No. 810,535. PATENTED JAN. 23, 1906.

H. HEINRICH.

EXPLOSION ENGINE.

APPLICATION FILED APR. 20, 1904.

3 SHEETS—SHEET 1.

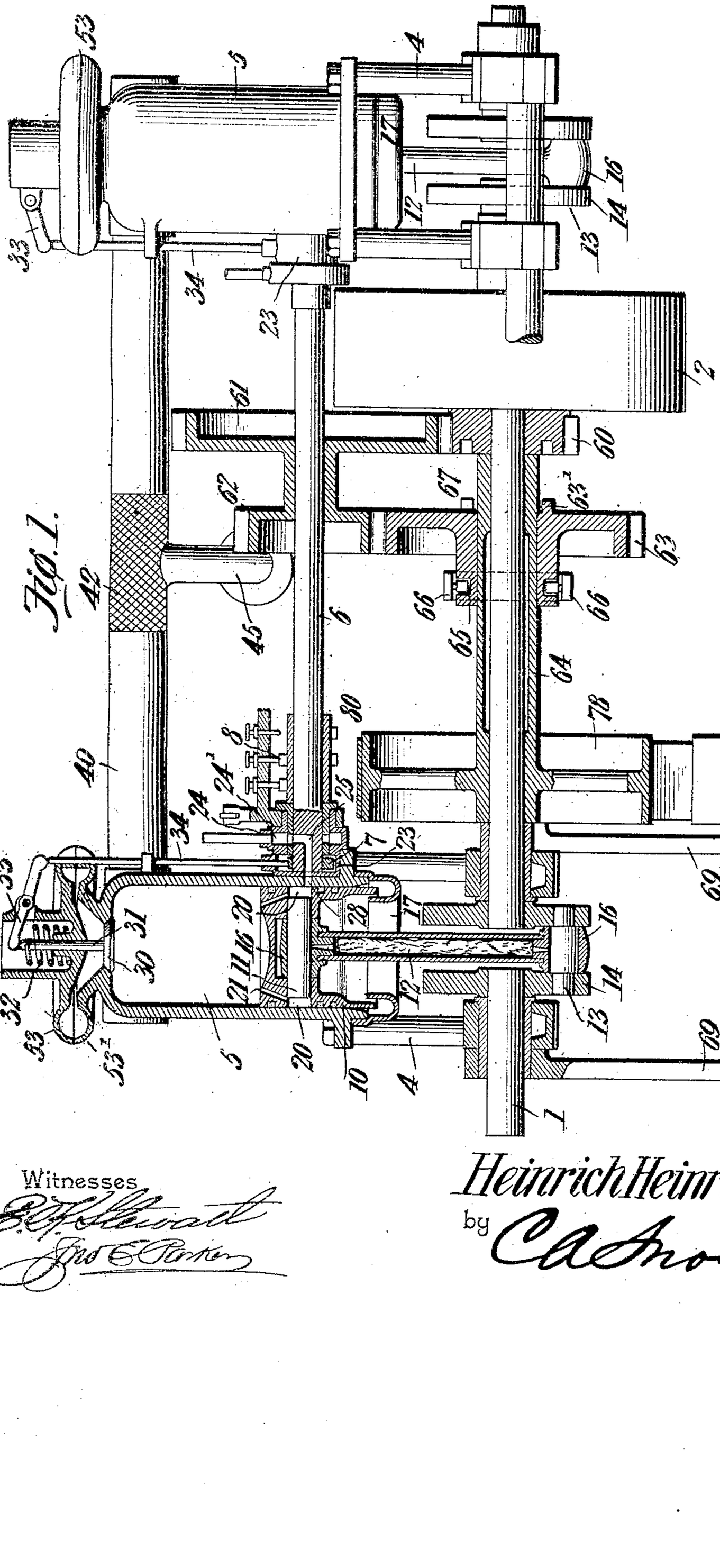

FIG. 1.

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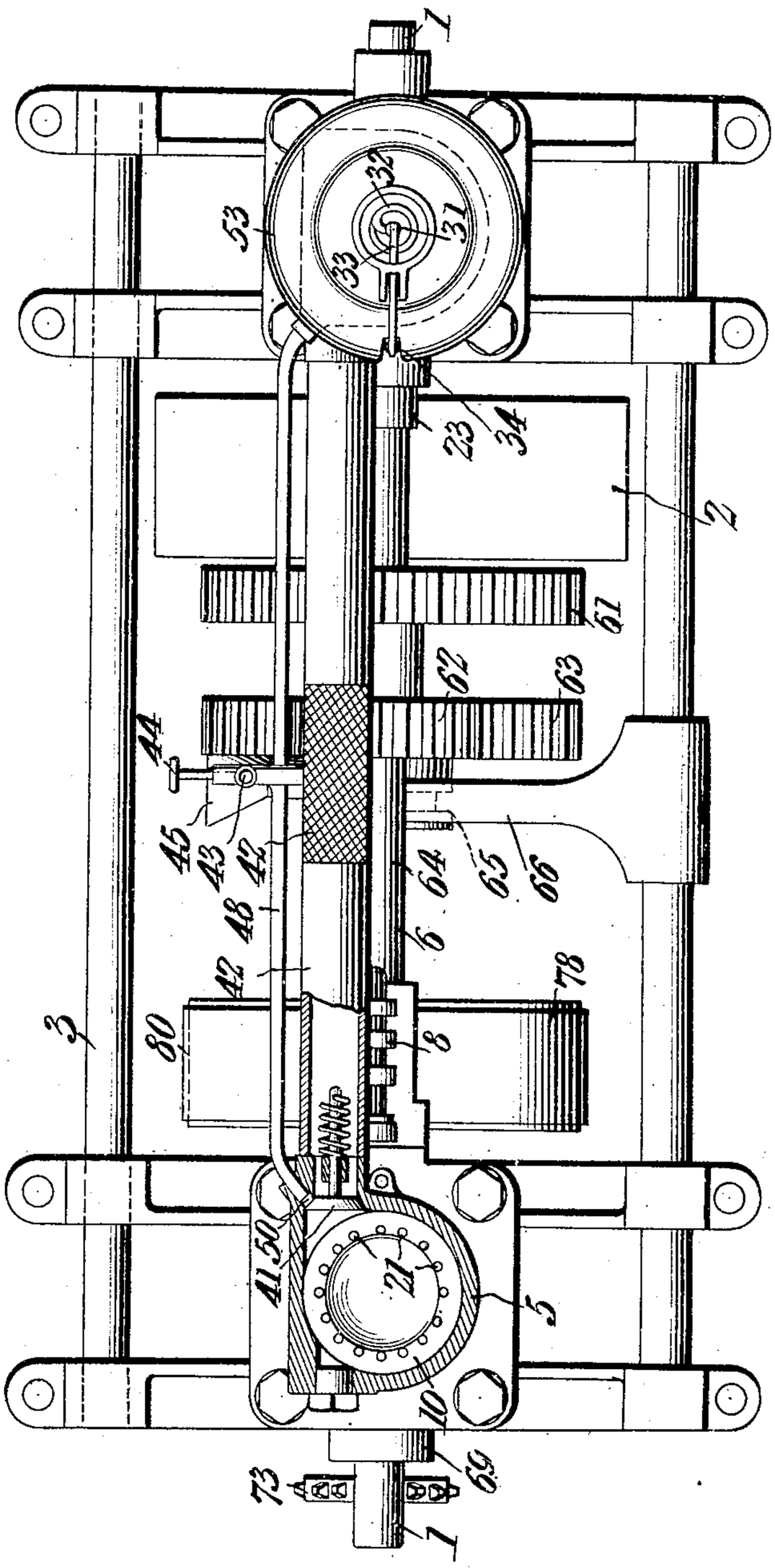
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

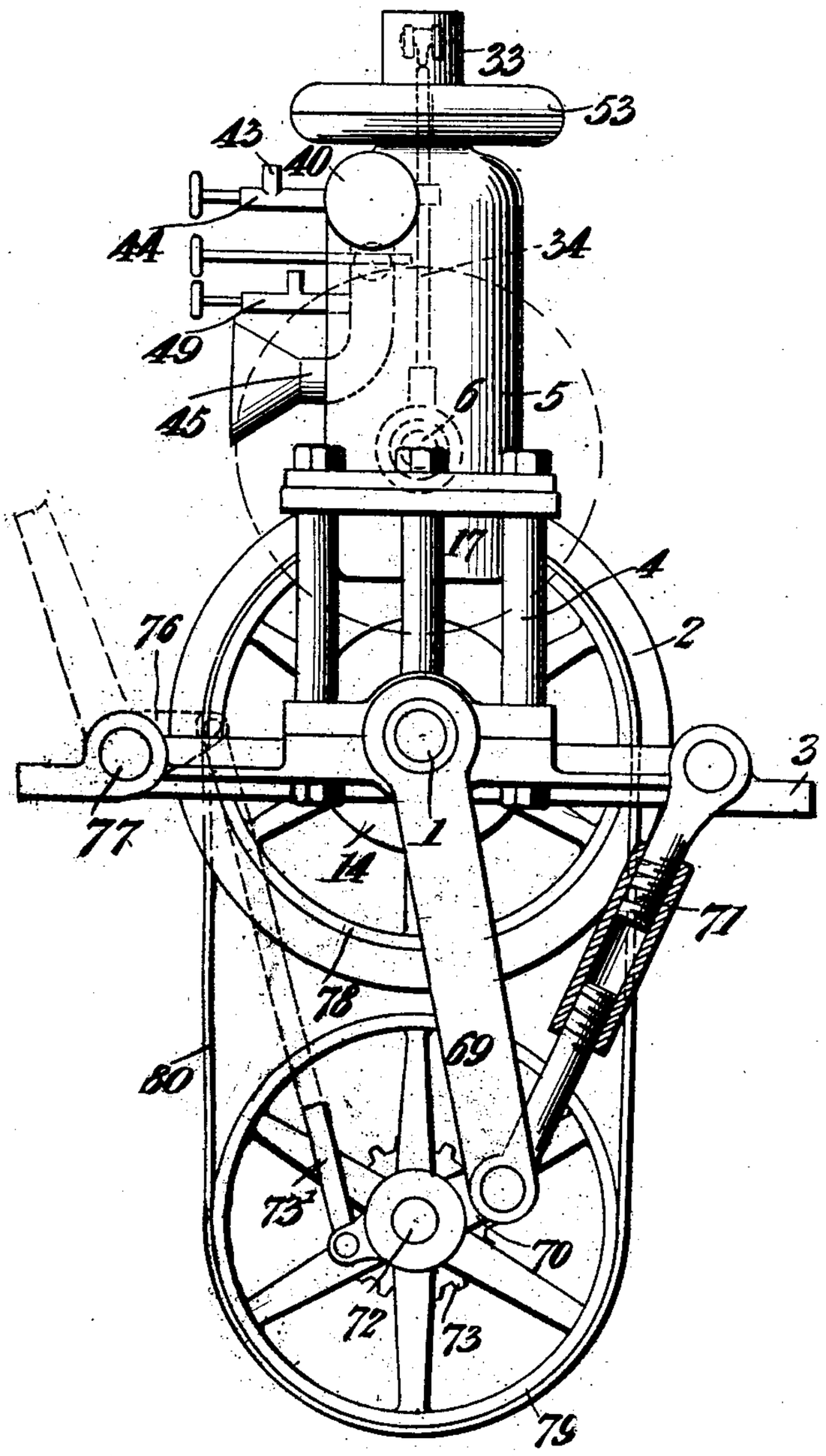


Fig. 4.

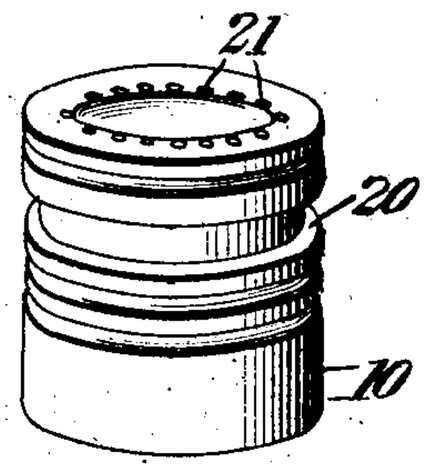
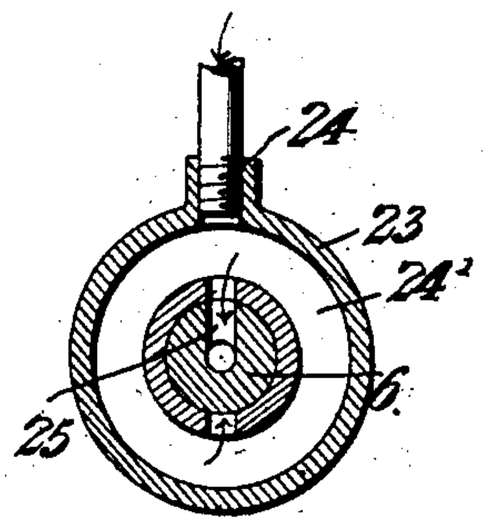


Fig. 5.



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UNITED STATES PATENT OFFICE.

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EXPLOSION-ENGINE.

No. 810,535. Specification of Letters Patent. Patented Jan. 23, 1906.

Application filed April 20, 1904. Serial No. 204,120.

To all whom it may concern:

Be it known that I, HEINRICH HEINRICH, a subject of the German Emperor, residing at Spotswood, in the county of Middlesex and State of New Jersey, have invented a new and useful Explosion-Engine, of which the following is a specification.

This invention relates to improvements in explosion-engines.

One object of the invention is to provide an engine of this class with means whereby water may be introduced into the piston or at a point on the periphery of the piston adjacent to the walls of the cylinder, so that it may be brought into direct contact with the heated walls of the cylinders and assist in cooling the same.

A further object of the invention is to provide an explosion-engine in which the piston has one or more peripheral grooves or channels arranged to be placed in communication with the water-supply, said groove or channel having ported communication with the interior of the cylinder, so that any steam which may form will be conveyed to the inner end of the cylinder.

A still further object of the invention is to provide an explosion-engine in which water is introduced along with the explosive compound into the explosion-chamber, there to assist in reducing the temperature of the cylinder.

A still further object of the invention is to provide in an engine of this class for the control of the flow of water by a valve which governs the admission of the explosive compound.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in the novel construction and arrangement of parts hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figure 1 is an elevation, partly in section, of a two-cylinder explosion-engine constructed in accordance with the invention. Fig. 2 is a plan view of the same, partly in section. Fig. 3 is an end elevation of the engine, portions being shown in section. Fig. 4 is a detail perspective view of one of the pistons. Fig. 5 is a detail sectional view illustrating the connections for supplying water to the piston-channel.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The engine forming the subject of the present invention may be provided with one or more cylinders and may be of the four-cycle or two-cycle type, as desired, and in the present instance the engine is shown as of the two-cylinder four-cycle type, both pistons being connected to a common crank-shaft 1, on which is mounted a suitable balance-wheel 2.

The various working parts are supported in a suitable frame, which in the present instance includes a bed-plate 3, having bearings for the reception of the crank-shaft, and rising from the bed-plate are a number of spaced standards 4, forming supports for the two cylinders 5, provision being made for the support of a counter-shaft 6, to which the main shaft is connected by reducing-gearing, and in accordance with the customary practice the counter-shaft carries the exhaust-valve-operating cam 7 and commutators or other spark-controlling devices 8, the latter being arranged in any suitable or convenient manner and connected to sparking electrodes in the explosion-chambers, these being of any ordinary type.

The cylinders 5 are shown in the present instance as provided with plain unjacketed walls; but it is understood that any ordinary construction may be employed, and the cylinders may be provided with water-jackets or air-jackets, or the outer surface of the cylinder may be ribbed in order to assist in the radiation of heat. In each cylinder is a trunk-piston 10, that is connected by a pin 11 to one end of a connecting-rod 12, the opposite end of which is connected to a crank-pin 13, carried by a pair of crank-disks 14 on the crank-shaft 1. The connecting-rod 12 is formed of a tube adapted for the reception of wicking or absorbent material saturated with lubricating material. To each end of the tubular rod is secured a pin-box 16, having openings in communication with the hollow rod, so that the saturated material will keep the pin connections effectively lubricated.

At the lower end of the cylinder, which in the present instance is arranged vertically,

is an annular cup 17, in which is placed a lubricant, and into this lubricant dips the lower end of the piston at the completion of each downstroke, so that a portion of the lubricant will be carried up by the piston into contact with the inner walls of the cylinder.

The piston is provided with an annular channel or groove 20, arranged in much the same manner as one of the packing-receiving grooves, or there may be more than one of these grooves, if desired. From each groove lead a number of ports 21 to the upper end of the piston, so as to place the grooves in communication with the inner end of the cylinder, and when water is supplied to the groove or grooves such water will be held in contact with the heated inner wall of the cylinder and will absorb heat therefrom to an extent sufficient to keep the cylinder comparatively cool, while any steam which may form will pass through the ports 21 to the upper end of the cylinder, there to mingle with the explosive compound.

The bearings for the counter-shaft 6 are so arranged that the opposite ends of the shaft come close to the lower ends of the two cylinders, and the ends of said shaft pass through suitable bearing-boxes 23, in which are formed openings 24 in communication with a supply of water, preferably under pressure. The water-supply openings communicate with an annular groove 24′, formed in the interior of the guiding-box 23, and this annular groove is in communication with a radially-arranged portion of a right-angled passage 25, formed in the end portion of the shaft 6, leading for the greater portion of its length in the plane of the axis of the shaft to the extreme end thereof, and this passage is at all times in communication with an opening 28, formed in the wall of the cylinder. The opening 28 is so disposed that at the completion of each downstroke of the piston the channel 20 will be brought into alinement with said opening, and water under pressure will be forced into said channel or groove, and thence on the subsequent upstroke of the piston will be carried in constant contact with the inner wall of the cylinder and subjected to the action of heat, while any steam that may form will pass out through the ports 21.

At the top of the cylinder is an exhaust-valve 30, having the usual stem 31, that is acted upon by a coiled compression-spring 32, normally tending to maintain the valve in closed position, and engaging with the valve-stem is a lever 33, that is operated upon by the exhaust-valve cam 7, the movement being transmitted through a rod 34, guided at one end of the cylinder. The valve is operated in the usual manner at every fourth stroke in order to permit the escape of the exploded charge.

In communication with the upper ends of the cylinders is a pipe 40, having at its opposite ends the usual spring-closed inlet-valves 41, which open on the suction-stroke to permit the explosive charge to enter the cylinder. In this pipe is placed a reticulated casing 42, containing any suitable wicking or absorbent material, and this is kept constantly saturated by gasolene or other hydrocarbon flowing through a pipe 43, the quantity of fluid being under the control of a valve 44. The air to be carbureted is sucked in through an inlet-pipe 45, which communicates with the pipe 40 at a point about midway of the reticulated absorbent-holder 42, so that the air will be compelled to pass through the absorbent material and become saturated with the hydrocarbon before entering the cylinder. The degree of saturation of the absorbent is wholly under of the control of the engineer, so that by forming the explosive compound more or less rich in carbon he may to some extent control the speed and power of the engine.

At a point parallel with the pipe 40 is a water-pipe 48, to which water is admitted through a valved inlet 49, and the ends of the water-pipe are in communication with the ports 50, leading directly to the valve-seats of the inlet-valves 41, so that when the inlet-valves are closed the water-supply is wholly cut off; but when the inlet-valves open to permit the passage of the explosive compound the water is also free to flow into the cylinder and assist in cooling the same.

At the top of the cylinder and, if necessary, forming an integral part thereof is a muffler 53 in the form of an annular chamber approximately parabolic in cross-section and having an annular entrance-mouth of contracted width that is in constant communication with the space above the exhaust-valve 30, while at one or more points the muffler may be in communication with the atmosphere, and when the exhaust-valve is open the products of combustion will pass upward through the contracted passage-way and thence expand into the annular passage 53′, and finally escape to the atmosphere without noise.

On the crank-shaft 1 is keyed or otherwise secured a pinion 60, intermeshing with a gear 61 on the counter-shaft 6 in the proportion of one to two, as is usual in engines of the four-cycle type. Secured to the gear 61 is a pinion 62, intermeshing with a gear 63, that is feathered on a hollow shaft or sleeve 64, carried by the main shaft 1. The hub of the gear 63 is provided with an annular groove 65 for the reception of pins or antifriction-rollers carried by a bifurcated shaft-lever 66, which may be of the usual type and operate to shift the position of the gear on the hollow shaft 64, so that said gear may be moved out of mesh with the pin 63′ and clutch members 67 on its hub portion and forced into engagement with mating clutch members formed on the pinion

60, the gears being so related that the gear 63 may be moved to a point midway of its two positions, but out of engagement with both of the pinions 60 and 62, so that the movement of the engine will not be transmitted to the hollow shaft 64, or it may be readily shifted to engage with either of the pinions, and thus transmit to the hollow shaft a movement at varying speeds.

The braces of the main shaft are elongated and form pivotal supports for a pair of hangers 69, which at their lower ends form supports for pivotally-mounted brackets 70, and these hangers are further braced and supported by adjustable rods 71, connected at their upper ends to the bed-plate. The brackets 70 form bearings for the reception of a shaft 72, on which is secured a sprocket-wheel 73 or other devices for the transmission of power, or the shaft itself may be connected directly or indirectly or through the medium of a shaft to the propeller of the boat to be driven or to the axle of an automobile or to any other mechanism to be operated. At that side of the brackets 70, opposite the hangers 69, are connected links 73′, the upper ends of which are secured jointly to the shorter arms of a bell-crank lever 76, that is fulcrumed at 77 to a transverse bolt on the bed-plate. The hollow shaft 64 has a belt-wheel 78, and the lower shaft 72 has a belt-wheel 79, and over these two wheels passes a belt 80 for the transmission of power.

In the operation of the device, it being understood that the engines are of the four-cycle type, it is premised that the piston has completed its suction-stroke and that the space above the piston is filled with the explosive charge. On reaching the position indicated in Fig. 1 water will immediately flow into the annular channel or groove 20 of the piston, and as the piston starts on its upward or compression stroke the water will be kept in constant contact with the inner wall of the cylinder and will absorb heat therefrom, so that should steam form, as it invariably will when the engine is once well running, the steam will pass into the space above the piston and there mingle with the explosive compound. At the proper point, determined by the arrangement of the sparking circuit, the explosion will occur and the piston will be driven outward and the groove or channel will again be brought into communication with the water-supply and water will again enter therein, and on the upstroke of the piston, during the explosion of the explosive gases, the fresh supply of water will again be held in contact with the heated walls of the cylinder, so that at each reciprocation of the piston a volume of cool water will be brushed over the whole of the inner surface of the cylinder within the stroke of the piston, and at the same time the water which enters at the top of the cylinder, along with the explosive charge, will materially assist in keeping the upper portion of the cylinder cool.

The speed at which the hollow shaft 64 and its belt-wheel 78 are rotated will depend altogether on the position of the gear 63, as previously described, and the arrangement of this gear may be altered in very many different ways in accordance with the character of the work which the engine is to perform. Under ordinary circumstances the belt 80 will transmit power to the belt-wheel 79, and thus drive the shaft 72, but by merely shifting the controlling-lever 76 to the extent of a single notch the shaft 72 may be elevated until the belt is slacked and no power is transmitted, although the engine continues running, or, if desired, a slight further shifting of the lever will bring the surface of the belt-pulleys in frictional contact, and the movement of the shaft 72 will be reversed, and the speed during reversal will be precisely the same as that during the ordinary forward movement of the engine.

Having thus described the invention, what is claimed is—

1. In an explosion-engine, a piston having a peripheral groove forming a water-receptacle, a ported cylinder, a revoluble member having a water-passage in communication with the port, and means for rotating said member.

2. In an explosion-engine, a movable piston having a peripheral groove, a cylinder having a port with which the groove may aline, a revoluble shaft having a water-passage in alinement with the groove, a water-supply means encircling the shaft, and means for rotating said shaft.

3. In an explosion-engine, a cylinder having a port for the passage of water, a grooved piston, a revoluble shaft having a water-passage in alinement with the port, a boxing in which said shaft hangs, and water connections for the boxing, said passage having a laterally or radially extending portion in communication with the interior of the boxing.

4. In combination, a cylinder having a port, a piston having a groove which may aline with the port, a revoluble shaft having a passage-way in part extended on a radial line, an annular groove into which the outer end of the passage opens, a boxing encircling the shaft, and water connections for the boxing.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

HEINRICH HEINRICH.

Witnesses:
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ALICE M. DEVOE.