No. 778,154. PATENTED DEC. 20, 1904.

A. M. SWEDER.

GAS ENGINE.

APPLICATION FILED JUNE 1, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

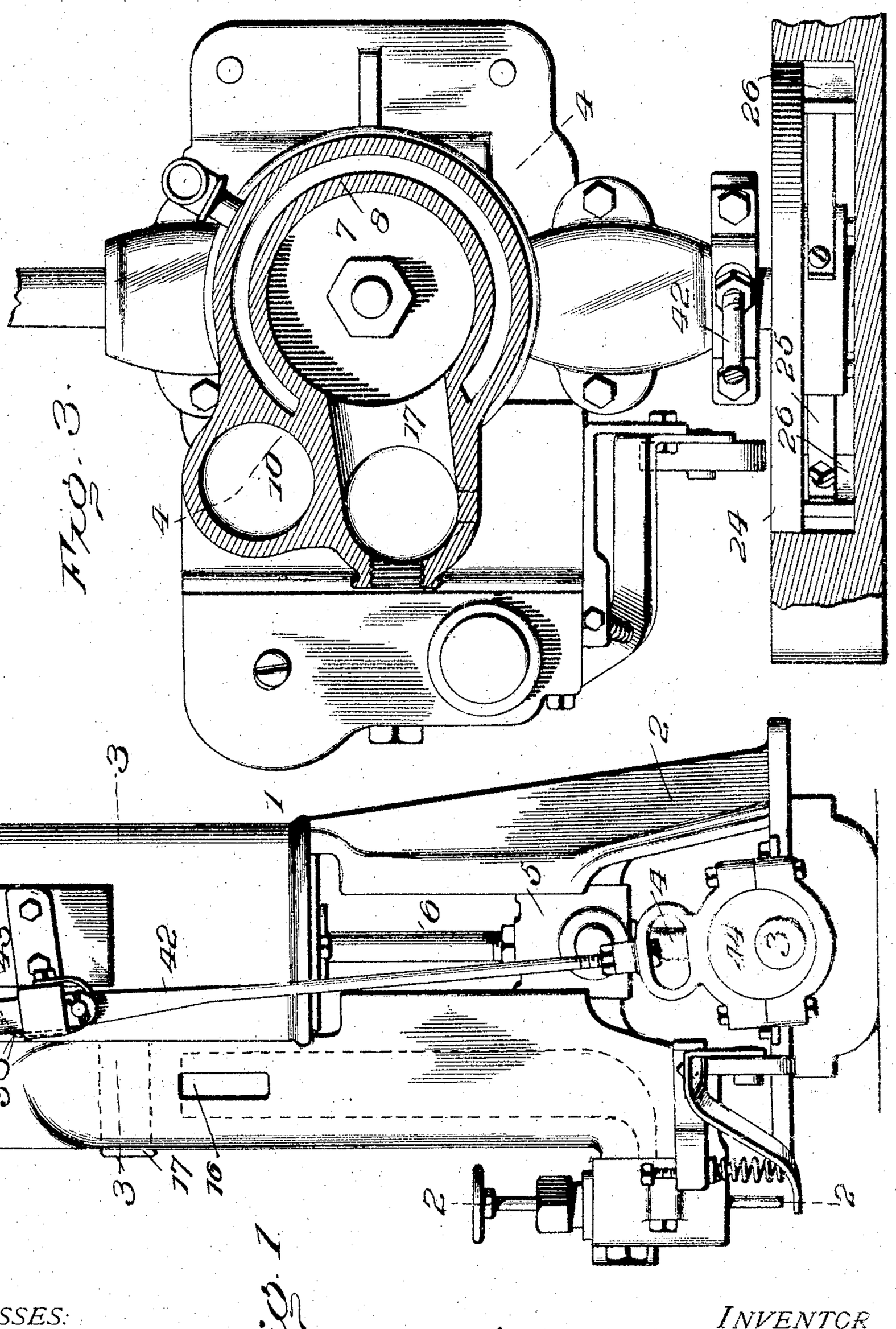

FIG. 3.

WITNESSES:

Jno. Purcell

Francis B. Maguire

INVENTOR

August M. Sweder

BY

Coldrun and Fenning

Attorneys.

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NO MODEL. 3 SHEETS—SHEET 2.

FIG. 2.

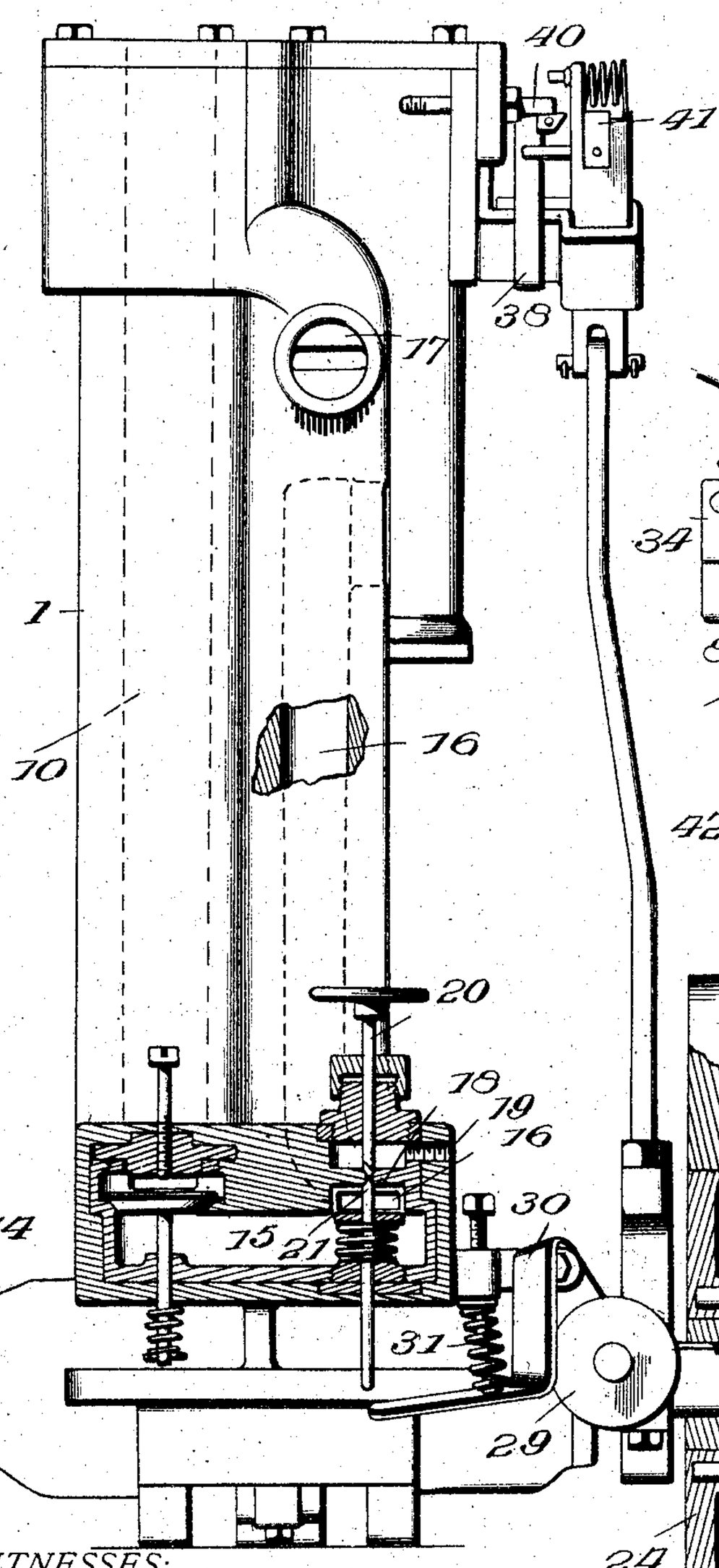


FIG. 6.

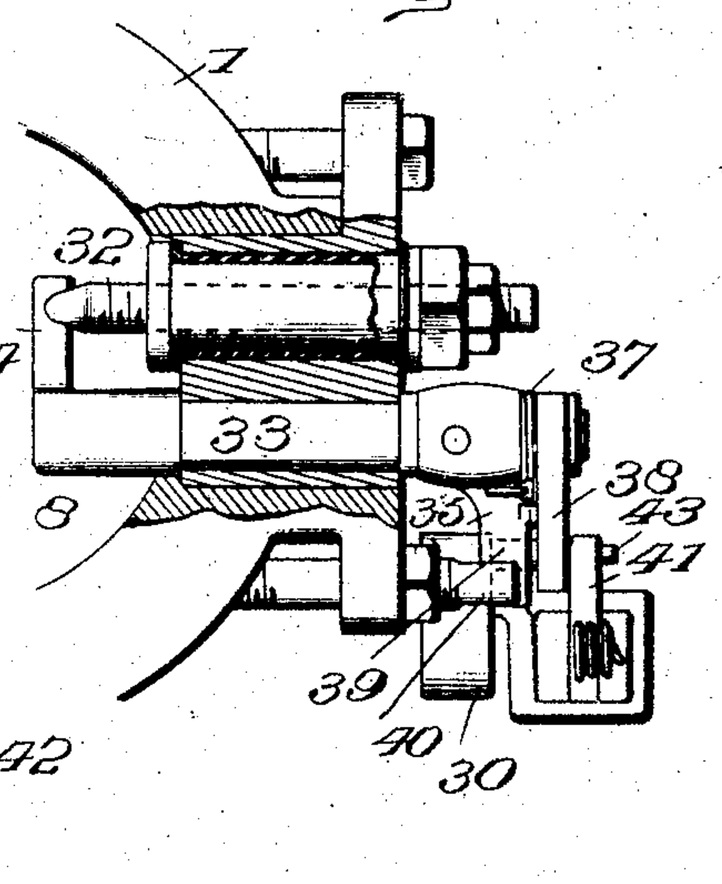
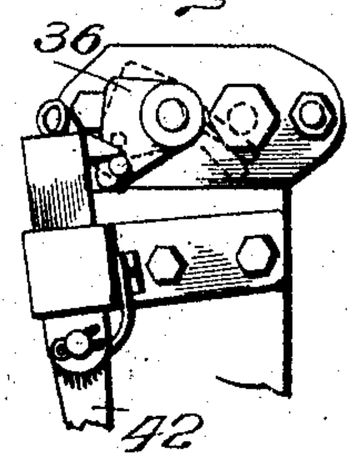


FIG. 7.



WITNESSES:

Jno. Minnie

Francis S. Maguire

INVENTOR

August M. Sweder

BY

Coburn & Fleming

Attorneys

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A. M. SWEDER.

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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 4.

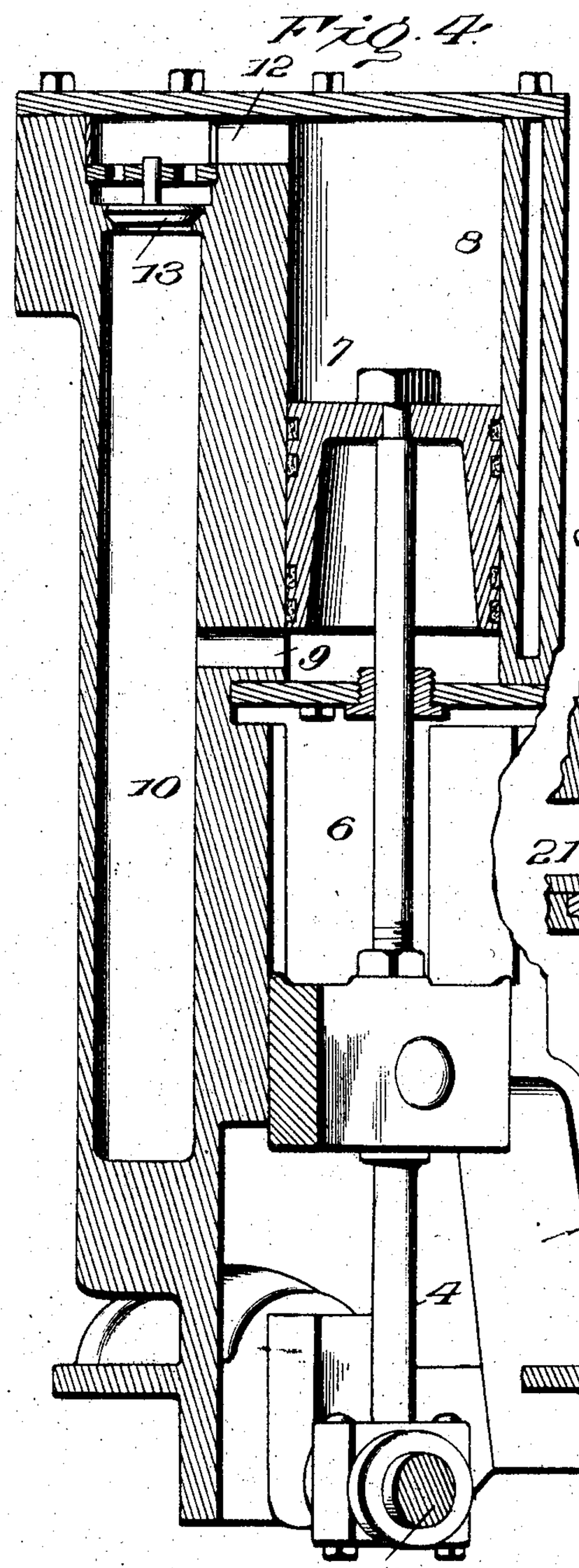
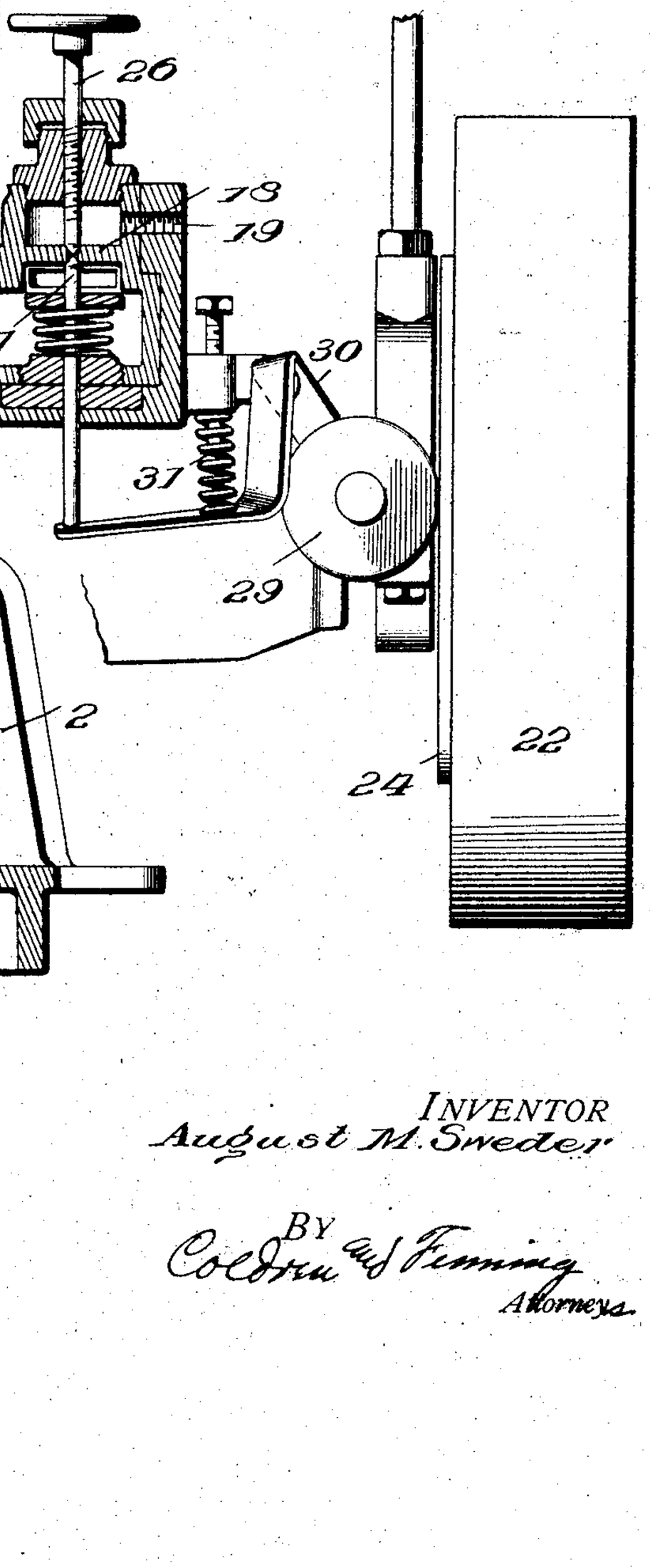


Fig. 5.



WITNESSES:

Jno. Imrie

Francis S. Magnire

INVENTOR

August M. Sweder.

BY

Coleman and Fenning

Attorneys.

No. 778,154. Patented December 20, 1904.

UNITED STATES PATENT OFFICE.

AUGUST M. SWEDER, OF MARQUETTE, MICHIGAN.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 778,154, dated December 20, 1904.

Application filed June 1, 1903. Serial No. 159,514.

To all whom it may concern:

Be it known that I, AUGUST M. SWEDER, of Marquette, in the county of Marquette and State of Michigan, have invented certain new and useful Improvements in Gas-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.

The objects of this invention are, first, to provide a two-cycle gas-engine possessing advantages in point of simplicity and inexpensiveness; secondly, to utilize the heat of the casing for heating the air before it enters the mixing-chamber and to maintain the air and vapor at proper temperature before entering the piston or explosion chamber; thirdly, to provide an improved relative arrangement of parts facilitating the attainment of the foregoing objects and insuring effective cushioning.

The invention will be hereinafter fully set forth, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation. Fig. 2 is a side view with parts in section, the latter being on line 2 2, Fig. 1. Fig. 3 is an enlarged horizontal sectional view on line 3 3, Fig. 1. Fig. 4 is a vertical sectional view through the entire casing about on line 4 4, Fig. 3. Fig. 5 shows the governor on an enlarged scale. Fig. 6 is a plan view of the sparker with parts in section. Fig. 7 is an end view of the sparker with different positions of the parts indicated in dotted lines.

Referring to the drawings, 1 designates the casing, having an open base 2 of the marine-engine style, the crank-shaft 3 having its bearings in the lower portion of this base. This crank-shaft, through a connecting-rod 4, is connected to a cross-head 5, to which is secured rod 6 of piston 7, movable within the cylinder or explosion chamber 8. Into this chamber beneath the piston opens a port 9, leading from the gas-storage chamber 10, which chamber is formed within the casing, running longitudinally thereof parallel with the explosion-chamber 8, into which it opens at its upper end through a port 12. A valve 13, seated in the upper end of this gas-storage chamber 10, prevents any return passage of the gas once it enters the explosion-chamber. Entrance of the gas to this chamber 10, which entrance is at the lower end thereof in line with the base, is controlled by a spring-held valve 14, which fits over a port leading from the air and vapor mixing chamber 15. Into this mixing-chamber opens the lower end of an air-duct or passage-way 16, which is formed in the casing 1, parallel throughout the most of its length with the gas-storage chamber 10, the upper end of such air-duct opening to the atmosphere at a point near the exhaust-port 17. By thus extending the air-duct into close relation to the exhaust-port the air is heated before entering the mixing-chamber. Within the latter is a diaphragm 18, having a central opening for the passage of the hydrocarbon, which is admitted through port 19 at a point above the diaphragm. The quantity of the hydrocarbon passed through the diaphragm is regulated by a screw 20. The opening in this diaphragm is normally closed by a spring-pressed valve 21, whose stem projects down beneath the casing.

The upward thrust of the piston effects the unseating of valve 21, thereby drawing the hydrocarbon into mixing-chamber 15, where it commingles with the air drawn in through duct 16, and valve 14 being simultaneously unseated the gas will be drawn into the storage-chamber 10 and through port 9 into chamber 8 beneath the piston. As soon, however, as the piston starts on its downward stroke the pressure on the gas will effect the reseating of valve 14 and the unseating of valve 13, allowing the gas to pass through port 12 into chamber 8 above the piston. The piston in its downward stroke exposes the exhaust 17, allowing the burned gases to escape to the atmosphere; but the return or upward stroke of the piston is so timed as to cut off the exhaust before any of the indrawn gas may escape therethrough. It will here be noted that the exhaust-port is in close proximity to the chamber 10, as well as to the air-duct 16, thus maintaining the charge heated before its entrance to the explosion-chamber. The upward pressure of the piston

compresses the gas within the chamber 8, closing valve 13, and as the piston approaches the end of its upward stroke a spark is generated for the creation of the explosion.

In order to control or entirely cut off the passage of the hydrocarbon when the engine is running at too great a speed, I provide means for automatically holding valve 21 to its seat or at least to the extent of decreasing the supply of hydrocarbon. To this end the fly-wheel 22, which is mounted fast on shaft 3, is equipped with a hub 23, whereon fits a disk 24, carrying spring-arms 25, having wedge-blocks 26 on their outer ends, their inner ends being secured to the hub of the disk. Under the centrifugal action these blocks fly outwardly, and their beveled edges 27, contacting with a corresponding bevel 28 of disk 24, force the latter outwardly from the face of the fly-wheel and against a roller 29 on one end of a lever 30, so that upon overcoming the tension of a spring 31 such lever will be brought into engagement with the stem of valve 21 to hold it seated or allow of only a partial unseating thereof, according as conditions may require. Upon the engine resuming its proper speed the wedging-blocks 26 move inwardly toward the axis of shaft 3, and the tension of spring 31 is sufficient to force lever 30 out of engagement with the stem of valve 21, the disk 24 being moved into the recess in the fly-wheel under the recoil of such spring.

In the upper end of the explosion-chamber is the sparker, which comprises a pin 32, mounted in suitably-insulated bearings in casing 1, such pin forming one terminal of an electric current, the other terminal being connected at any suitable point to the casing. Paralleling this pin 32 is a shaft 33, having an inner cranked end 34, which is designed to be forced into engagement with pin 32 preliminarily to the creation of a spark. Fast on this shaft is an arm 35, and immediately adjacent thereto is a loose plate 36, which is held in certain relation to arm 35 by a coil-spring 37. A plate-spring 38, engaging a stud 39 of plate 36, normally holds the cranked end of shaft 33 out of engagement with pin 32 and the arm 35 against a stop-pin 40. A spring-held pivoted dog 41, mounted in the upper end of a rod 42, upon engaging a lug 43 of said plate, will turn it and arm 35 in unison until the cranked end of shaft 33 contacts with pin 32, whereupon the plate 36 will continue to turn, as against the tension of the spring 37, until the dog 41 frees lug 43. As this occurs the shaft 33 under the recoil of spring 38 will break contact with pin 32, thereby creating a spark. The dog 41 is free to ride over the lug 43 in the upward stroke of rod 42. The latter is actuated by an eccentric 44 on shaft 3. The pin 32 is tapered at its inner end and adjustable in its bearing, so that the life of the contact may be increased or lessened according to the extent to which the pin is projected inwardly.

From what has been said it will be seen that by extending the air-duct longitudinally of the casing, at one side thereof, with its inlet end in close relation to the exhaust-port the air is thoroughly heated before entering the mixing-chamber, and by likewise extending the gas-storage chamber the air and vapor-gas is kept at that temperature for securing the best possible results within the explosion-chamber. Furthermore, the location of the mixing-chamber beneath the open base enables the passages 16 and 10, leading to and from the same, respectively, to be brought approximately into the vertical plane of a marine engine, providing economy of space, while the charging-chamber extending down to the mixing-chamber increases the size thereof and provides greater preadmission to the cylinder to insure effective cushioning.

I claim as my invention—

1. A two-cycle gas-engine comprising a casing having an open base and an upper explosion-chamber, a piston movable in the latter, a mixing-chamber in line with such base, a gas-storage chamber extending from said mixing-chamber and longitudinally of the explosion-chamber with which it communicates, a check-valve controlling communication between said mixing and storage chambers, and an air-duct paralleling said storage-chamber and extending from a point intersected by said explosion-chamber down and opening into said mixing-chamber.

2. A two-cycle gas-engine comprising a casing having an explosion-chamber, formed with upper and lower inlet-ports and an intermediate exhaust-port, a piston movable within such chamber for opening up such exhaust-port on each downward stroke, a gas-storage chamber, from which said inlet-ports extend, a mixer-chamber in the lower portion of said casing opening into said storage-chamber, and an air-duct formed in said casing and extending longitudinally thereof from a point adjacent to said exhaust-port, as set forth.

3. The casing having an explosion-chamber, a piston therein, inlet-ports opening into said chamber above and below said piston, and an exhaust-port intermediate said inlet-ports, a gas-storage chamber in one side of the casing adjacent said exhaust-port paralleling said explosion-chamber and from which said inlet-ports extend, a valve between said storage-chamber and the upper inlet, a mixer-chamber opening into said storage-chamber, a valve controlling such opening, said valves being seated and unseated by the action of the piston on the gas, said mixer-chamber having a hydrocarbon-inlet and an air-inlet, an air-duct in said casing leading from a point near said exhaust-port to said air-inlet, and a valve for normally closing the hydrocarbon-inlet, as set forth.

4. The combination with the casing having an open base and an upper explosion-chamber, of a crank-shaft mounted in said base, a piston movable in said chamber and having its rod connected to said crank-shaft, a mixer-chamber at such base, a gas-storage chamber in the casing and into which the mixer-chamber opens, a valve controlling such opening, said gas-storage chamber having upper and lower openings into said explosion-chamber above and below the piston, a valve for such upper opening, an exhaust-port being formed in the casing between said inlet-openings adjacent said storage-chamber, an air-duct leading from near the exhaust-port to said mixer-chamber, an oil-inlet, a valve for controlling the latter, and means automatically actuated by the crank-shaft for preventing or regulating the extent of the opening of such latter valve, as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

AUGUST M. SWEDER.

Witnesses:
HUGH M. STERLING,
FRANCIS S. MAGUIRE.