No. 875,865. PATENTED JAN. 7, 1908.

E. STUKE.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED APR 11, 1907.

2 SHEETS—SHEET 1.

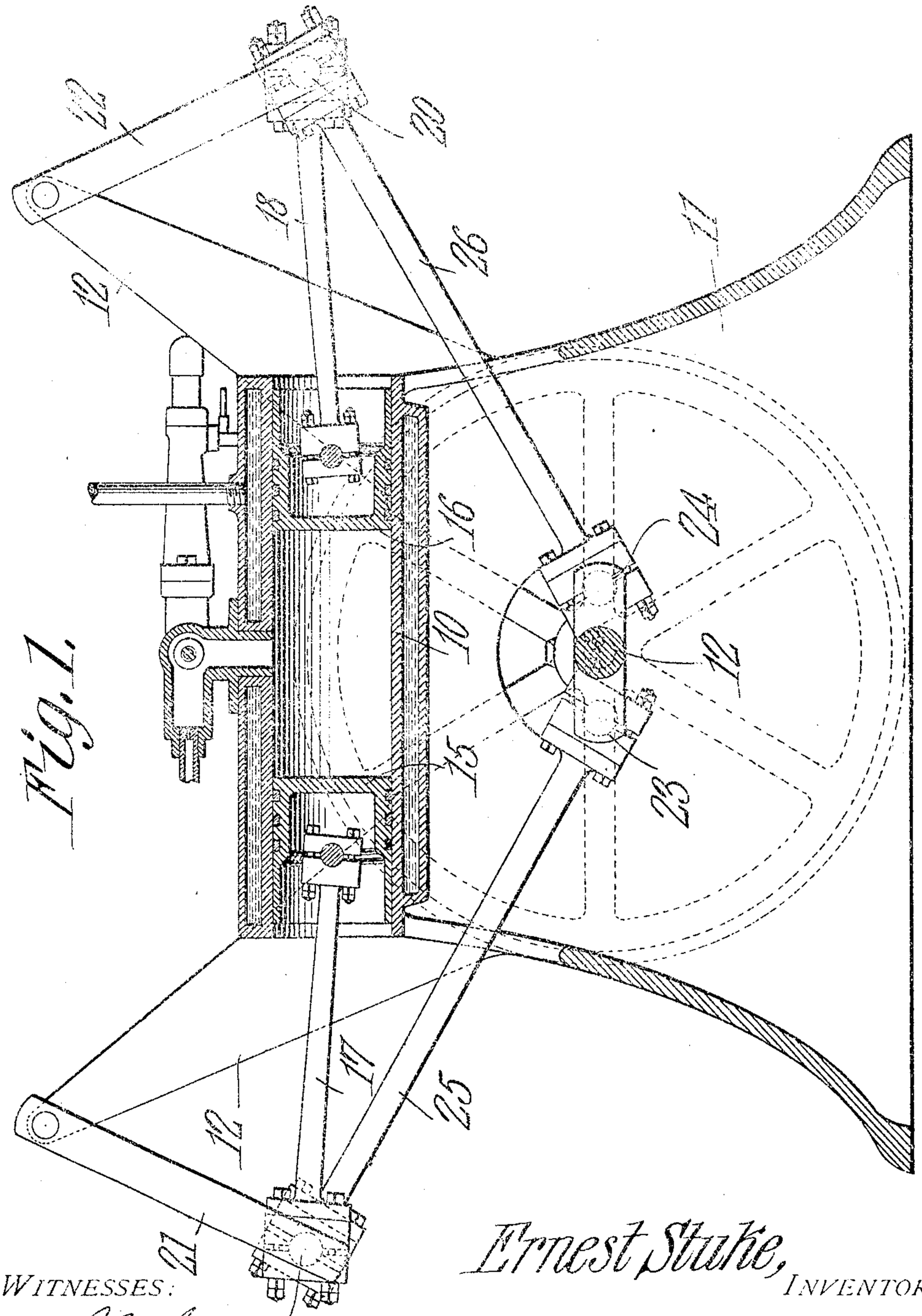

Fig. 1.

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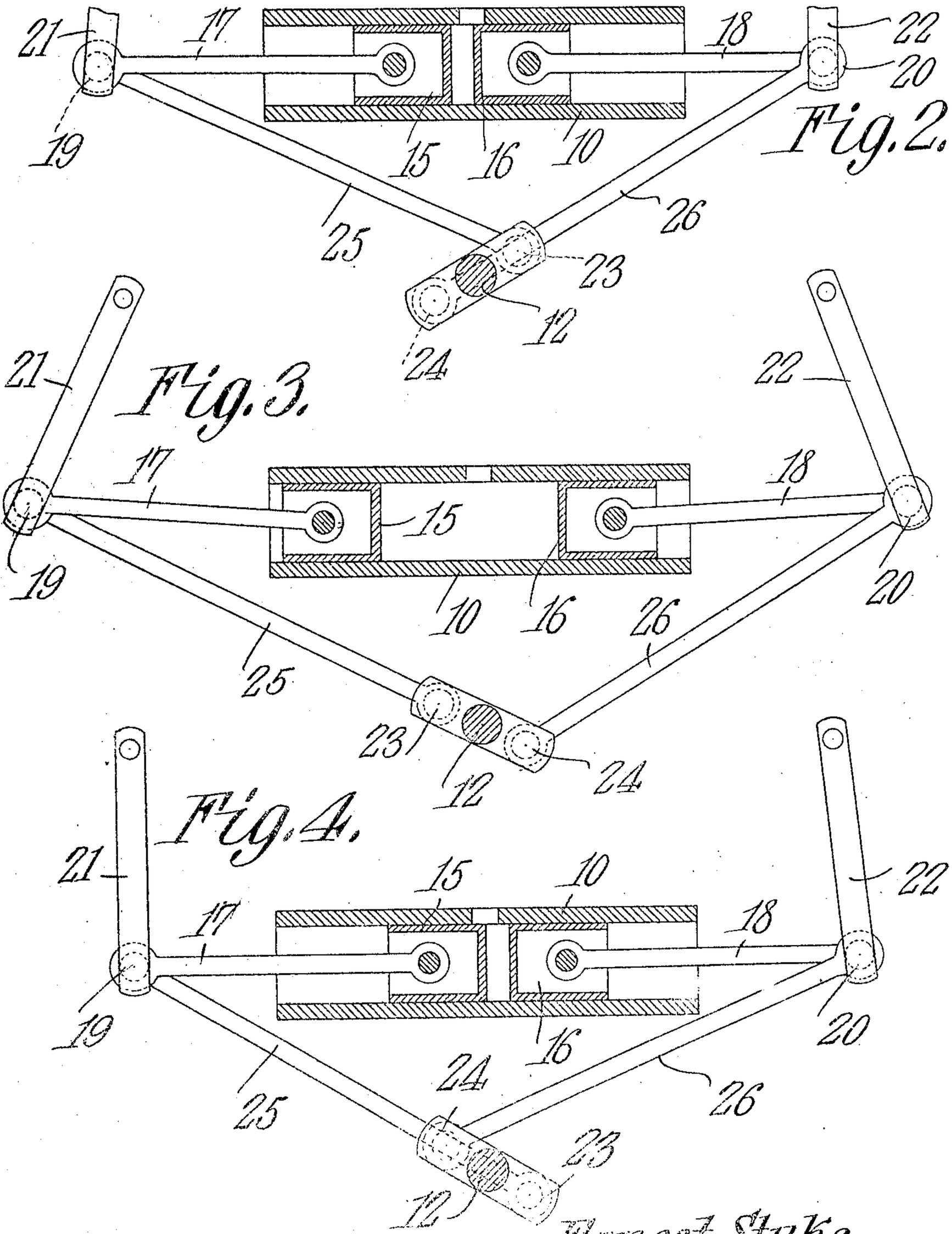

Fig. 2.

Fig. 3.

Fig. 4.

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UNITED STATES PATENT OFFICE.

ERNEST STUKE, OF MERIDIAN, MISSISSIPPI.

INTERNAL-COMBUSTION ENGINE.

No. 875,865. Specification of Letters Patent. Patented Jan. 7, 1908.

Application filed April 11, 1907. Serial No. 367,605.

To all whom it may concern:

Be it known that I, ERNEST STUKE, a citizen of the United States, residing at Meridian, in the county of Lauderdale and State of Mississippi, have invented a new and useful Internal-Combustion Engine, of which the following is a specification.

This invention relates to reciprocatory engines, and while intended more especially for application to engines of the internal combustion type, may be used to advantage in engines that are operated by steam, compressed air or other fluid under pressure.

One of the principal objects of the invention is to provide an engine of this type in which the force due to the explosion of the charge may be utilized to better advantage than in ordinary engines. In internal combustion engines of the ordinary construction, the explosion takes place at the end of the compression stroke, and while the crank is practically on dead center, and has therefore the lowest leverage force, while in carrying out the present invention the explosion is made to occur after the crank has passed a considerable distance beyond the dead center, and is in position to exert nearly its greatest leverage on the shaft.

A further object of the invention is to provide a novel form of engine of the single cylinder two piston type, wherein the positions of the pistons alternate as regards the completion of the inward stroke, that is to say each piston travels alternately to a position about mid-way of the length of the cylinder, while the other piston, which forms the opposite side of the explosion chamber, is at a predetermined distance from the central position after the explosion occurs.

A still further object of the invention is to provide an engine of this construction in which the two diametrically opposed crank pins of a crank shaft are connected to two reciprocatory pistons through the medium of connecting rods that are constantly at an angle to each other, so that it is impossible for both pins and rods to move to a dead center.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts, hereinafter fully 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 a sectional elevation of an internal combustion engine constructed in accordance with the invention. Figs. 2, 3 and 4 are sectional views in the natures of diagrams, illustrating different positions of the pistons, cranks and connections.

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

The engine shown is of the four cycle type, and is provided with a suitable cylinder 10 of uniform diameter throughout its length and open at both ends. The cylinder is mounted on a suitable frame 11 having bearings for a shaft 12, the shaft being horizontally disposed at a point directly in the vertical plane of the center of the length of the cylinder, and preferably below the cylinder as shown, although, of course, the parts may be reversed in order to mount a shaft above the cylinder, if desired. The frame is further provided with a pair of arms or brackets 12 forming supports for portions of the power transmitting mechanism, as hereinafter described. The cylinder is preferably surrounded by a suitable water jacket or other cooling device, and may be provided with any of the ordinary inlet valves, discharge valves, and igniting devices, this portion of the device being of any well known character, and forming no part of the present invention.

Arranged in the cylinder are two pistons 15 and 16 of the trunk type, and these pistons are connected by rods 17 and 18, respectively, with pins 19 and 20 that are hung from the brackets 12 by a pair of links 21 and 22.

Arranged on the crank shaft are two diametrically opposed cranks carrying pins 23, 24 which are connected to the pins 19 and 20, respectively, by rods 25 and 26, these rods being arranged constantly in angular relation to each other, so that it is impossible for the rods and crank pins to be in precisely the same plane, and, therefore, on dead center.

In Fig. 2 the parts are shown in the position assumed when the charge is ignited, it being noted that the working face of the piston 16 is then at a point midway of the

length of the cylinder, and in the vertical plane of the axis of the shaft, while the working face of the piston 15 is moved outward, its corresponding crank pin having moved something less than an eighth of a revolution from the horizontal. This movement of the crank pin, however, is considerably more than is necessary to carry it beyond the dead center, that is to say, the point at which the axis of the crank pin, the axis of the shaft, and the axis of the pin 19 are all in alinement, and the crank pin is, therefore, in a position to exert its greatest leverage force on the crank shaft, and will continue to exert this force with gradually increasing power until the pin reaches a position ninety degrees from the dead center position before mentioned, and thereafter through the descending arc to the opposite dead center will exert gradually decreasing force. The movement under the greatest power, however, carries the opposite crank pin 24 beyond its dead center, and as the piston 16 is moved outward under the force of the same explosion, the leverage force of the crank pin 24 will gradually increase through its first arc of ninety degrees, so that instead of exerting the greatest power on the piston while the crank is on dead center as is usually the case, the power is exerted when the crank is in a position most favorable for transmitting force to the crank shaft.

By the time the pistons have assumed the position shown in Fig. 3, the piston 15 will be at the limit of its out stroke, while the piston 16 has not finished its out stroke, the corresponding crank pin 24 of said piston still having an arc of about thirty degrees to traverse and, during this movement, the final pressure of the exploded charge acting on the piston 16 and crank pin 24 will serve to carry the pin 23 beyond the dead center, the parts then moving approximately to the position shown in Fig. 1. When arrived at this position, the piston 15 is still traveling inward, while the piston 16 is still moving outward, and it is not until the axis of the crank pin 24 reaches the common plane of the axis of shaft 12 and pin 20 that the outward movement of the piston 16 stops and its inward movement starts. Both pistons then move inward, the piston 15 traveling faster than the piston 16 and by the time the crank pins have reached the positions shown in Fig. 4, the working face of the piston 15 will have reached the center of the length of the cylinder, and the products of combustion will have been expelled. During the next out or suction stroke, the piston 16 will follow the piston 15 for a short distance, and then both pistons will move outward in order to create a partial vacuum between them, and thus draw in the charge. At the return or compression stroke, the piston 16 will arrive at the mid-position shown in Fig. 2, and then the explosion will occur, this cycle of operations being repeated so long as fuel is supplied.

One of the principal advantages gained is that the explosive force operates on the piston when the crank of that piston is in a position most favorable for the transmission of power. Another advantage is that the volume of the cylinder is kept less than the volume of either a single or double piston engine of the ordinary type, diameters being equal, for the reason that the working faces of the pistons are never separated a distance equal to double the distance between the two crank pins, which results in a considerable reduction in the quantity of fuel used.

I claim:—

In an engine, a cylinder open at both ends and provided with an inlet port mid-way of said ends, a supporting frame for the cylinder, a pair of trunk pistons disposed in the cylinder, a crank shaft journaled in the frame and having its axis in a vertical plane that extends through the center of the cylinder, a pair of diametrically opposed crank pins carried by the shaft, arms projecting from the frame, a pair of swinging links connected to said arms, pitman rods extending from the crank pins to the free ends of the links, and a pair of piston rods extending from the pistons and pivotally connected to the links at a point adjacent to the connection between the links and pitman rods, the pitman rod connections with the crank pins being at such an angle as to prevent the rods assuming a position in alinement with each other, whereby the trunk pistons will travel in opposite directions, respectively, during the greater portion of the stroke, and in the same direction at each end of the stroke.

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

ERNEST STUKE.

Witnesses:

R. A. EMMONS.

A. BRASWELL.