No. 764,840. PATENTED JULY 12, 1904.

J. C. CROCKER.

SPEED REGULATOR FOR EXPLOSIVE ENGINES.

APPLICATION FILED AUG. 20, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

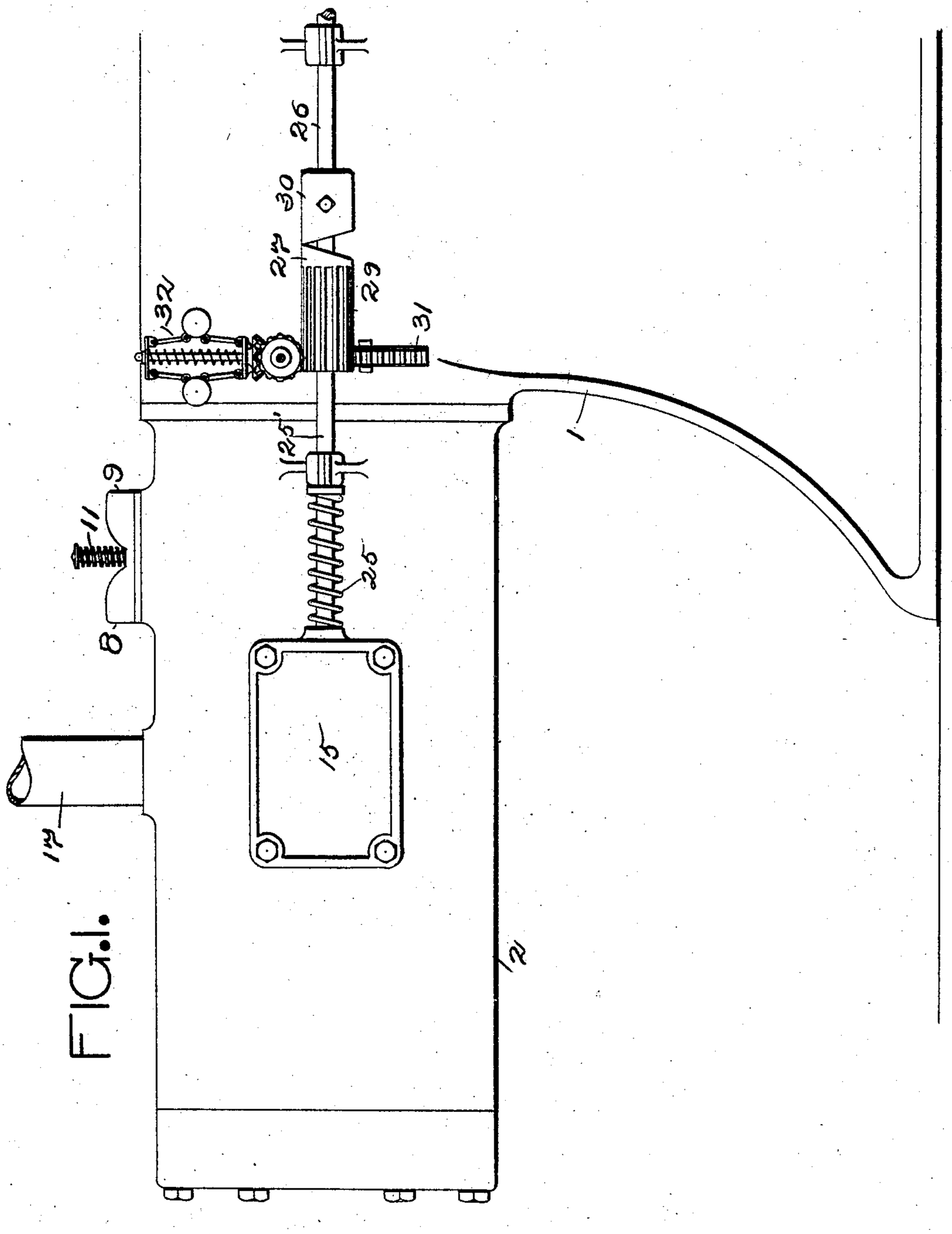

FIG. 1.

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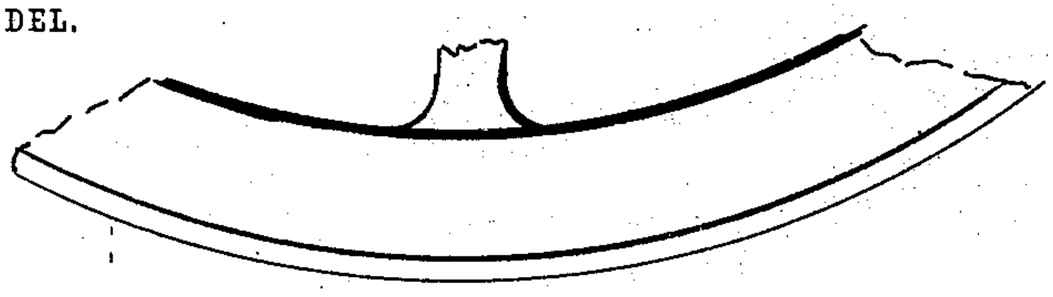
NO MODEL. 3 SHEETS—SHEET 2.



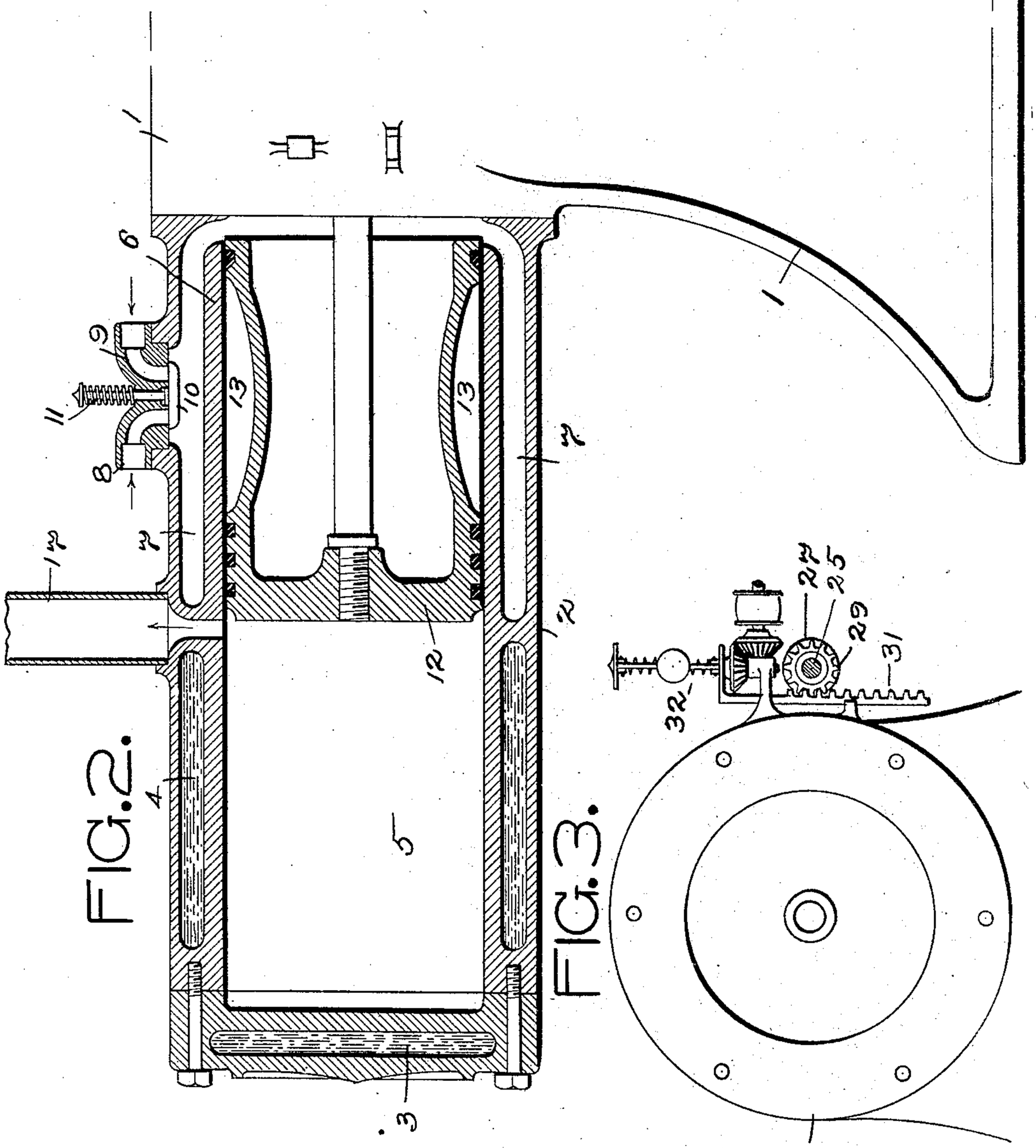


FIG. 2.

FIG. 3.

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NO MODEL. 3 SHEETS—SHEET 3.

FIG. 6.

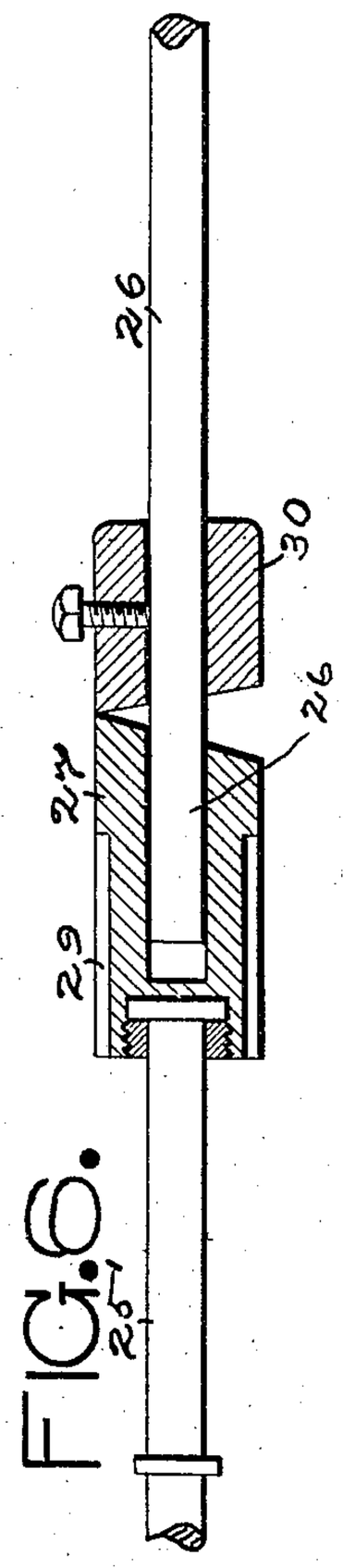


FIG. 7.

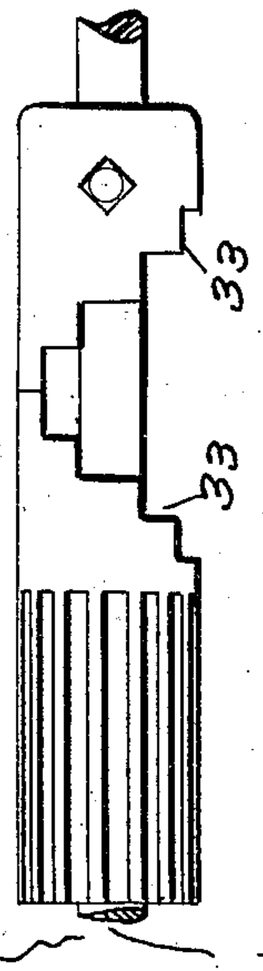


FIG. 5.

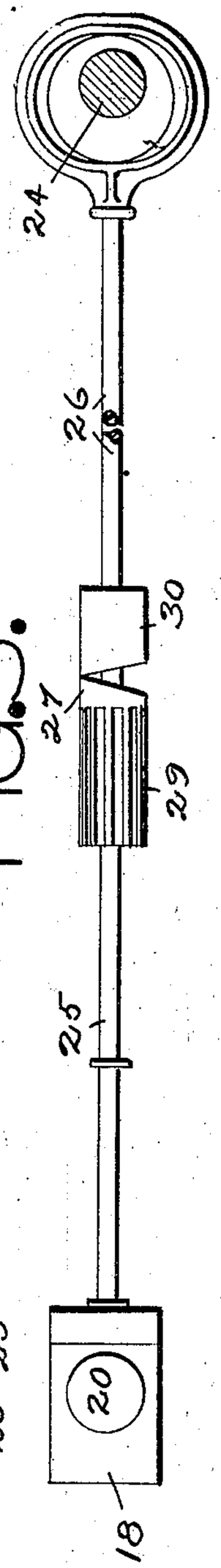
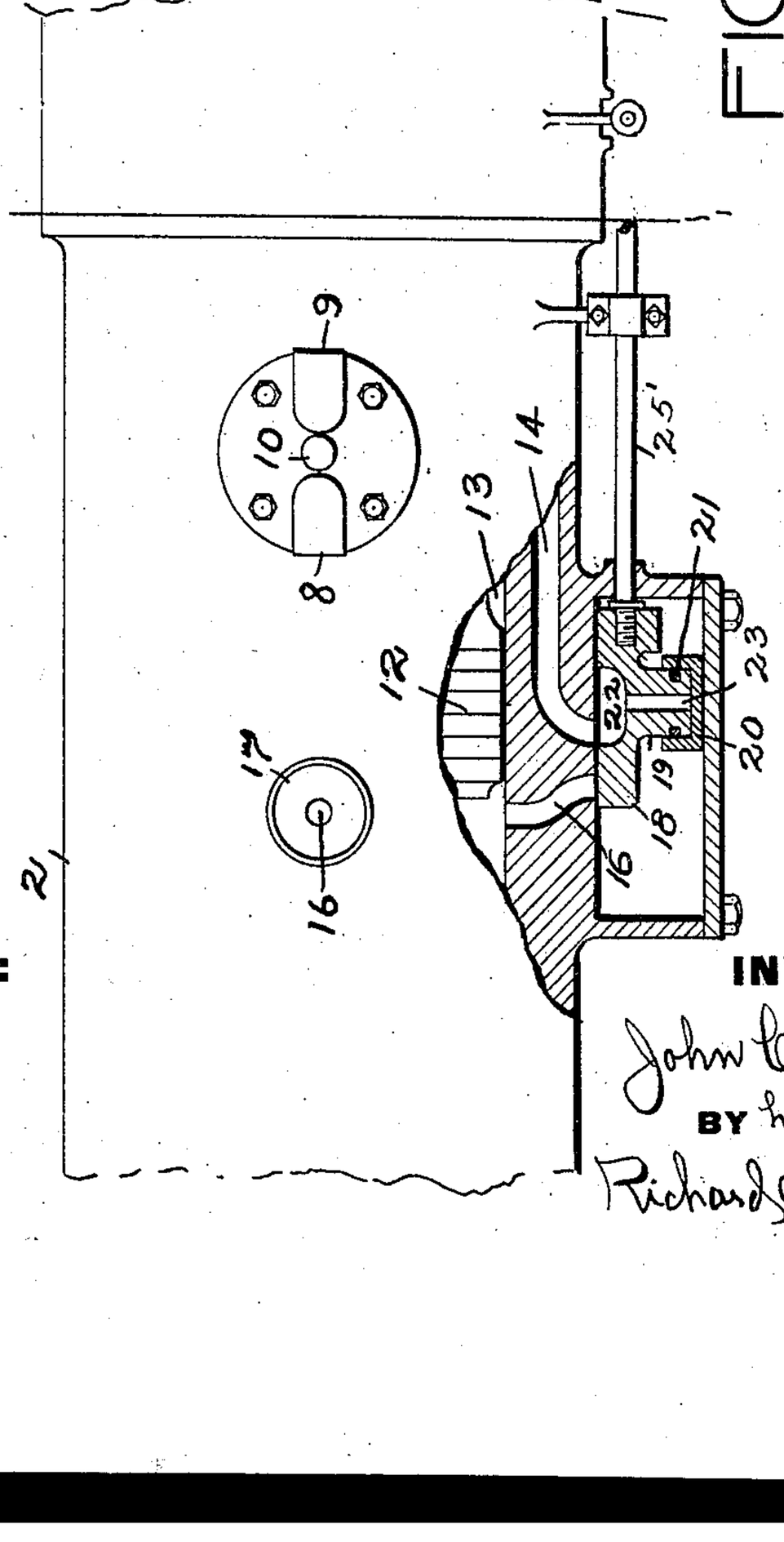


FIG. 4.



WITNESSES:

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No. 764,840. Patented July 12, 1904.

UNITED STATES PATENT OFFICE.

JOHN C. CROCKER, OF GROVE CITY, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO H. B. HEASLET, OF GROVE CITY, PENNSYLVANIA.

SPEED-REGULATOR FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 764,840, dated July 12, 1904.

Application filed August 20, 1903. Serial No. 170,114. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. CROCKER, a citizen of the United States, residing at Grove City, in the county of Mercer and State of Pennsylvania, have invented a new and useful Improvement in Speed-Regulators for Explosive-Engines, of which improvement the following is a specification.

This invention relates to improvements in explosive-engines, and has for its object the provision of means whereby the supply of explosive mixture is automatically regulated in accordance to the power required, together with other certain new and useful improvements for simplifying and increasing the efficiency of the engine.

In the accompanying drawings I have shown portions of an engine to which my improvements relate, in which—

Figure 1 is a side view of the front portion of the engine. Fig. 2 is a similar view with the cylinder shown in longitudinal section and the governor and attending parts removed. Fig. 3 is an end view of the upper portion of the bed-plate with the cylinder detached on the line *x x* of Fig. 1 and the valve-rod in section. Fig. 4 is a plan view of a portion of the cylinder and bed-plate, partly in section, through the valve and cylinder ports. Fig. 5 is a longitudinal side view of the valve, valve-rod, and attending parts. Fig. 6 is an enlarged longitudinal view of a portion of the valve-rod with the connecting members in section. Fig. 7 is an enlarged longitudinal view of a portion of said valve-rod, showing a variation in the connecting members.

Further reference to said drawings for a description of the detail parts and the arrangement thereof, the numeral 1 designates a portion of the bed-plate, and 2 the cylinder attached thereto. In this instance the cylinder is provided with a water-space 3 within the head, and the cylinder proper has an annular space 4 formed about the explosive end or chamber 5, while the mixing end of chamber 6 has formed thereabout an annular air and gas space 7, which opens into the end of said chamber. The air and gas properly proportioned enters the said space by way of ports 8 and 9, controlled by a valve 10, which valve is normally held closed by a spring 11. A piston 12, having a concavity 13 thereabout, creates a suction when moving forward to the explosive-chamber, causing the valve controlling the air and gas inlets to open and draw the elements into the mixing-chamber by way of the annular space and passes therefrom by way of the port 14 to the valve-chamber 15 and from the latter to the explosive-chamber by a port 16, and after the explosion occurs, by means of a suitable igniting device, the resultant gases pass to the atmosphere by way of the exhaust-port 16 and pipe 17. To control the elements in passing from the mixing to the explosive chamber, a slide-valve 18 is fitted into the valve-chamber, which valve is provided with an extension 19, fitted with a cap 20, between which is arranged packing 21, said valve being further provided with a cavity 22 to permit the commingled elements passing from one port to the other when the valve is moved thereover, and a port 23, leading from the valve-cavity to the cap, the purpose of the latter port being to utilize the pressure of the explosive elements by permitting them to act upon the valve-cap and cause the valve to seat perfectly. The valve is operated in opening and closing the ports by a cam 24, either arranged upon the main shaft or otherwise operated therefrom, and a cam-rod, said cam-rod being formed of two sections 25 and 26, connected by a sleeve member 27, slidably fitted over the end of the section 26, attached to the cam-strap 28 and rotatably attached to the end of the valve-connecting section 25, said section being provided with a spring 25′ to actuate the valve in one direction and the member 27 being provided with teeth 29 at one end and normally engaging at the opposite end with an adjustable member 30 upon the section attached to the cam-strap, the engaging surface of both members being inclined. A vertically-disposed operated gear-rack 31 meshes with the teeth of the said sleeve 27, which gear-rack is adapted to be adjusted or controlled by a suitable governor 32 attached thereto.

In practice the air and gas in certain pro-

portions enter the mixing-chamber and are caused to thoroughly commingle by the suction created by the forward movement of the piston and pass from the mixing-chamber to the explosive-chamber by way of the valve-ports, as specified, and upon being compressed is ignited and exhausted. Now as the speed increases the rotation of the governor elevates the gear-rack in proportion to the speed, causing said sleeve 27 to be rotatably adjusted relative to the fixed sleeve engaged thereby, and as the engaging surfaces of both sleeves are inclined the normal length of the valve-rod proper will have been shortened in proportion to the sleeve adjustment. Consequently the valve-section will be caused to complete its full back stroke by the action of the spring 25, while the fixed sleeve carried by the cam-section will when the cam approaches and passes the dead-center be for a time out of contact with the governor-controlled sleeve in accordance to the adjustment. Therefore the valve will be moved forward when re-engagement of the sleeves occurs a lesser distance than if said sleeves were in their normal engagment, and as a result the port 16 will not be fully opened, and the supply of explosive mixture passing therethrough to the explosive-chamber will be decreased. This decrease in the supply of explosive mixture to the explosive-chamber being under the control of the governor, the power of the engine will be proportionately regulated in accordance to the labor to be performed. Should any of the explosive mixture escape past the piston, it would be confined within the concave space between the walls of the chamber and piston, and as the piston moves forward the said leakage would be conveyed by said piston and escape out of the exhaust-port, thus preventing possibility of premature explosion.

By taking the gas and air in at the cylinder-head the piston-head when moving in one direction forms a pump or suction, taking the gas and air in from the mixing-chamber, and when the piston-head is returning back to compress the governor holds the valve open and permits this air and gas to pass back into the mixing-chamber, just keeping enough gas and air in the cylinder for the explosion in accordance to the power needed. When the piston is traveling back toward the exploding end, it then pumps the gas and air back into the mixing-chamber, thereby avoiding the resistance.

At Fig. 7, where the modification in the valve-rod members is shown, the engaging surfaces of said members are provided with a series of steps 33 instead of the plain incline surfaces, as previously shown and described.

It is evident that some of the detail parts may be altered or equivalent parts substituted to attain the same results. I therefore do not desire to be limited to the specific details described and shown.

Having thus fully shown and described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an explosive-engine having a slide-valve for controlling the mixture passing into the cylinder, the combination of an eccentric-rod, a valve-rod alining with said eccentric-rod, a member fixed to and carried by the free end of said eccentric-rod, a revoluble member carried by the free end of the valve-rod engaging with said eccentric-rod member, and a governor adapted to rotatably adjust said valve-rod member to vary the movement of said valve, the engaging surfaces of said members being inclined, as shown and set forth.

2. In an explosive-engine having a slide-valve for controlling the mixture passing into the cylinder, the combination of an eccentric-rod, a valve-rod alining with said eccentric-rod, a member carried by the free end of said eccentric-rod, a revoluble member engaging said eccentric-rod member and carried by the valve-rod, a governor adapted to rotatably adjust said valve-rod member to vary the movement of said valve, and a spring on said valve-rod, as shown and set forth.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JOHN C. CROCKER.

In presence of—
C. M. STRUTHERS,
ISAAC HILLKIRK.