W. G. STITT.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED MAY 27, 1916.

1,208,854.

Patented Dec. 19, 1916.

3 SHEETS—SHEET 1.

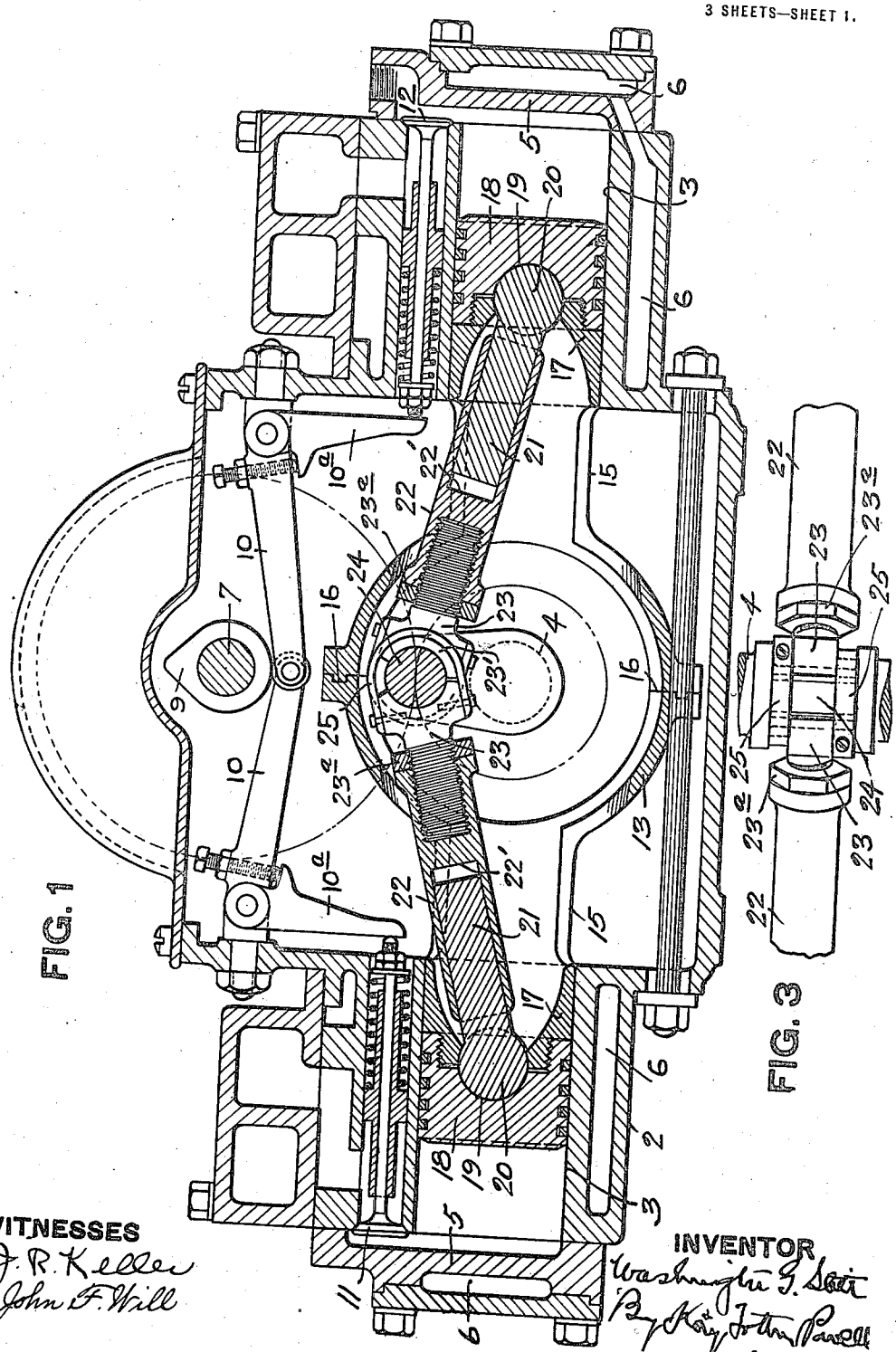


FIG. 1

FIG. 3

WITNESSES

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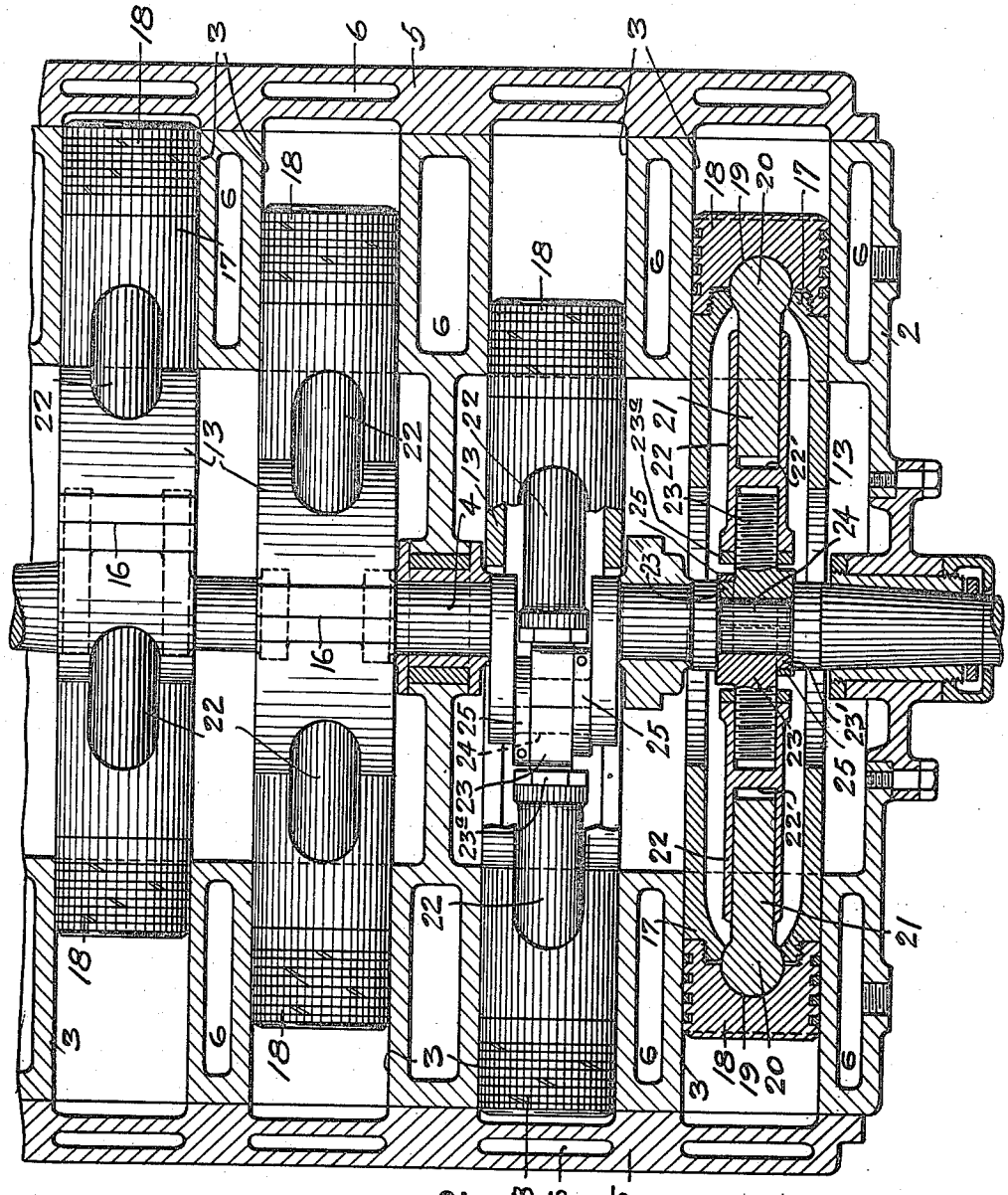


FIG. 2

WITNESSES

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3 SHEETS—SHEET 3.

FIG. 4

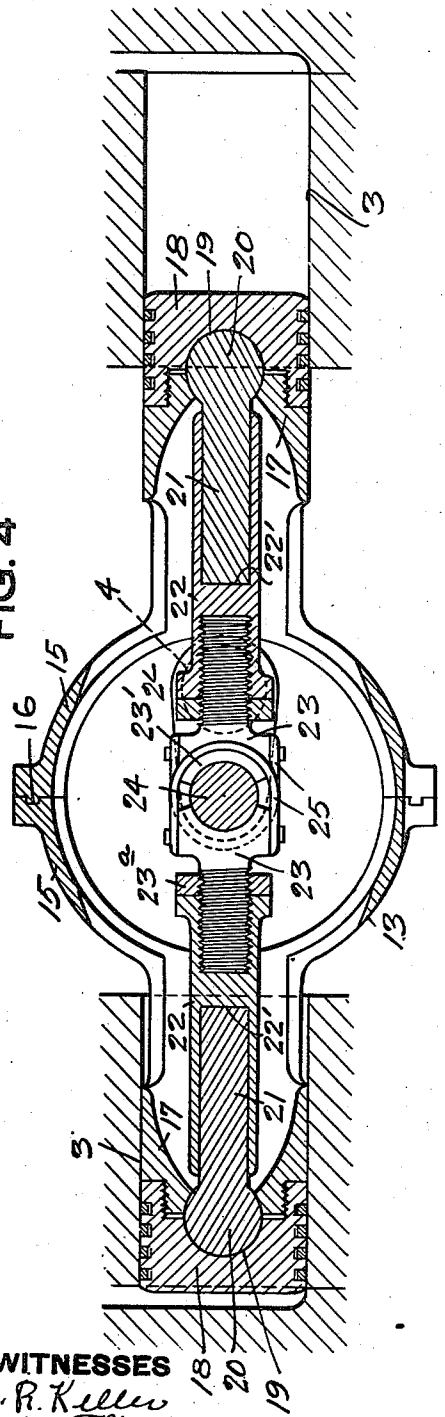
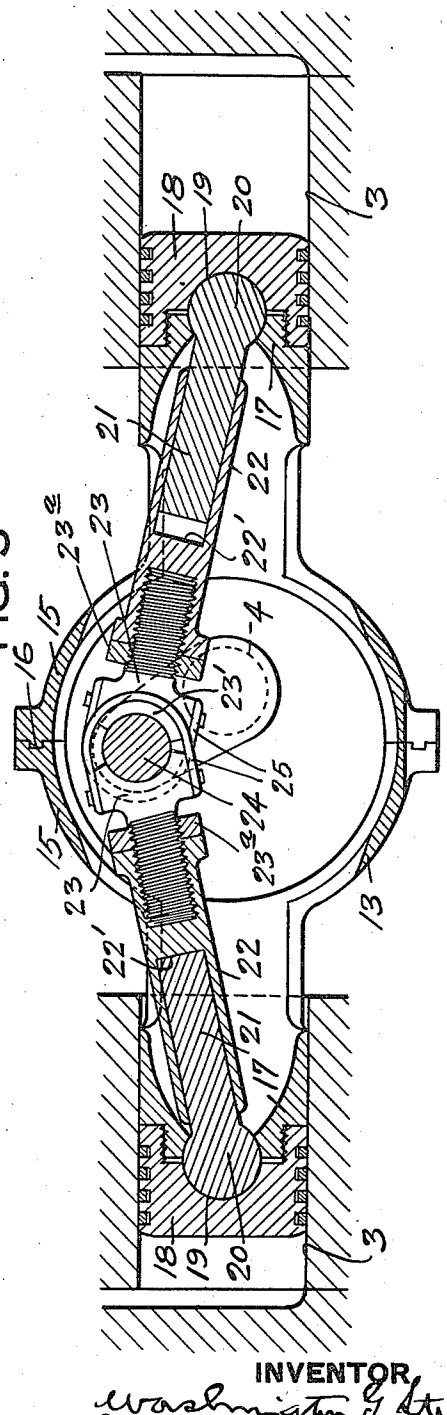


FIG. 5



WITNESSES

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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

1,208,854. Specification of Letters Patent. Patented Dec. 19, 1916.

Application filed May 27, 1916. Serial No. 100,221.

To all whom it may concern:

Be it known that I, WASHINGTON G. STITT, a citizen of the United States, and resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Internal-Combustion Engines; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to internal-combustion engines of four-cycle horizontal opposed cylinder type, and more especially to the arrangement of the cylinders, the construction of pistons and piston-rods.

Heretofore in the construction of engines of this type of four or more cylinders, the practice has been to construct each opposed set of cylinders, or each cylinder as a separate unit, the several units being assembled and bolted to the crank case, and each cylinder of an opposed pair of cylinders being offset one from the other to provide for piston-rod crank-pin bearing.

The chief disadvantages of such arrangement being increased over all length of the engine, separate crank-pin connections, wide separation of cylinders, and difficulties obtain in the alinement of cylinders and parts, increasing the labor in assembling, with attendant high cost in manufacture.

The object of my invention is to improve that class of engines whereby the construction will be simplified and compact, and which can be manufactured cheaply and conveniently assembled.

The invention comprises the construction and arrangement of parts hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a longitudinal vertical section through a pair of opposed cylinders, the piston of the cylinders being in neutral or "balanced" position in respect to the position of the crank; Fig. 2 is a horizontal sectional view through the engine cylinders, the piston of one pair of cylinders being in like section; Fig. 3 is a plan view of a portion of the crank-shaft and piston-rod connections; Fig. 4 is a longitudinal sectional view through a pair of cylinders and piston with the piston at the end of its stroke; and Fig. 5 is a like view showing the position of parts when the piston at the left-hand side of the drawing is at the beginning of the explosion stroke and the other cylinder exhausting.

The numeral 2 indicates the body of an eight-cylinder, four-cycle engine, the cylinders 3 being arranged horizontally in two sets of four, one set each side of the crank-shaft 4. The outer ends of the cylinders of each set are covered by a single head or cap-plate 5. The engine is cooled by water introduced and circulated in suitable spaces 6 formed in the body around the cylinders and in the cap-plates 5.

The body of the engine is shown in its simplest form as a single casting, the cylinders being integral therewith, but I do not desire to limit my invention to a cast-metal body as it is apparent that the body may be pressed metal, and the cylinders be formed of separate seamless tubing, which may be readily exchangeable in case of wear or damage.

The center of the bore of each cylinder is in a plane with the axis of the crank-shaft, and the cylinders of an opposed pair of cylinders have their bores in axial alinement.

Suitable valves and valve-operating mechanism are employed to allow for the different phases of a four-cycle engine; and valve mechanism other than that which is shown may be employed without departing from the principle of my invention. The mechanism shown comprises the cam shaft 7 driven by gearing from the crank-shaft 4, and operates through cams 9 to rock levers 10 and 10^a to open intake and exhaust valves 11 and 12 respectively, the intake valve of one cylinder and the exhaust valve of the opposite cylinder being operated simultaneously by a single cam 9, the valve bores for all of the valves being in the same plane and parallel with the bores of the cylinders.

Each opposed pair of cylinders is provided with a single double-acting piston member 13, formed of two half sections 15 connected as at 16. This member is adapted to connect the pistons of each cylinder and forms a hollow skeleton frame to house the crank and piston-rods, the ends of the members terminating in heads 17 fitting the bore of the cylinder. Piston heads 18 are detachably fitted to the ends of the piston member, such as by thread engagement, and form therewith pivotal sockets 19 adapted

to receive the heads 20 of a piston-rod member 21. Each cylinder has a piston-rod connected to a single crank-pin bearing 24 within the piston member.

The piston-rod for each cylinder comprises the piston-rod member 21 telescoping with a pitman or sleeve member 22, which is adjustably connected to the crank by threaded engagement with a bearing member 23, and locked with the nut 23ª. The sleeve is provided with the wall or bottom 22′ and forms an abutment against which the member 21 seats, as will be hereinafter described. It will be noted that the crank connection for both piston-rods has a bearing face extending the entire length of the crank-pin journal 24, as distinguished from the usual practice of piston-rod connection to the crank-pin in opposed cylinder arrangement. The purpose of this arrangement is to provide ample bearing surface without increasing the length of the crank journal or decreasing the bearing surface of the piston-rod connection to the crank-pin. This is accomplished in the following manner: Each member 23 has only a segmental bearing face in contact with the crank-pin, and has a flanged end portion 23′ which forms a journal bearing concentric with the crank-pin, and is adapted to receive a strap 25 which connects it to the member 23 of the opposite piston-rod.

In the operation of my improved engine, the movement of the double piston imparts rotary motion to the engine shaft through its telescoping piston-rods comprising the members 21, 22 and 23. In Fig. 4 is shown the position of these members when the piston is at the end of its stroke, the crank on "dead" center, and the piston-rods in their shortened position. It will be observed in this view that both piston-rod members 21 are in engagement with their seats 22′. Assuming that this position of the crank represents the piston at the beginning of the explosion stroke, movement of the piston to the right from this position, as indicated in Fig. 5, will cause member 21 at the left hand to remain in contact with its seat during the expansion stroke of the piston, or for 180° movement of the crank. The other piston-rod, by reason of its connection to the same crank-pin will, during movement of the piston, elongate the member 21 separating from its seat 22, elongation commencing at the beginning of the stroke and continuing until the crank has moved 90 degrees, when shortening of the distance between the crank-pin and the opposite end of the piston will cause members 21 and 22 to move together, which movement continues until the crank is again on "dead" center and the piston at the end of its stroke in the opposite direction.

It is obvious by consideration of the foregoing that a reverse movement of the piston will cause the right hand piston-rod members to impart motion to the crank while the left-hand piston-rod adjusts itself longitudinally.

The advantages of the invention will be found to reside in the provision of a multiple cylinder engine of the type described, which can be cheaply and conveniently manufactured,—which is compact in size, and readily adaptable to modern automobile and motor boat construction,—which provides for maximum crank-throw without wide separation of cylinder sets.

What I claim is:

1. In an internal-combustion engine, the combination with a pair of opposed cylinders, of an engine crank-shaft, a single piston member common to both cylinders, and extensible piston-rods within the piston member journaled in each end of the piston member and journaled to a single crank-pin of the crank-shaft.

2. In an internal-combustion engine, the combination with a pair of opposed cylinders, of an engine crank-shaft, a single piston member common to both cylinders, and extensible piston-rods within the piston member and having like non-shiftable journal connections to the piston and to a single crank-pin of the crank-shaft.

3. In an internal-combustion engine, the combination with a pair of opposed cylinders, of an engine crank-shaft, a single piston member common to both cylinders, and extensible piston-rods within the piston member having relatively fixed journal connections to the piston member and having like opposite connections to a single crank-pin of the crank-shaft.

4. In an internal-combustion engine, the combination with a pair of opposed cylinders, of an engine crank-shaft, a single piston member common to both cylinders, and piston-rods within the piston member, having relatively fixed journal connections to each end of the piston member, said piston-rods being composed of a piston-rod member and a pitman member having sliding connection with each other.

5. In an internal-combustion engine, the combination with a pair of opposed cylinders, of an engine crank-shaft, a single piston member common to both cylinders, and piston-rods within the piston member, having relatively fixed pivotal connections to each end of the piston member, said piston-rods comprising members telescoping one within the other.

6. In an internal-combustion engine, the combination with a pair of opposed cylinders, of an engine crank-shaft, a single piston member common to both cylinders, and extensible piston-rods within the piston member centrally journaled to each end of

said member in respect to the longitudinal axis thereof, and having alined journal connections with the crank pin of the crank shaft.

7. In an internal-combustion engine, the combination with a pair of opposed cylinders, of an engine crank-shaft, a single piston member common to both cylinders, and piston-rods within the piston member having fixed pivotal connections with each end of said member, automatically adjustable longitudinally to the throw of the crank of the crank-shaft.

8. In an internal-combustion engine, the combination with a pair of horizontally opposed cylinders, of an engine crank-shaft, a single piston member common to both cylinders, and extensible piston-rods oppositely disposed having relatively fixed pivotal connections to said member and to the crank of the crank-shaft within the piston member.

9. In an internal-combustion engine, the combination with a pair of opposed cylinders, an engine crank-shaft, a single piston member common to both cylinders, and extensible piston-rods within the piston member centrally journaled in each end of said member and having alined pivotal connections with the crank of the crank-shaft.

10. In an internal-combustion engine, the combination with a pair of opposed cylinders, an engine crank-shaft, a single piston member common to both cylinders, and extensible piston-rods within the piston member having relatively fixed journal connection with said member, said piston-rods comprising a piston-rod member and a pitman member, said pitman member being adjustable longitudinally, and means for locking said member in adjusted position.

11. In an internal-combustion engine, the combination with a pair of opposed cylinders, an engine crank-shaft, a single piston member common to both cylinders, and extensible piston-rods within the piston member having nonvariable journal connections to each end of said member, said piston-rods comprising a piston-rod member, and a pitman member, said pitman member having an adjustable crank bearing portion, and means for locking said bearing portion to said pitman.

12. In internal-combustion engines, the combination with a pair of opposed cylinders, of an engine crank-shaft, a single piston member common to both cylinders, and extensible piston-rods oppositely disposed within the piston member journaled centrally in each end of said member and each having a bearing portion with a bearing face extending for the full width of the crank-pin of the crank-shaft, said bearing portions having their opposite ends formed into journals concentric with the crank-pin, and straps engaging said journals connecting both bearing portions.

In testimony whereof, I, the said WASHINGTON G. STITT, have hereunto set my hand.

WASHINGTON G. STITT.

Witnesses:
ROBT. D. TOTTEN,
JOHN F. WILL.