas at each cycle of the engine.

The valve 34 is supported on an arm 35, which in turn is connected to a rod 36, supported in a bearing 37 in the cover 25, and is provided with a conical shoulder 38, which engages a conical seat 39 at the inner end of the bearing to prevent escape of the motor fluid around the rod. The shoulder 38 is held to its seat 39 by the tension of a coiled spring 40, which is supported at its inner end on a projection 41, and said inner end of the spring 40 is bent at 42 and engages a hole 43, while its outer end 44 engages an arm 45, Figs. 1, 2, 3, and 7, by which the valve 34 is operated through connections with the governor 9 to control the quantity of fuel supplied, according to the varying conditions of the load on the engine, by varying the time the valve is held from its seat or discharge-port 33. The valve is opened by a beveled cam 45′, longitudinally adjustable on the arm 8, attached to the eccentric-rod 7, with each stroke of the arm 8 in the direction of said valve.

By the construction and connections between the governor 9, the air-valve 16, and the oil or fuel discharge valve 34 it will be observed that the air and the fuel are controlled by the governor in varying quantities proportionate to the work done by the engine, the explosive mixture is maintained in the same relative proportions, and an explosion of the gaseous mixture is produced in each cycle of the operation of the engine.

On the arm 45 is a conical and cylindrical cam 46, loosely mounted on a pin 47, secured to said arm to move freely thereon, and in the cam is a concentric groove 48, which is engaged by an arm 49 of a lever 50, pivotally connected at 51 to the bracket 52, which supports the governor 9, Figs. 1, 2, 3, and 7, and the opposite end of said lever 50 is provided with an adjustable screw 53, which is struck by a stud or arm 54, adjustably secured by a screw 55 on the governor-rod 56, the lower end of which is attached to the crank-arm 57, secured to the governor-valve rod 58. After contact of the oppositely-beveled cams 45′ and 46 the latter is returned to its normal position on the pin 47 by a coiled spring 59 on a pin 60, supported on a lug 61, projecting from the bracket, the tension of the spring being regulated by an adjustable nut 62. The bracket 52 is secured to the cover 63 of the governor-valve case by a bolt 64 and by the rod 58 and the crank-arm 57, secured on said rod.

The governor-valve 17 shown is of a well-known type, having a hollow cylindrical body provided with slots which register with slots in the valve-cage, and by its connection with the governor is semirotary. The valve being of well-known form requires no further elucidation.

On the cover 65 of the ignition-chamber 14 is a binding-post 66 and to which is attached the fixed electrode 67, provided with a sparking point 68, and is suitably insulated at 69, and adjacent to the post 66 is the opposite binding-post 70. From the cover 65 projects a hollow or tubular neck or extension 71, in which the shaft 72 of the axially-movable electrode 73 is supported, and on the arm 74 of said shaft is the sparking point 75 in alinement with the point 68 of the fixed electrode. The shaft 72 is provided with a conical shoulder 76, which engages a like conical seat 77 and is held thereto by a spring 78 to prevent escape of motor fluid from the ignition-chamber 14 around the shaft. On the outer end of the neck 71 is an axially-adjustable eccentric collar 79, secured by a set-screw 80, and is provided with an opening 81, which engages the neck, as shown in Figs. 6 and 8, and secured to and projecting from the outer face of the collar is a pin or post 82, which extends to and is struck by the anvil 83, adjustably secured to the outer end of the shaft

72, and arrests the axial motion of the shaft and by the impact causes the sparking points to separate. The time of the sparking is regulated by the adjustment of the collar 79 and the pin 82. A further object of this adjustment of the collar and the pin with relation to the anvil is to compensate for or take up the wear on the sparking points 68 and 75. The anvil 83 is adjustably secured to the shaft 72 by a bolt 84, and to the upper end of the anvil a hammer 85 is secured by a hinge-joint 86, and the hammer is forcibly returned to its seat on the outer face of the anvil by a spring 87. The construction of the anvil is claimed in my application for a patent, Serial No. 109,284, filed May 28, 1902.

From the chest 12 extends a post 88, in which is a bolt or pin 89, on which pin is supported at one end a swinging link 90, whose opposite end 91 is pivotally secured to the arm 8 and guides the arm in its reciprocation, and on the front end of said arm is a finger 91′, pivoted to the arm by a pin 92, which crosses the bar, as shown in Figs. 1, 2, and 3, is provided with an extension 93, which rests upon the arm when the finger is in its normal position, and the finger is held in this position by a coiled spring 94 between the arm and the finger. When the arm 8 is projected by the eccentric and its rod, the finger 91′ engages or strikes the lower end of the hammer 85 and carries the hammer and anvil along until the sparking points are closed or brought together, when the hammer continues moving outward away from the anvil and the arm 8 is deflected slightly below its horizontal plane at its outer end until the finger 91′ releases the hammer. The hammer is then returned forcibly to the anvil 83 by spring 87, the impact of which separates the sparking points, breaks the electric circuit, produces a spark, and ignites the charge in the ignition-chamber and in the cylinder. On the return stroke of the arm 8 the outer side of the finger 91′ strikes against the end of the hammer 85 and compresses the spring 94 sufficiently to allow the finger to pass under the hammer.

The valve-casing 15 is provided with an air-inlet passage 92′, through which air is admitted to the interior of the governor-valve 16, and for the purpose of starting the engine a carbureter 93′ is inserted in the passage, as shown in Fig. 3, to supply fuel for the purpose of starting the engine, after which the carbureter is detached from the passage. The carbureter is preferably made of an inner and an outer cylinder 94′ and 95, each open at both ends, and the inner cylinder provided with transverse partitions 96, of wire-gauze, and interposed fillings 97, of cotton-waste or other like material, and the waste is saturated with gasolene or other light distillate of petroleum-oil. The construction of the carbureter is shown in Fig. 15. The valve-casing 15 is also provided with a discharge-passage 98, which communicates with the cylinder 1, near the front end thereof, through the pipe 99 and elbow 100 (see Figs. 1 and 2) and conducts part of the air admitted through the governor-valve 16 into the front end of the cylinder, where it is compressed, and returns the air to the mixing-chamber 13, where it is mingled with the fuel—oil or gas—and flows on into the cylinder during the outstroke of the piston, as heretofore described, expels the burned gases in the cylinder through exhaust-port 101, and the charge remaining in the cylinder is compressed during the return stroke of the piston and subsequently ignited. During the transfer of the compressed air from the front end of the cylinder to the rear or explosion end through pipe 99 a portion of the air which has become heated is conducted through pipe 102, provided with a check-valve 103, to the fuel-tank 28 to produce pressure on the liquid fuel to effect its ready transit to the mixing-chamber and deliver the oil in a spray ready for admixture with the compressed air in said chamber. The heat from the air discharged in the fuel-tank renders the oil limpid, causes it to flow freely, and facilitates its conversion into gas in the mixing-chamber of the engine.

In starting the engine through the medium of the carbureter the piston is moved to the front end of the cylinder, the carbureter applied to passage 92′, when the piston is moved in toward the explosion end of the cylinder by turning the fly-wheel of the engine. During this instroke of the piston the carbureted air drawn in by the piston fills the cylinder in front of the piston. The engine is then reversed and the piston moved on its outstroke, which transfers the gaseous mixture or charge from the front to the opposite end of the cylinder, behind the piston, the charge being compressed by the return stroke of the piston until the charge is ignited and the piston driven outward in the cylinder, after which the carbureter is detached and the gaseous mixture supplied by the air and fuel admitted through the valves 16 and 34, respectively, controlled by the governor, in quantities proportionate to the work or load on the engine.

The fuel-tank 28 is provided with a perforated pipe 104, which surrounds the pipe 102, within the tank, the pipe 104 having a cap 105 to close its upper end and to prevent escape of the air, and to said pipe 104 the pipe 27 is connected for conducting fuel from the tank to the engine. The air is discharged through the perforations 106 in pipe 104 to produce pressure on the surface of the fuel at whatever height it may be in the tank, and the fuel is supplied from the tank through said perforations into pipe 104 and pipe 27.

The exhaust-port 101 is provided with bars 107, Fig. 16, which extend longitudinally in the cylinder to prevent the packing-rings (not

shown) of the piston engaging the metal on the front and rear edges of the port.

Having thus fully described my invention, what I claim is—

1. An explosive-engine provided with a mixing-chamber, a fuel-supply valve, an ignition-chamber, a governor-valve case communicating with said mixing-chamber and with the compression end of the cylinder, an air-supply passage, an air-discharge passage, a valve between said passages, a valve in said governor-valve case for controlling the supply of air to the mixing-chamber, to the compression end of the cylinder and from the compression end of the cylinder to the mixing-chamber.

2. An explosive-engine cylinder having a chest detachably secured to one side thereof and provided with a mixing-chamber, a fuel-supply valve, an ignition-chamber, and a weighted valve between said chambers, a governor-valve case having a passage communicating with the atmosphere, a passage communicating with said mixing-chamber, a passage communicating with the compression end of said cylinder, a valve controlling the admission of air to the governor-valve case, and a governor-controlled valve between the latter valve, the mixing-chamber and the compression end of the cylinder, for controlling the supply of atmospheric air to the mixing-chamber and to the compression end of the cylinder, and the compressed air from the cylinder to the ignition-chamber.

3. An explosive-gas engine provided with a mixing-chamber, a governor-controlled valve for supplying fuel to said chamber, an air-supply passage, an air-discharge passage, a governor-controlled valve for regulating the supply of air to the mixing-chamber, to the compression end of the cylinder, and from said end of the cylinder to said mixing-chamber.

4. An explosive-engine provided with a fuel-tank, and having a governor-valve case provided with an air-eduction passage and communicating with the mixing-chamber of the engine and with a fuel-tank, and a valve controlled by the speed of the engine and interposed between the eduction-passage and the mixing-chamber and between one end of the engine-cylinder and the said tank.

5. An explosive-engine provided with a mixing-chamber and an ignition-chamber, a fuel-supply valve, a fuel-discharge valve, a fixed and a movable electrode, and a reciprocatory arm operating upon the fuel-discharge valve and the movable electrode; in combination with a governor and connections between the governor, the fuel-discharge valve and said reciprocatory arm.

6. In an explosive-engine, a fuel-discharge valve, a connection between the engine and said valve for opening the valve, a governor, and connections between the governor and the valve, consisting of a beveled reciprocatory cam and an oppositely-beveled cam moved by the governor.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN S. LOSCH.

Witnesses:

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