No. 719,199. PATENTED JAN. 27, 1903.

C. E. DAWSON.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED DEC. 10, 1900.

NO MODEL. 6 SHEETS—SHEET 1.

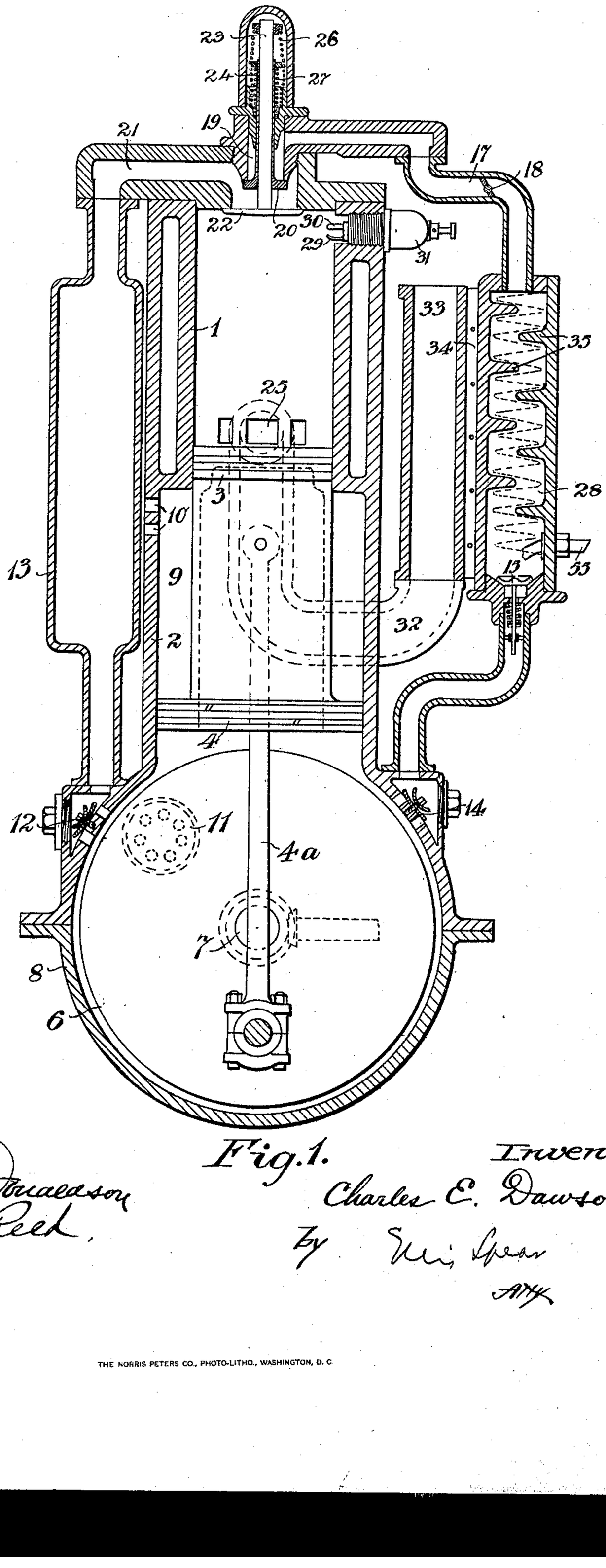

Fig. 1.

Attest
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NO MODEL. 6 SHEETS—SHEET 2.

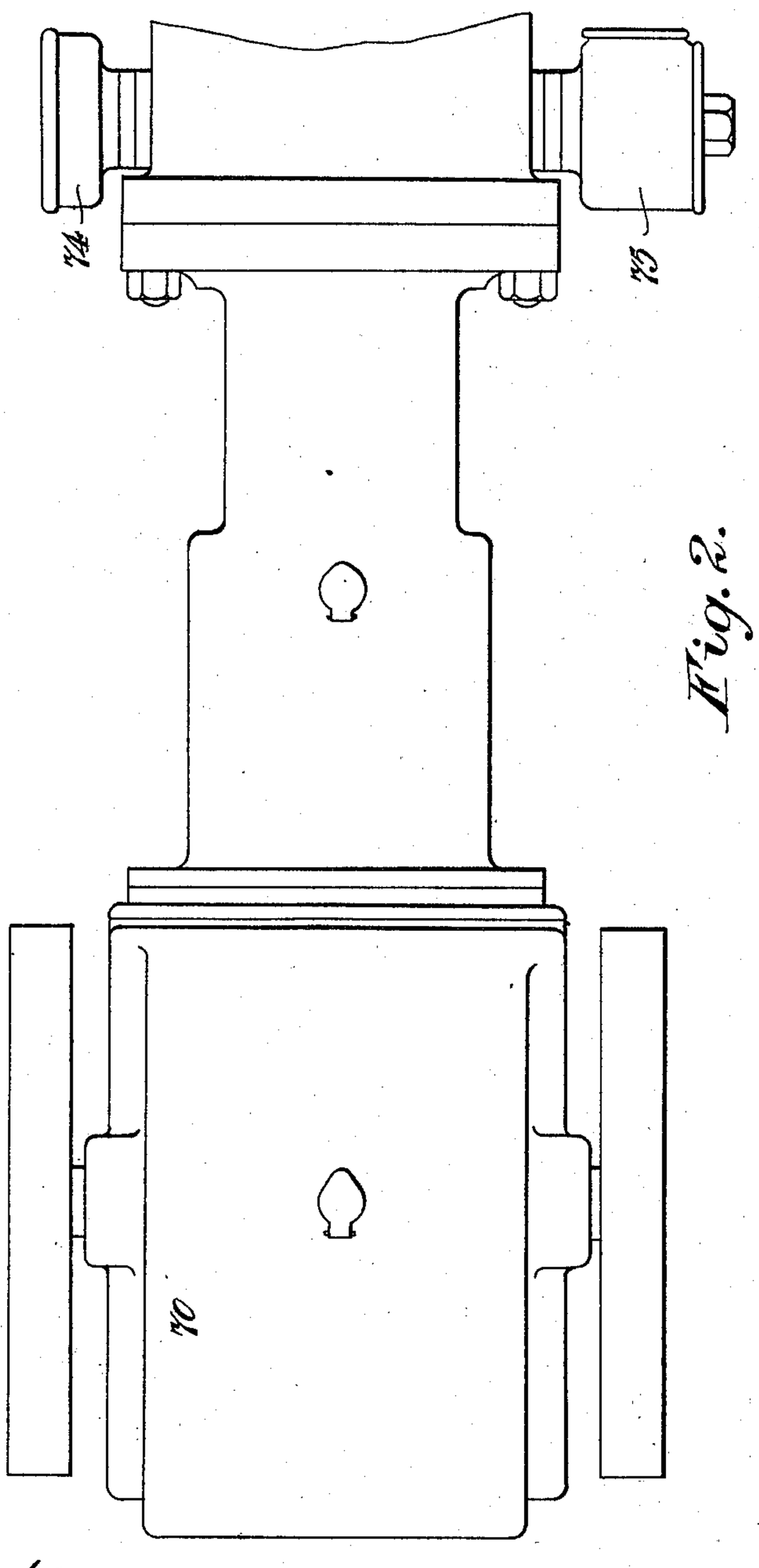

Fig. 2.

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NO MODEL. 6 SHEETS—SHEET 3.

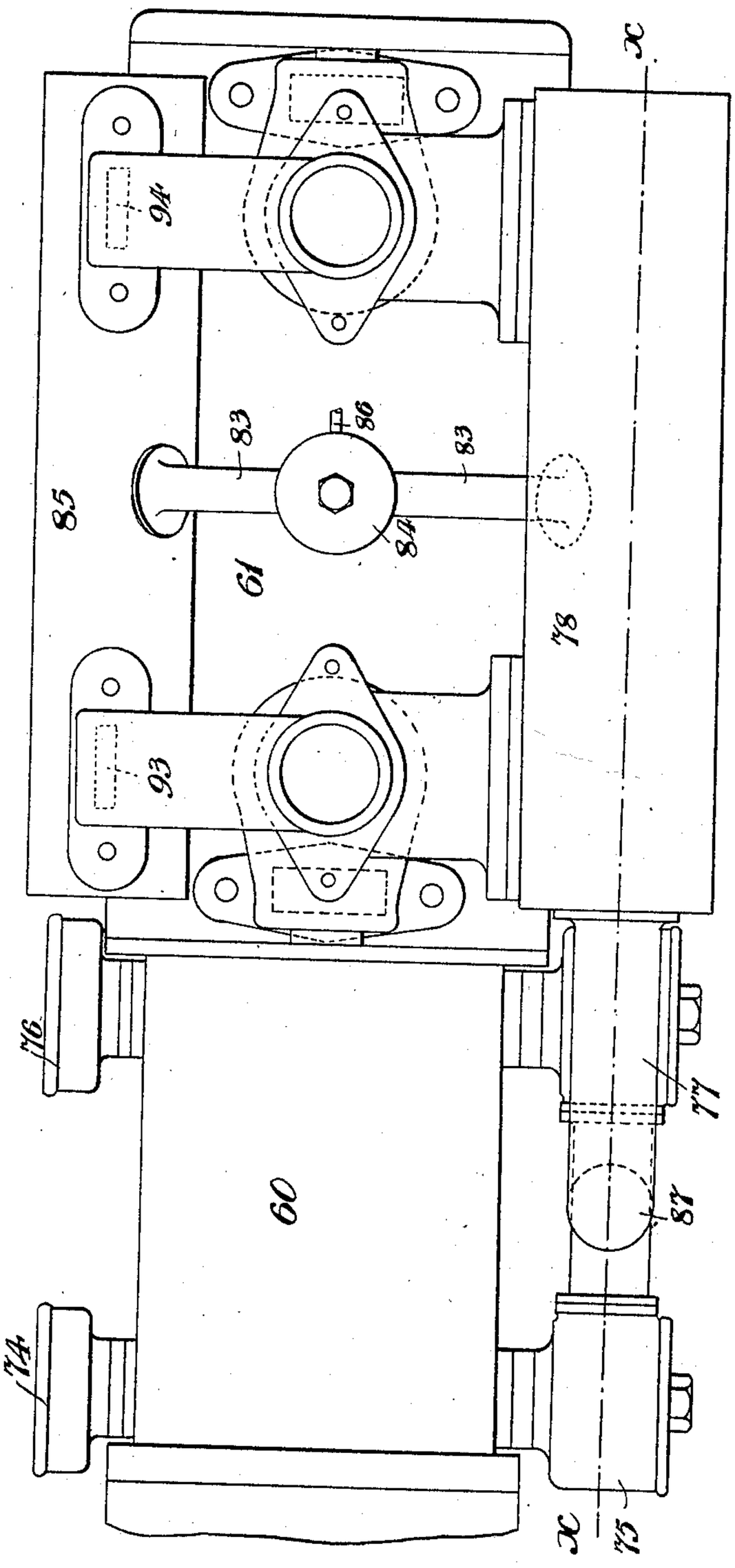

Fig. 3.

Attest
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NO MODEL. 6 SHEETS—SHEET 4.

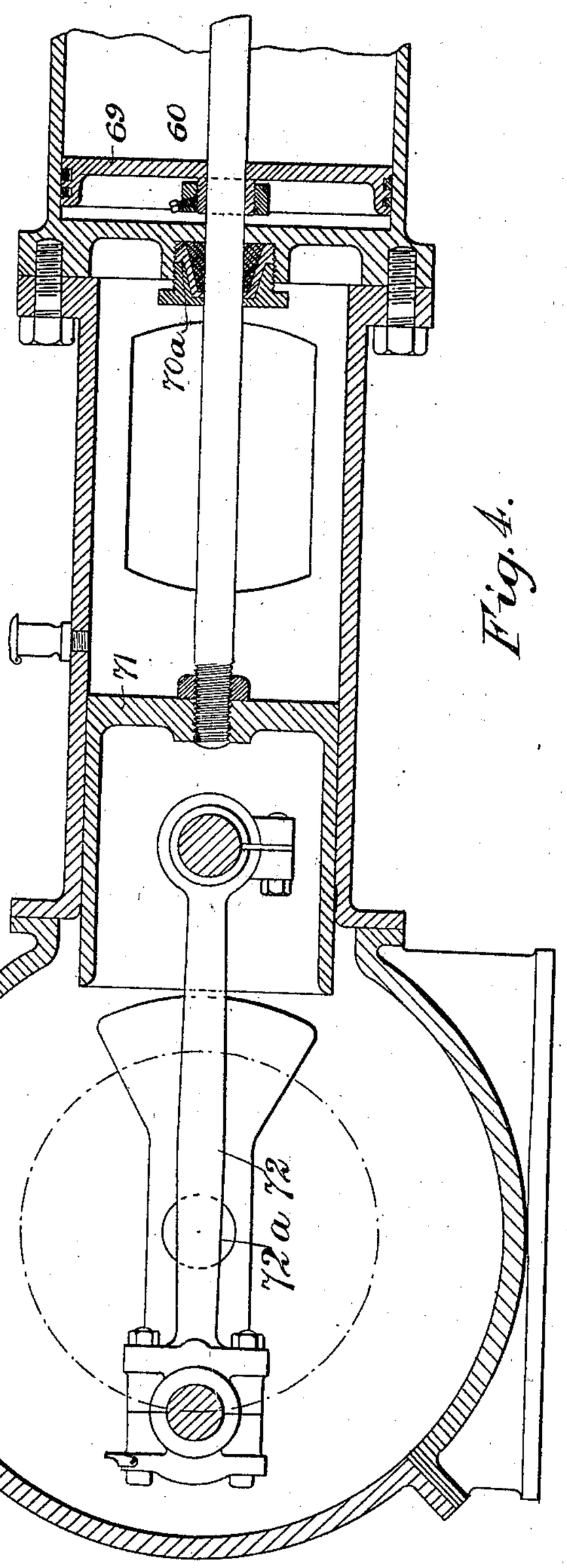

Fig. 4.

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INTERNAL COMBUSTION ENGINE.

APPLICATION FILED DEC. 10, 1900.

NO MODEL. 6 SHEETS—SHEET 5.

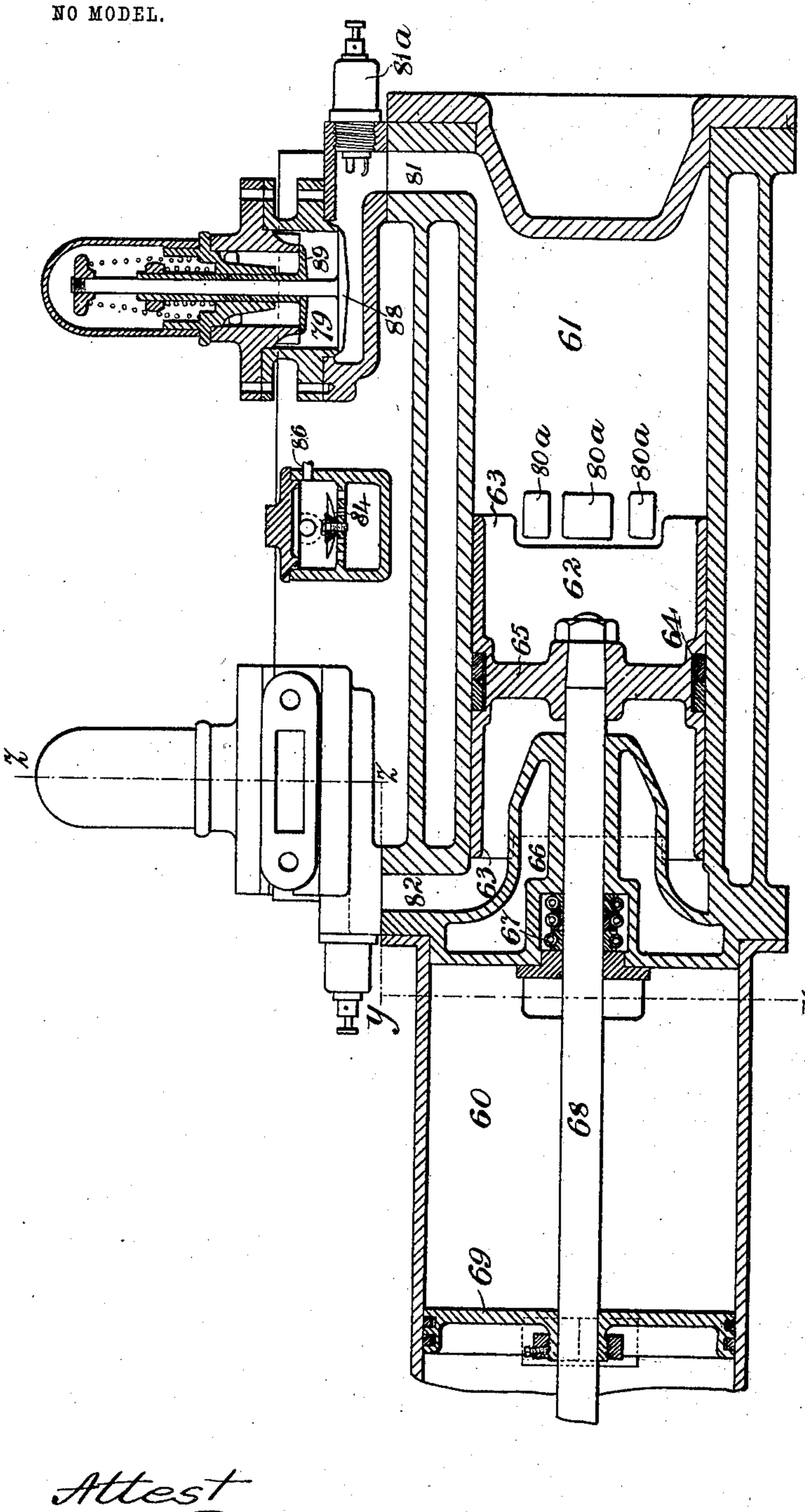

Fig. 3.

Attest
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NO MODEL. 6 SHEETS—SHEET 6.

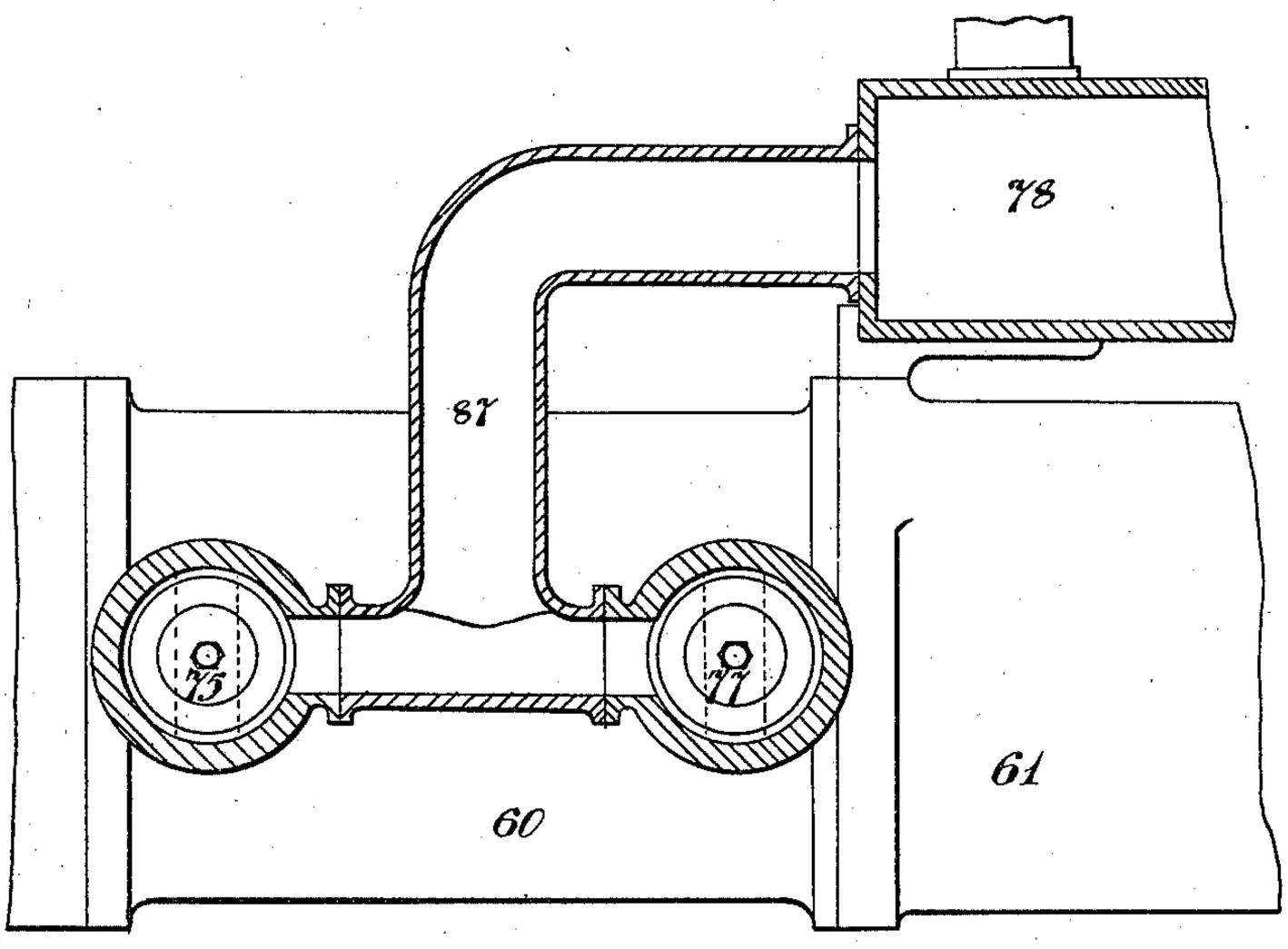

Fig. 6.

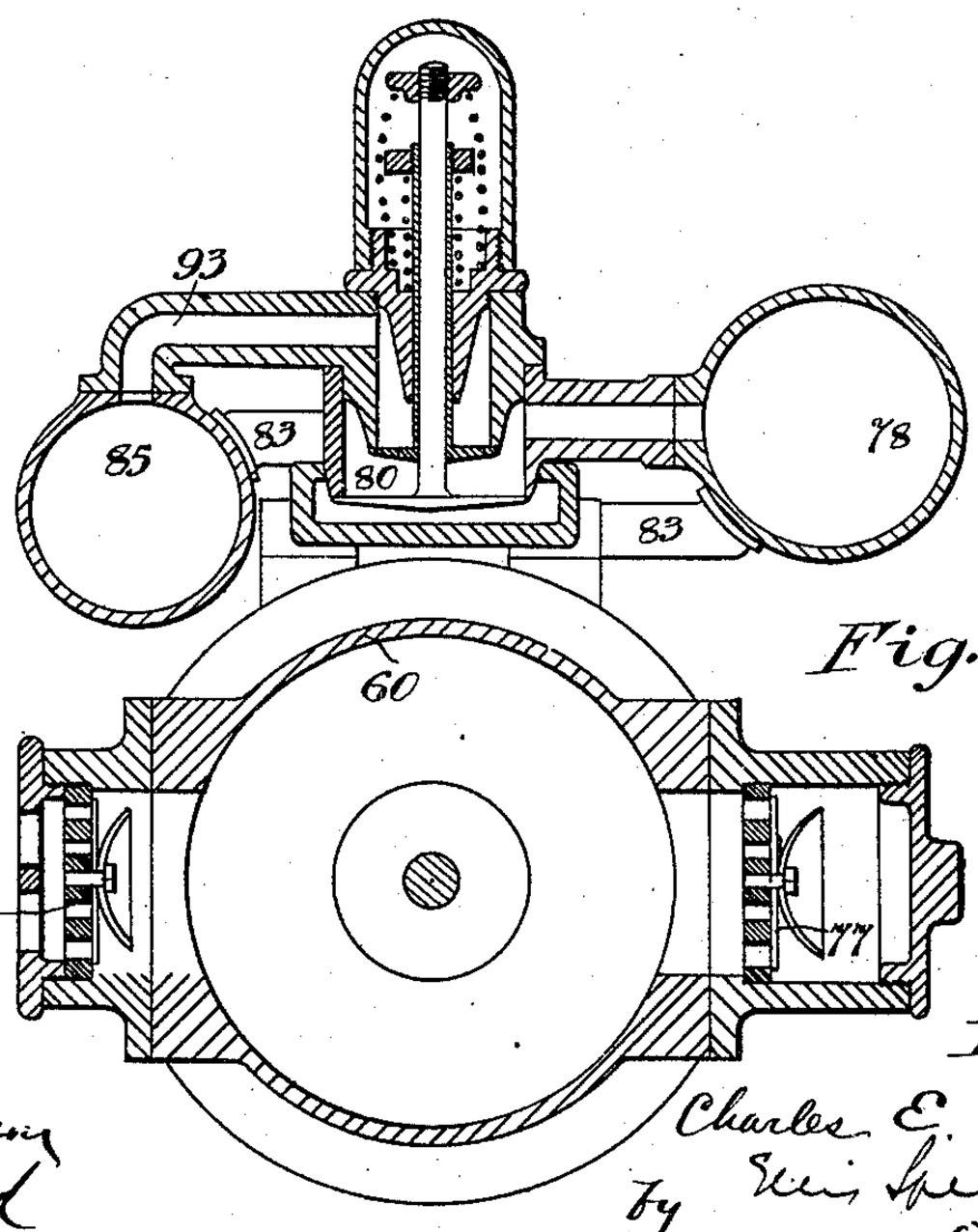

Fig. 7.

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Inventor
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by Wm Spear
Attorney

UNITED STATES PATENT OFFICE.

CHARLES ERNEST DAWSON, OF HYTHE, ENGLAND.

INTERNAL-COMBUSTION ENGINE.

SPECIFICATION forming part of Letters Patent No. 719,199, dated January 27, 1903.

Application filed December 10, 1900. Serial No. 39,427. (No model.)

To all whom it may concern:

Be it known that I, CHARLES ERNEST DAWSON, engineer, a subject of the King of Great Britain and Ireland, residing at "The Villa," Hythe, near Southampton, England, have invented certain new and useful Improvements in Internal-Combustion Engines, (for which I have made application for patent in Great Britain, No. 9,055, and dated May 16, 1900,) of which the following is a specification.

My invention relates to internal-combustion engines in which light or heavy oils are used, and has for its object to provide a simple and reliable engine of the two-stroke-cycle type.

My invention is also designed to enable the engine to be worked with a charge free from spent gases and at the same time to prevent part of the explosive charge from following the exhaust-gases, and so being lost.

My invention consists in attaching in any suitable manner to the main piston a displacing-piston of suitable area, which discharges through ordinary non-return valves into two reservoirs, each of considerable capacity. These reservoirs both communicate with a common passage leading to the combustion-space of the cylinder, but are each independently closed by valves so controlled that the contents of one of the reservoirs are discharged through the cylinder when the piston passes exhaust-ports in the cylinder-walls and the pressure has fallen sufficiently, thus thoroughly scavenging the cylinder. The spring controlling the valve which closes the second reservoir is so proportioned with regard to the relative areas of the two valves that the second valve cannot open until the scavenging-air from the first reservoir has passed into the cylinder. A graduated charge of heavy or light oil vapor is then admitted to the cylinder through the second valve.

My invention also consists in a double-acting two-stroke-cycle oil-vapor engine in which my scavenging arrangements are applied.

In the accompanying six sheets of drawings, Figure 1 is a sectional elevation of a single-acting engine constructed according to my invention and suitable for propulsive purposes. Figs. 2 and 3, Sheets 2 and 3, represent in plan a complete double-acting engine constructed in accordance with the invention. Figs. 4 and 5, Sheets 4 and 5, show a central longitudinal section of the engine, the displacer-piston appearing in both figures for the sake of clearness. Fig. 6 is a partial vertical section of Fig. 3 on the line $x\,x$. Fig. 7 is a cross-section of Fig. 5 on the lines $y\,y$ and $z\,z$.

Referring to Fig. 1, upon the front end of the motor-cylinder 1 I form a displacer-cylinder 2, and I fit the motor-piston 3 with a trunk displacer-piston 4, which works within the cylinder 2. To this displacer-piston I attach the usual connecting-rod 4^a, which drives onto two fly-wheel disks secured to the power-shaft 7, only one of the disks 6 being shown in Fig. 1, and works within a closed casing 8, formed as an extension of the displacer-cylinder. The space 9 behind the displacer-piston is isolated from the motor-cylinder by the piston 3 and is in free communication with the atmosphere through the openings 10. I may in some cases omit the separate displacer-piston 4 and utilize the front of the piston 3 as displacer by making the clearance volume in front of the piston 3 sufficiently small. The displacer-piston on its backward stroke draws in a charge of air through the non-return valve 11, fitted in the side of the crank-chamber, and upon its forward stroke expels a portion of the air charge through the non-return valve 12 into an air-reservoir 13, the remainder of the charge passing to the vaporizer 28 through the flap-valve 14 and the vaporizer-valve 15, where it takes up the oil charge which enters by the pipe 55. The passage 17, which leads from the vaporizer, is fitted with a throttle-valve 18 and communicates with a chamber 19 on the upper side of a spring-controlled valve 20, which chamber is formed upon the motor-cylinder cover. The chamber beneath the valve 20 communicates by a passage 21 with the air-reservoir 13 and opens into the motor-cylinder through a spring-controlled valve 22, the stem 23 of which passes centrally up through the hollow stem 24 of the valve 20. Exhaust-ports 25 are formed in the walls of the motor-cylinder and are arranged so that they are completely uncovered when the motor-piston has reached the end of its working stroke. When this

takes place, the pressure in the cylinder has fallen sufficiently to allow the valve 22 to open under the pressure of the charge of air stored in the reservoir 13, which overcomes the force of the spring 26. A quantity of air then rushes through the cylinder, thus thoroughly scavenging out the exhaust products. The spring 27 is so proportioned to the relative areas of the two valves that the valve 20 cannot open until the scavenging-air from the reservoir 13 has passed into the cylinder. The fall of pressure then permits the valve 20 to open and discharge the mixture of air and vaporized oil from the vaporizer into the cylinder. Compression of the charge is then effected by the piston 3 on its return stroke, the valves 20 and 22 closing under the increased pressure and the displacer-piston 4 at the same time drawing in a charge of air through the valve 11. When the motor-piston reaches the end of its stroke, ignition is effected by an electric spark which passes between the contact-points 29 and 30 of the ignition-plug 31, and the cycle of operation is repeated. The exhaust products are conducted away by a pipe 32 and utilized to vaporize the oil by passing them through a casting 33, which is united to the vaporizer 28 by a heat-conducting web 34. The vaporizer is fitted with internal ribs 35, which are provided in order to cause thorough mingling of the air and oil charge and also to increase the internal heat-transmitting surface, and wire-gauze or other suitable material is arranged interleaving the ribs 35, as indicated by the dotted lines, so as to insure thorough division of the oil-vapor.

Referring now to Figs. 2 to 7, inclusive, which illustrate a double-acting engine constructed according to my invention, a double-acting air-pump cylinder 60 is secured to the front end of a water-jacketed motor-cylinder 61. The piston 62 of the motor-cylinder is made of considerable length, but hollowed on both sides, the projecting parts 63 63 on both sides being made of very thin metal closely fitting the cylinder, so that the piston is sufficiently cooled by the cylinder-walls without internal water circulation. Piston-rings 64 are placed at the thickened central part 65 of the piston. This piston is of such a length that exhaust-ports 80^a in the center of the cylinder are fully opened when said piston has completed either a forward or a backward stroke. Between the motor and air-pump cylinders I provide a water-cooled stuffing-gland 66, having suitable packing 67 on the end of the gland on the air-pump cylinder side. Fixed to the piston 62 and sliding within the stuffing-gland 66 is a piston-rod 68, to which is also secured an air-pump piston 69. The rod 68 is carried through a gland 70^a in the forward cover of the air-pump and is guided by means of a trunk-guide 71. A connecting-rod 72 connects the guide 71 with the power-shaft 72^a, which is inclosed by a casing 70. The air-pump cylinder 60 has at its forward end an air-suction valve 74 and a non-return air-delivery valve 75 diametrically opposite each other. Corresponding valves 76 and 77 are placed at the other end of the pump. (See Figs. 3 and 7.) The delivery-valves 75 and 77 are connected to a reservoir 78, supported above the motor-cylinder, but a little on one side of its vertical axis. Formed on each end of the motor-cylinder and leading to ports 81 and 82 are chambers 79 and 80, containing spring-controlled valves similar to those used in my single-acting engine. When a forward stroke takes place, the air-pump piston 69 displaces air into the reservoir 78 through the pipe 87, some of which air will pass, by means of a pipe 83 and flap-valve 84, into a second reservoir 85. A small pipe 86 from an oil-vaporizer conducts oil or vapor into the pipe 83, whence it is carried by the air into the reservoir 85. When the piston 62 uncovers the ports 80^a, the exhaust-gases in the rear portion of the cylinder pass out through these ports. The pressure there then becoming reduced, the spring-controlled valve 88 opens, causing compressed air from the reservoir 78 to flush the cylinder. Since this air expands within the cylinder, its pressure also becomes less, permitting the spring-controlled valve 89 to open, whereby explosive mixture from the reservoir 85 is admitted to the rear of the cylinder. Pieces of wire-gauze may be stretched across the passages 93 and 94, Figs. 3 and 7, which lead from the reservoir 85 to the cylinder, to prevent firing back when ignition of the charge takes place in the latter. As the piston 62 performs its return stroke compression of the newly-admitted charge and ignition thereof takes place by means of the ignition-plug 81^a in the rear end of the cylinder, while the cycle of operations just described is commenced in the front end of the cylinder. Thus an explosion takes place at each end of the cylinder every revolution of the engine, the exhaust-gases being in each case expelled by compressed air and replaced by a new charge.

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

1. In an internal-combustion engine of the two-stroke-cycle type having an air-displacer discharging into two reservoirs communicating with a chamber connected to the engine-cylinder through openings situated above each other, a valve controlling the passage from the upper opening of the chamber, above a second valve controlling the passage from the lower opening to the engine-cylinder, the upper valve having a hollow stem, and guiding the lower valve, substantially as described.

2. A double-acting internal-combustion engine of the two-stroke-cycle type having a double-acting air-pump delivering into a

scavenging-air reservoir, a second reservoir in valve-controlled communication with the scavenging-reservoir, spring-adjusted scavenging-air and charge-admitting valves controlling passages between both ends of the motor-cylinder and the two reservoirs, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

CHARLES ERNEST DAWSON.

Witnesses:
BERTRAM H. I. MATTHEWS,
GEORGE I. BRIDGES.