Jan. 7, 1941. A. TURNER 2,227,853

MULTIPLE-PISTON ENGINE

Filed July 5, 1938 2 Sheets-Sheet 1

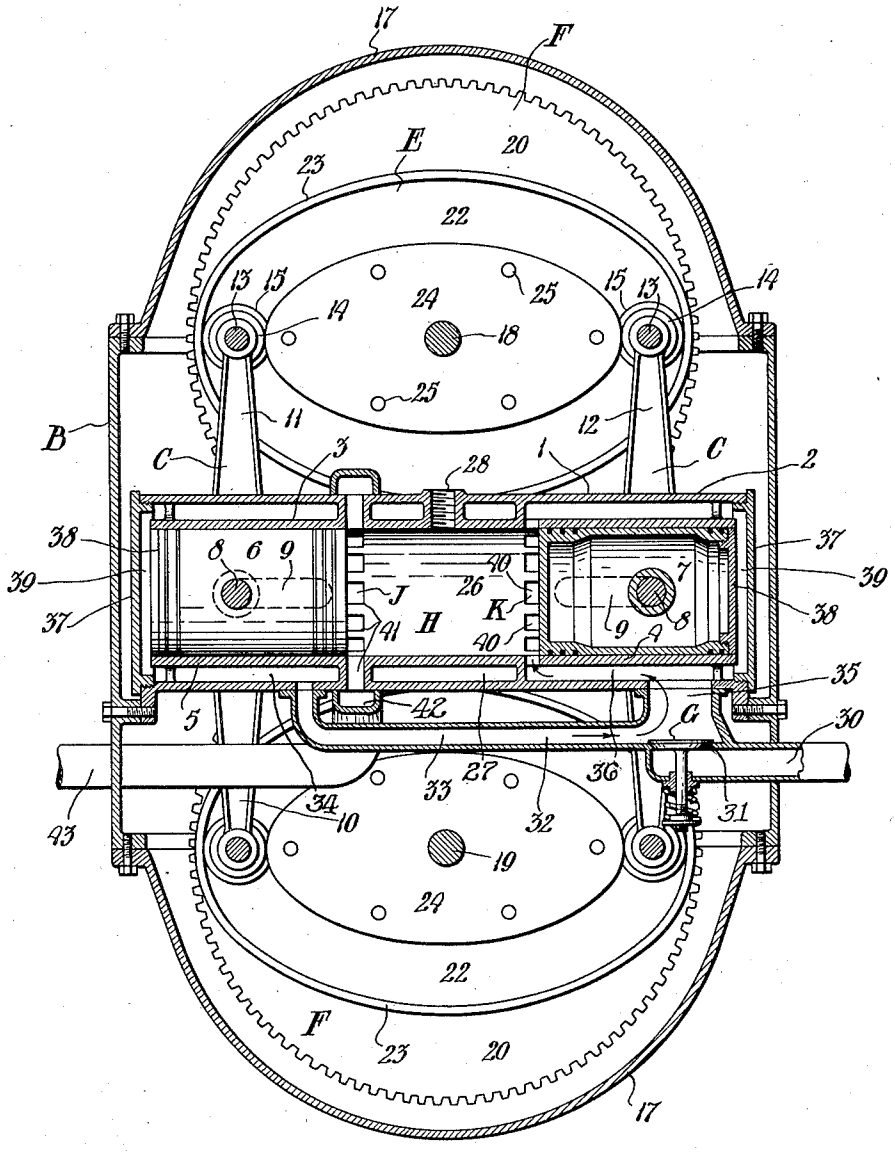

FIG. 1.

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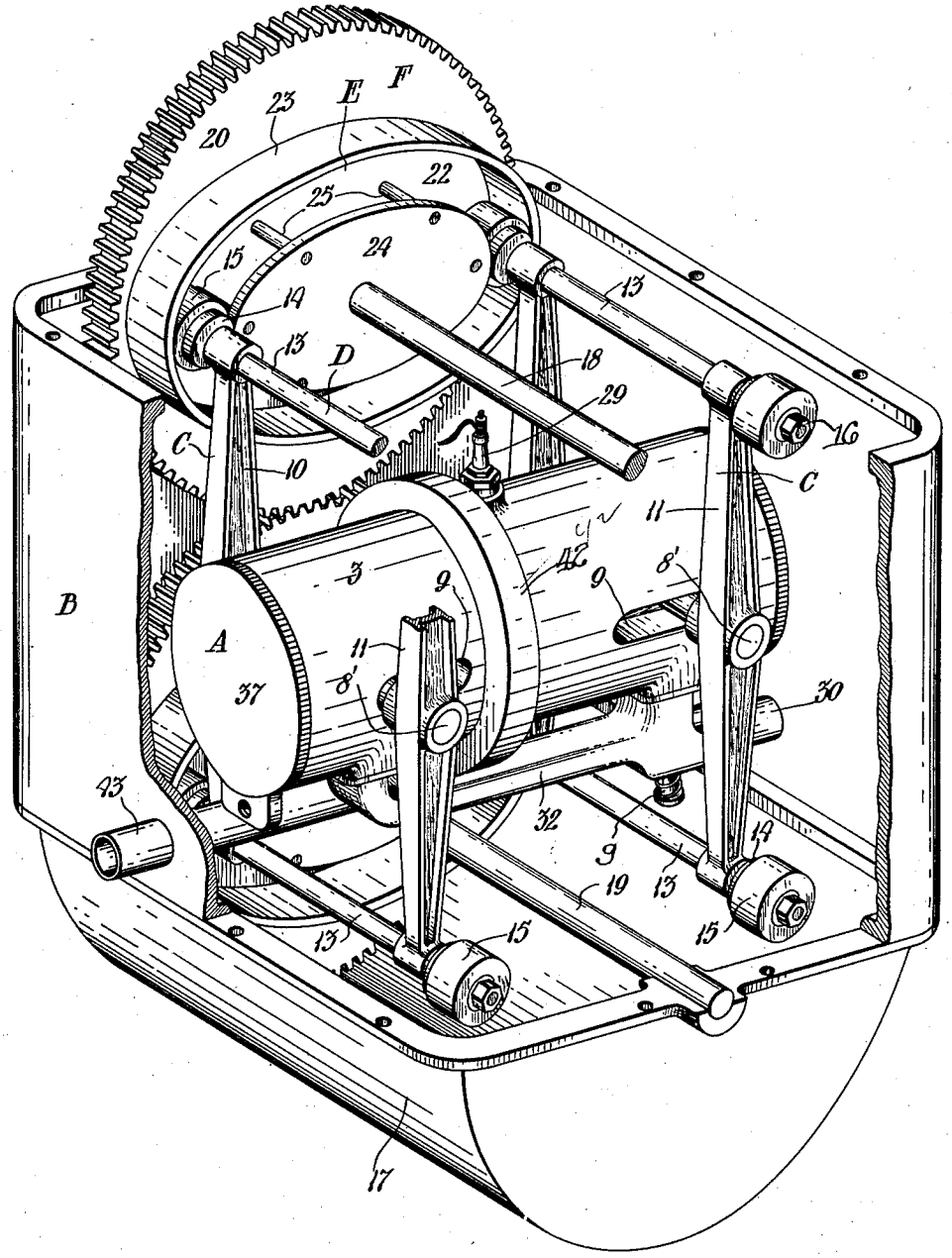

Fig. 2.

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UNITED STATES PATENT OFFICE

2,227,853

MULTIPLE-PISTON ENGINE

Algernon Turner, Prince Albert, Saskatchewan, Canada

Application July 5, 1938, Serial No. 217,639
In Great Britain July 6, 1937

6 Claims. (Cl. 123—51)

My invention relates to improvements in multiple-piston internal expansion engines, and an object of my invention is to provide an expansion engine, the principles of which may be employed in an internal combustion engine, or by slight modifications, in a steam engine, air compressor pump or the like, the structure herewithin described and illustrated applying to internal combustion gasoline engines.

A further object of my invention is to provide an engine of the character herewithin described in which side thrust and wear upon the pistons such as takes place in conventional internal expansion engine design, is eliminated, the side thrust being "balanced out" in the case of my engine by the opposite rotation of the cam.

A further object of my invention is to provide an engine of the character herewithin described in which the intake and exhaust ports are at opposite ends of the cylinder in contrast to conventional internal expansion engine design thus permitting a more complete scavenging action and less dilution of the fuel charge.

A further object of my invention is to provide an engine of the character herewithin described in which the power impulses are not applied direct to a crank shaft as in conventional practice but are applied to cams positioned at diametrically opposed points, thereby reducing vibration and permitting the use of lighter weight transmission shafts.

A further object of my invention is to provide a device of the character herewithin described in which improvements in the balancing of the engine are attained by the provision of equal weights in direct opposition to each other and moving in opposite directions at all times.

A further object of my invention is to provide an engine in which the necessary power may be produced by the use of a small number of large diameter cylinders instead of a larger number of small cylinders as is the case in standard internal combustion engine design.

A further object of my invention is to provide a device of the character herewithin described in which wear is eliminated to a very considerable extent, and in which the principal wear takes place in parts which may be very easily and inexpensively replaced.

A further object of my invention is to provide a device of the character herewithin described in which manufacturing and upkeep costs are both inconsiderable compared with standard internal combustion engine practice, and in which fuel consumption will be materially decreased over that required in the case of an internal expansion engine of standard type of equal horse power, to a motor of the type herewithin described.

With the above more important objects in view and such other minor objects as may appear as the specification proceeds, my invention consists essentially in the arrangement and construction of parts all as hereinafter more particularly described, reference being had to the accompanying drawings, in which:

Figure 1 is a sectional elevation of my multiple-piston engine.

Figure 2 is a perspective illustration of my engine with a portion of the casing shown broken.

In the drawings like characters of reference indicate corresponding parts in the different figures.

I am aware that it is common practice to employ a pair of co-axial opposed cylinders, each having a piston therewithin secured to a connecting rod which is in turn secured at its opposite end to a crank shaft positioned within a crank case positioned between the two opposing cylinders, such engines having been used considerably for the propulsion of motorcycles. My invention, however, differs radically from the foregoing and although illustrated and described herein as a two-stroke engine may be modified to operate on a four-stroke cycle if desired. The same may briefly be said to consist of a cylinder A, positioned within a casing B, two pistons being positioned for movement in opposition one to the other within the cylinder. Each of the pistons is provided with a diametrically extending gudgeon pin which extends through a pair of diametrically opposed and longitudinally extending slots 9, positioned upon each side of the central transverse axial plane of the cylinder, the ends of the gudgeon pins forming trunnions.

A connecting rod C is secured centrally to each of the trunnions, the connecting rods being paired and connected at their outer ends by a shaft D to each end of each of which is journalled a cam-follower. The cam-followers ride in a cam track E secured upon the inner side of each of two pairs of meshing fly wheels F, the position illustrated in Figures 1 and 2 of the accompanying drawings corresponding to "top dead-centre" in the conventional type of engine.

Driving fluid enters through the valve G, being sucked into the manifold during the movement of the pistons towards each other, during which time driving fluid in the compression chamber H is compressed to be ignited (in the case of gasoline and the like) by a spark whereupon the pis-

tons are forced apart, the exhaust gas being discharged through the ring of apertures J, and at this time the charge of fuel which has been sucked in on the compression stroke is forced, by the outward thrust of the pistons into the compression chamber to form a fresh charge, the same entering via the ring of intake apertures K.

Having now given a brief description of my invention, a detailed statement of its construction will follow.

My invention consists of a cylinder block 1 which includes a spaced outer jacket 2 and an inner cylinder 3 divided into two portions, a right hand portion 4 and a left hand portion 5, the cylinder block as will be clearly apparent from the drawings accompanying this application, lying in a horizontal position.

Within the cylinder 3 is a pair of opposed pistons 6 and 7, the piston 6 occupying the left-hand portion 5 of the cylinder, and the piston 7 occupying the right-hand portion 4 thereof when the motor is at dead center. A gudgeon pin 8 extends diametrically and horizontally through each piston and through a pair of aligned diametrically opposed slots 9 extending horizontally upon the sides of each of the portions 4 and 5, the outer end of the gudgeon pin constituting trunnions 8'.

Secured centrally and rigidly to each of the trunnions, is a connecting rod 10 of the configuration clearly illustrated, and for clarity I will designate the connecting rods associated with the piston 6 by the numeral 11 and those associated with the piston 7 by the numeral 12. At each end of each of the four connecting rods is a spindle 13 upon which is journalled at each end thereof, a cam follower 14 and a second cam follower 15 of slightly larger diameter for a reason presently to be described, the assembly being suitably secured as by means of the nut 16.

Journalled in the semi-cylindrical housing 17 upon drive shafts 18 and 19, I provide two pairs of fly wheels 20 and 21, (these latter not shown but in all respects similar to the fly wheels 20 and balancing the same), these fly wheels being geared upon their peripheries with the two fly wheels upon each side being in mesh one with the other.

Suitably secured upon the inner face of each of the fly wheels is a cam track 22, these cam tracks being elliptical in shape and consisting of an outer flange 23 and an inner elliptical plate 24 secured to the inner face of each of the fly wheels as by means of studs 25.

The periphery of each of the flanges 23 is parallel to the periphery of each of the plates 24, but it will be noted by reference to Figure 2 of the drawings accompanying this application, that the peripheries of the plates 24 are slightly off-set with respect to the outer edge of each of the flanges 23, the arrangement being that the cam followers 14 will ride the periphery of the plate, while the slightly larger cam followers 15 will ride the inner surface of the flanges 23.

The engine as illustrated, is in the position which corresponds to "top dead-center" in the conventional type of internal expansion engine, and in this position it will be seen that the pistons 6 and 7 are at their maximum distances apart.

The central portion of the cylinder 3 which constitutes my compression and explosion chamber 26, is suitably water jacketed as at 27, and I provide an aperture 28 extending through this portion for the attachment of a spark plug 29 or for a fuel injector if the engine should be designed upon the Diesel principle.

At the end of my fuel intake 30 I locate my fuel intake port 31, the intake communicating via the port, with a manifold 32, consisting of a conduit 33 leading to the cylinder jacketing chamber 34, and a short conduit 35 leading to a similar cylinder jacketing chamber 36. At each end of the cylinder and sealed at each end thereof by the end-plates 37 and the piston caps 38 is a suction chamber 39.

As previously stated, this engine as illustrated and herein described, works upon a two-stroke cycle (although by a slight modification can be made to work upon a four-stroke cycle if desired), and upon the compression stroke, which is the stroke wherein the two pistons approach each other, fuel is drawn in through the manifold 32 by the suction created by the inward movement of both pistons. When the pistons have reached the inner end of their travel, the port 31 is closed by the valve G and the power stroke forces them apart. This has the effect of causing both pistons to force the fuel trapped in the manifold and in the suction chambers in the direction of the arrows and into the compression chamber 26 under pressure through the circumscribing ring of apertures 40.

Simultaneously with the intake of fuel through these apertures, the products of combustion are being exhausted through a similar ring of apertures 41 which communicate with the circumscribing exhaust conduit 42 which in turn communicates with the exhaust pipe 43.

From the foregoing, it will be obvious that I have provided a highly ingenious type of motor which has the advantage of perfect balance by the use of a minimum number of pistons, and in which, for this reason, vibration and consequently friction, are very considerably diminished.

Since various modifications can be made in the above invention, and many apparently widely different embodiments of same, made within the scope of the claims without departing from the spirit and scope thereof, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense and I desire only such limitations placed thereon as are specifically expressed in the accompanying claims.

What I claim as my invention is:

1. Improvements in multiple-piston engines comprising the combination with a cylinder, a piston therewithin, connecting rods attached to and movable with said piston, an intake port, an exhaust port and a fly wheel, of a cam upon said fly wheel, said cylinder being provided with diametrically opposed and longitudinally extending slots on the cylindrical wall thereof, diametrically opposed trunnions upon said piston, said trunnions extending through said slots, said connecting rods being secured to said trunnions, said connecting rods being also in engagement with said cam to rotate said fly wheel upon movement of said piston between the position of maximum compression and maximum exhaustion.

2. Improvements in multiple-piston engines comprising in combination a cylinder, a pair of pistons therewithin, each of said pistons being movable in opposition one to the other and positioned upon either side of the central transverse axial plane of said cylinder, an intake port, and an exhaust port communicating with the interior of said cylinder, said cylinder being provided with a pair of diametrically opposed and longitudi-

nally extending slots upon the cylindrical wall thereof upon each side of said central transverse axial plane, a diametrically opposed pair of trunnions upon each of said pistons, each pair of said trunnions extending through each of said pairs of diametrically opposed slots, a connecting rod secured to each of said trunnions, a plurality of fly wheels, said connecting rods being in driving association with said fly wheels, to rotate the same upon movement of said pistons between the position of maximum compression and maximum exhaustion.

3. In a multiple-piston engine comprising in combination, a cylinder, a piston therewithin, said cylinder being provided with diametrically opposed and longitudinally extending slots upon the cylindrical wall thereof, diametrically opposed trunnions upon said piston extending through said slots, connecting rods, each of said connecting rods being secured to one of said trunnions, an exhaust port and an intake port, communicating with the interior of said cylinder and at least one fly wheel in driven association with at least one of said connecting rods.

4. In a multiple-piston engine comprising in combination, a cylinder, a piston therewithin, said cylinder being provided with a pair of diametrically opposed and longitudinally extending slots upon the cylindrical wall thereof, a pair of diametrically opposed trunnions upon said piston, each of the trunnions of said pair extending through one of said slots, an intake port and an exhaust port communicating with the interior of said cylinder, a pair of connecting rods, each connecting rod being secured centrally to one of said trunnions, the longitudinal axis of said pair of connecting rods being normal to the longitudinal axis of said cylinder, a pair of fly wheels upon each side of said cylinder, the axis of rotation thereof being normal to the longitudinal axis of said cylinder and also normal to the longitudinal axis of said connecting rods, a cam upon each of said fly wheels, the opposing ends of each of said connecting rods being in driving engagement with one of said cams.

5. Improvements in multiple-piston engines, comprising in combination, a cylinder, a pair of pistons therewithin, each of said pistons being movable in opposition one to the other and positioned upon either side of the central transverse axial plane of said cylinder, an intake port and an exhaust port communicating with the interior of said cylinder, said cylinder being provided with two pairs of longitudinally extending diametrically opposed slots upon the cylindrical wall thereof, a pair of diametrically opposed trunnions upon each of said pistons, said trunnions extending through said slots, one trunnion through each slot, a rigid connecting rod secured centrally to each of said trunnions, the longitudinal axis thereof being normal to the longitudinal axis of said cylinder, a pair of fly wheels upon each side of said cylinder, the two fly wheels of each pair opposing the two fly wheels of the remaining pair, each of the opposing fly wheels being mounted for rotation upon a common drive shaft, said drive shaft being normal to the longitudinal axis of said cylinder and also normal to the longitudinal axis of said connecting rods, a cam upon each of said fly wheels, the opposing ends of each of said connecting rods being in driving engagement with said cams.

6. Improvements in multiple-piston engines comprising in combination, a cylinder sealed off at each end thereof from the atmosphere, a pair of oppositely moving pistons therewithin, the central cubic area of said cylinder constituting a combustion chamber having inlet and exhaust ports therein, transverse trunnions secured to said pistons and projecting through longitudinal slots formed medially upon the wall of said cylinder, one piece connecting rods attached to said trunnions and at right angles to the axis of said cylinder, a pair of fly wheels, the axis of rotation of said fly wheels being normal to the axis of said cylinder, an elliptical cam track upon said fly wheels, rollers upon the ends of said connecting rods engageable with said cam track, a spaced jacket extending around said cylinder, said jacket being capped at each end, a manifold communicating with said jacket upon either side of the central transverse axial plane thereof and with the ends of said cylinder whereby said pistons may alternately draw in and compress a metered charge of fuel and in compressing the same, also force it through said inlet port and into said combustion chamber.

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