C. J. PETERSON.

REVERSING MECHANISM FOR ENGINES.

APPLICATION FILED MAY 26, 1908.

908,033.

Patented Dec. 29, 1908.

2 SHEETS—SHEET 1.

Fig. 4.

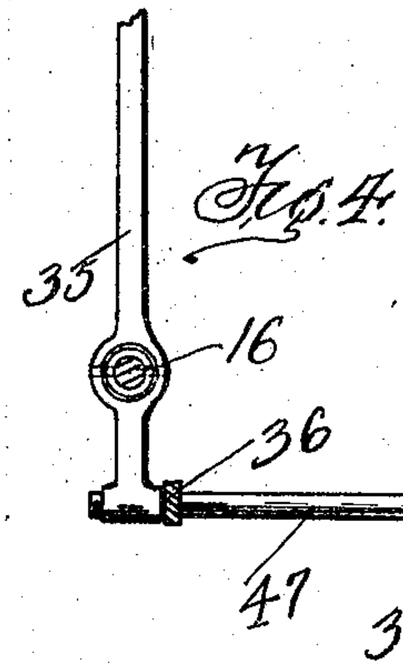

Fig. 1.

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2 SHEETS—SHEET 2.

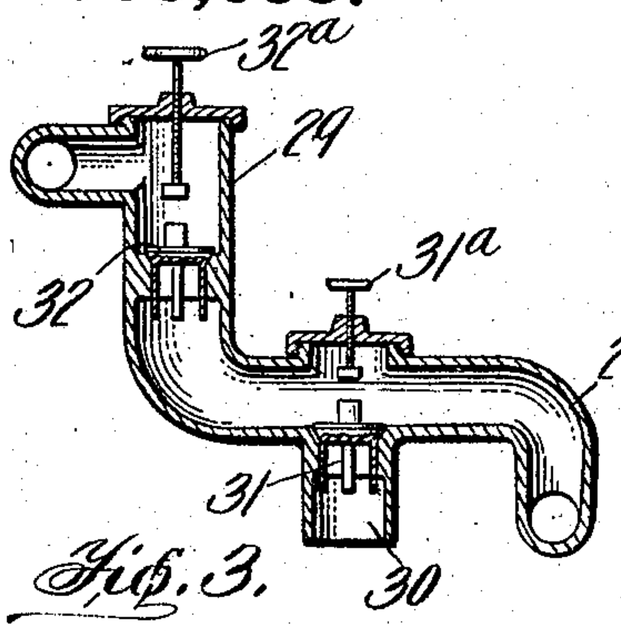

Fig. 3.

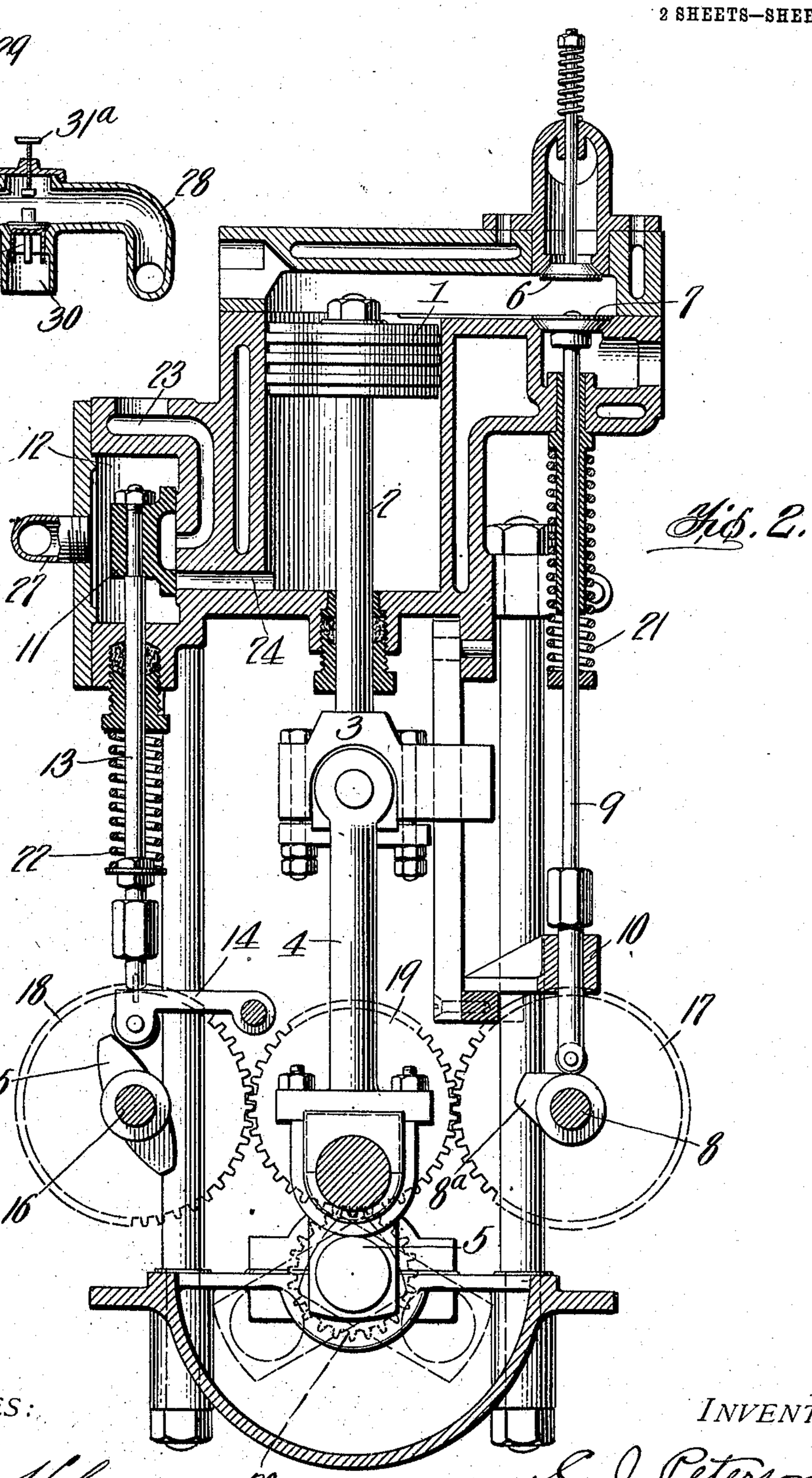

Fig. 2.

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REVERSING MECHANISM FOR ENGINES.

No. 908,033. Specification of Letters Patent. Patented Dec. 29, 1908.

Application filed May 26, 1908. Serial No. 435,051.

To all whom it may concern:

Be it known that I, CHARLES J. PETERSON, a citizen of the United States, residing at Point Richmond, in the county of Contra Costa and State of California, have invented certain new and useful Improvements in Reversing Mechanisms for Engines, of which the following is a specification.

This invention relates to internal combustion motors and involves novel improvements including peculiar starting and reversing mechanism.

The invention also aims to increase materially the power of the explosive engine, under certain conditions of service, by utilizing in connection therewith a pressure medium acting upon the pistons of the cylinders to return the same to the explosive ends of said cylinders after the power stroke is completed. The controlling means whereby the said pressure medium is admitted to the cylinders is of such a nature as to also govern the starting and reversing of the motor, constituting the novel mechanism before referred to.

For a full understanding of the invention, including the merits and advantages thereof, reference is to be had to the following detail description, and to the accompanying drawings, in which:

Figure 1 is a side elevation of an engine embodying the invention; Fig. 2 is a vertical sectional view taken through one of the cylinders of the engine; Fig. 3 is a detail section of the auxiliary valves controlling the supply of compressed air to the reservoir therefor; and Fig. 4 is a detail section on the line 4—4 of Fig. 1 looking in the direction of the arrow.

Corresponding and like parts are referred to throughout the description and drawings by similar reference characters.

Specifically describing the invention, and referring to the drawings particularly, the engine shown is of the four-cycle type, and embodies the three cylinders A, B, and C, in which operate the pistons 1. The cylinders and adjacent coöperating parts are all substantially of the same structure, generally speaking, and one only will therefore be described at this time. The piston 1 of each cylinder has its piston-rod 2 connected with a sliding head 3, the latter being connected by a pitman 4 with the crank-shaft 5. Suitable inlet and exaust valves 6 and 7, respectively, are provided for each cylinder, the exaust valve being operated from a cam shaft 8. The valve 7 has a valve rod 9 operating through a guide 10 and provided with a roller on its lower end with which a cam 8^a on the shaft 8 engages in the rotation of said shaft. The valves 6 and 7 are preferably arranged upon one side of the cylinder while upon the opposite side is located a slide valve 11 arranged in a suitable casing 12. The valve 11 has a valve-rod 13 supported at its lower end on a rocking arm 14, the latter having a roller arranged to be engaged by a double cam 15 carried by another cam shaft 16. The cam shafts 8 and 16 are provided with gears 17 and 18, respectively, which mesh with an intermediate gear 19. The gear 19 is in mesh with a gear 20 applied to the crank-shaft 5, and the shafts 8 and 16 are therefore driven from the crank-shaft.

A spring 21 normally tends to force the valve-rod 9 to the limit of its downward movement, and a similar spring 22 coöperates with the valve-rod 13 in a similar manner. The valve-casing 12 is provided with an exhaust port 23 leading therefrom and the lower end of the cylinder is provided with a port 24 leading to the casing 12. The valve 11 is an ordinary slide valve such as commonly employed on steam-engines and is adapted to connect the port 24 and the exhaust port 23 in an obvious manner, when the pressure medium received in the lower end of the cylinder exhausts therefrom on the down stroke of the piston 1.

It is to be noted that when the engine is going ahead the cam-shafts 8 and 16 rotate in the same direction as the crank-shaft and the valves 11 in the casings 12 of the cylinders move up and down with the pistons 1.

Extending from a compressed air reservoir 25 is an air pipe 26 from which lead branches 27 by which the air is supplied to the valve casings 12. The compressed air is adapted to enter the lower ends of the cylinders A, B, and C from the pipes 27 when the valves 11, of course, reach the upper limit of their movement in regular order in the operation of the engine, the force of the compressed air being exerted against the pistons on every stroke thereof to force the same upwardly, as will be readily apparent. The slide valves 11 operate constantly while the engine is going, in order to supply the compressed air to the lower end of the cylinders at the proper time, and it will be seen that the arrangement

of the parts is such that the air acting upon the pistons 1 does not in any way interfere with the operation of the pistons by the explosion of the explosive mixture received in the upper ends of the cylinders at proper intervals. In other words, in the present invention the combined forces derived from exploding the explosive mixture in one end of the cylinders, and admitting compressed air at the opposite end of the cylinders, are utilized in driving the pistons, such forces acting in opposite directions in the manner described with obvious resultant advantages.

Leading downwardly from the lower end of the cylinder C is a pipe 28 which extends upwardly to a small valve casing 29 arranged adjacent to the outer side of said cylinder C. In the length of the pipe 28 is an auxiliary air inlet 30 normally closed by a valve 31. In the casing 29 is an upwardly opening check valve 32. The piston in the cylinder C is employed as a pump for charging the reservoir 25 with compressed air. In other words, the cylinder C and its piston 1 perform the function of a pump, virtually, for the above purpose. The casing 29 is connected by a pipe 33 with the pipe 26. Handles 31^a and 32^a are provided for the valves 31 and 32, respectively, and when said handles are adjusted so as to occupy the positions shown in Fig. 3, on the up stroke of the piston of the cylinder C air will be drawn into the lower portion of said cylinder through the inlet 30. On the down stroke of said piston the valve 31 closes and the air previously drawn into the lower portion of the cylinder C will be forced through the pipe 28 by the check-valve 32, through the pipes 33 and 26, into the reservoir 25. Whenever the reservoir 25 is sufficiently charged with compressed air the handles 31^a and 32^a may be so adjusted that the stem portions engage and hold the valves 31 and 32 positively closed. Under such conditions the cylinder C and its piston will no longer pump the air to the reservoir 25. A throttle-valve 34 is located between the pipe 27 connected with cylinder A and the point where the pipe 33 joins the pipe 26.

At one end of the engine is provided a shifting lever 35 having a link connection 36 at its lower end with the frame of the engine and suitably connected between its ends, as shown at 37 with one end of the cam-shaft 16. A pin 38 projects from the shaft 16 into a spiral slot 39 formed in the hub of the gear 18. The gear 18 is held for rotation in the same plane as the gear with which it meshes by means of a bracket 40, the shaft 16, however, being longitudinally movable through the gear 18 when the lever 35 is moved either to the right or left. Movement of the shaft 16 longitudinally varies the relative position of said shaft, when rotating or not rotating, with respect to the positions of the gear 18, crank-shaft 5, and pistons 1. Such movement of the shaft 16 shifts the cams 15 carried thereby, which coöperate to actuate the slide valves 11. The slot 39 is of such a length that by moving the lever to the limit of its movement in either direction, a one-third revolution of the shaft 16 and its cams is caused.

A sparker 41 is provided for each cylinder and is operated by a rod 42 and eccentric 43, the latter being carried by the shaft 16. It will be obvious, therefore, that any adjustment of the cams 15 by shifting of the lever 35, when the shaft 16 is rotating or not rotating, will also cause adjustment of the eccentrics 43 which operate the sparking mechanism.

The engine is started by admitting compressed air to one of the cylinders, said air acting upon the lower side of the piston therein to give the necessary initial rotation to the crank-shaft. The air acting upon the lower sides of the pistons leaves the upper sides of said pistons free to be acted upon by explosion of the explosive mixture. In an engine of the type shown and described it will be apparent that the same may be started or reversed from any position at which it may stop. In the position of the parts as shown in Fig. 2 the crank-shaft 5 is turning in the direction of the arrow and the cam-shaft 16 is of course moving in the same direction. Should it be desired to reverse the engine the lever 35 would be operated so as to shift the shaft 16 to the right and this would effect rotary movement of the shaft and the cams 15 and vary the relative positions of the valves 11 and the pistons 1. The slide valve 11 shown in Fig. 2, for instance, would be thrown into a position fully opening the exhaust of the cylinder adjacent thereto, and the adjustment of the valves 11 will be such as to cause the engine to be reversed. The pivotal support of the lever 35 is a shaft 47, shown most clearly in Fig. 4 of the drawings, said shaft connecting the lever with the link 36. On the end of the shaft 47 opposite that carrying the lever 35 is an arm 35^a which is connected with the shaft 8 by means substantially the same as the connecting devices between the lever 35 and the shaft 16. A link 36^a corresponding to the link 36 connects the frame of the engine with the end of the shaft 47 adjacent to the arm 35^a. It will be apparent that on operation of the lever 35, the arm 35^a will be simultaneously operated, and by this means the shafts 8 and 16 are shifted the same time, when the lever 35 is moved, thereby varying the positions of the cams 8^a and 15 with respect to the valves operated thereby.

Having thus described the invention, what is claimed as new, is:

In an explosive engine, the combination of a plurality of cylinders, pistons mounted therein, a crank shaft connected with said

pistons, exhaust and inlet valve mechanism, operating means for said valve mechanism, a compressed air reservoir, valve casings applied to the cylinders and communicating therewith at the lower ends thereof, an air pipe connecting the reservoir with said valve casings, slide valves controlling the admission of compressed air from the valve casings to the cylinders, sparking mechanism for exploding explosive charges in the upper ends of the cylinders, a cam shaft operably connected with the crank shaft for actuation thereby, cams carried by said crank shaft and arranged to operate the slide valves, connections between said cam shaft and the exhaust valve mechanism, a shifting lever for effecting longitudinal movement of the cam shaft, and means including a pin and slot device for varying the relative positions of the cam shaft with respect to the pistons on longitudinal movement of said shaft, whereby the slide valves and sparking mechanism are adjusted to start or reverse the engine.

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

CHARLES J. PETERSON.

Witnesses:

JOHN LINDAHL,

GUST. W. HEDLUND.