May 8, 1956 E. W. SHERMAN 2,744,505

TURBINE-TYPE ENGINE

Filed Oct. 19, 1953 2 Sheets-Sheet 1

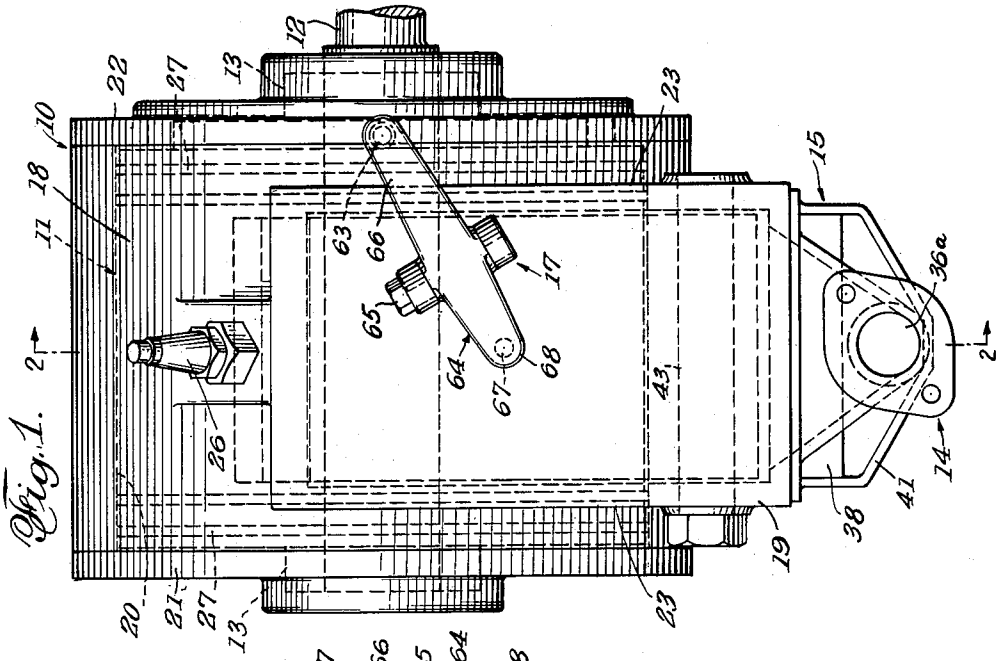


Fig. 1.

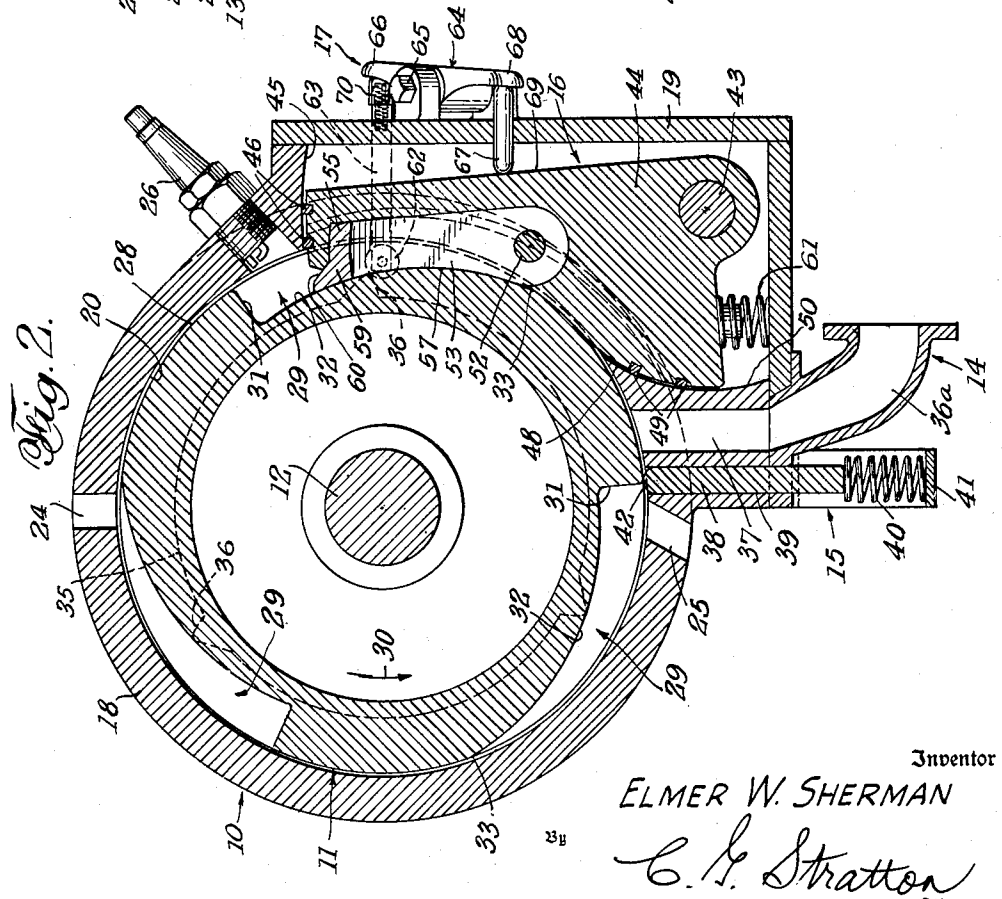


Fig. 2.

Inventor
ELMER W. SHERMAN
By C. L. Stratton
Attorney

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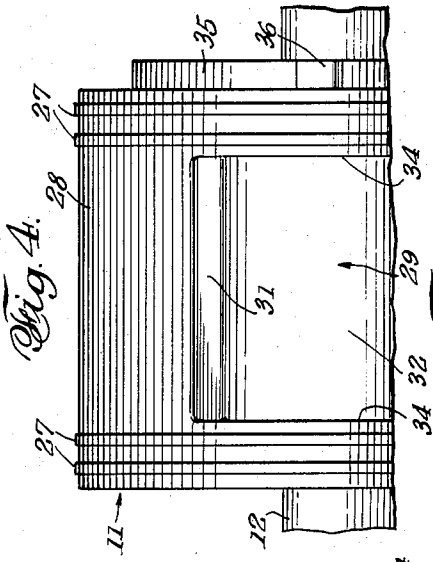


Fig. 4.

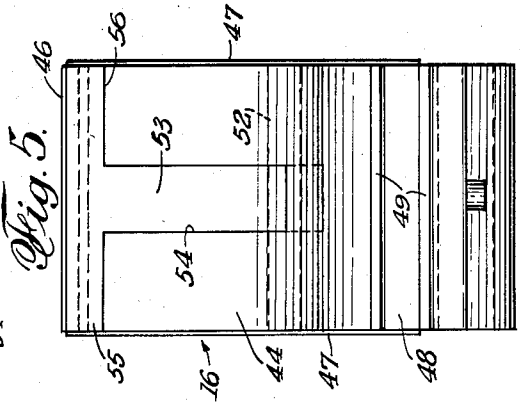


Fig. 5.

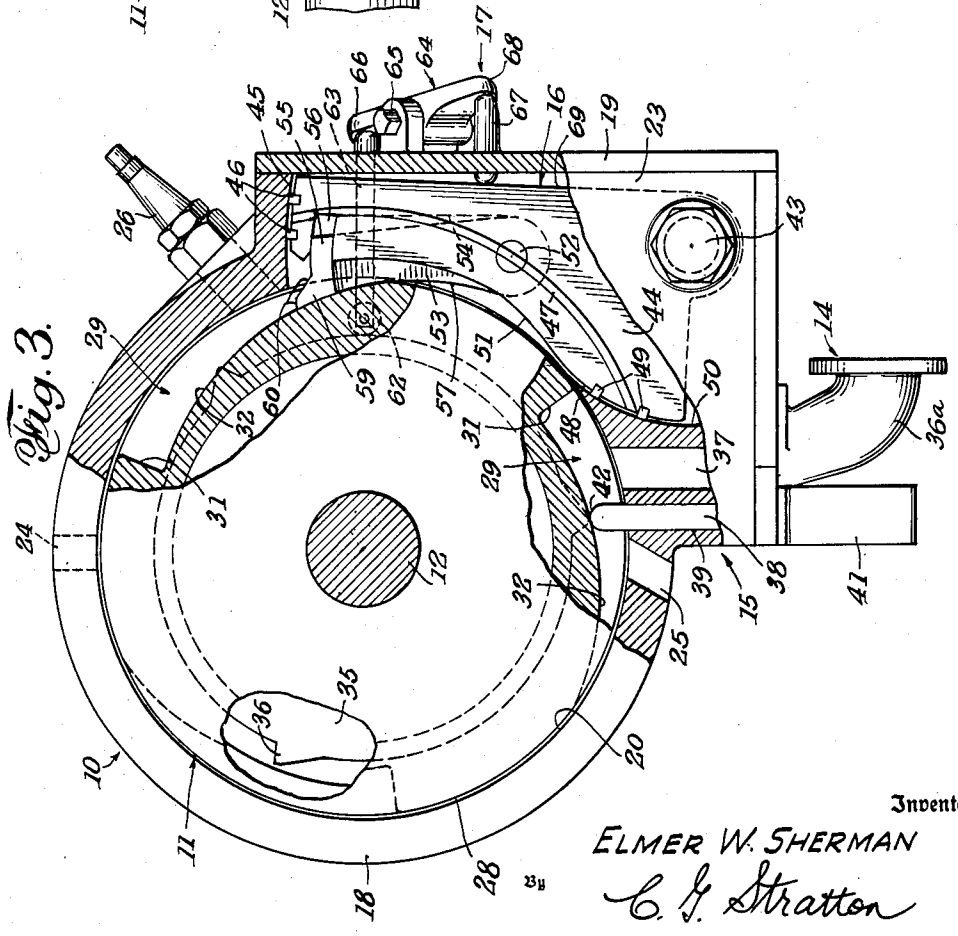


Fig. 3.

Inventor

ELMER W. SHERMAN

By C. G. Stratton

Attorney

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2,744,505

# TURBINE-TYPE ENGINE

Elmer W. Sherman, Van Nuys, Calif.

Application October 19, 1953, Serial No. 386,906

5 Claims. (Cl. 123—15)

This invention relates to turbine-type or rotary internal combustion engines.

The invention is characterized by extreme simplicity and compactness and has for an object to provide novel and efficient means for feeding fuel and compressing the same for efficient operation.

Another object of the invention is to provide novel and automatic means to simultaneously scavenge the engine of burnt spent gases and supply a new charge of fuel thereto.

A further object of the invention is to provide an engine, as indicated, in which a fuel-holding rotor is combined with novel means to compress a charge of fuel during ignition of said charge to impart rotation of said rotor.

A still further object is to provide novel means to control the fuel-compressing means.

The invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description. However, the drawings merely show and the following description merely describes, one embodiment of the present invention, which is given by way of illustration or example only.

In the drawings, like reference characters designate similar parts in the several views.

Fig. 1 is an elevational view of a turbine-type internal combustion engine embodying the features of the present invention.

Fig. 2 is a cross-sectional view as taken on line 2—2 of Fig. 1, the engine being shown in firing position and just before a new charge of fuel is to be supplied.

Fig. 3 is a view similar to Fig. 2 except that some of the parts are shown in side elevation and the engine is at the end of its power stroke and in the process of simultaneously scavenging and receivng a new fuel charge.

Fig. 4 is an elevational view of a portion of the rotor of said engine.

Fig. 5 is a similar view of fuel-compressing means operatively associated with the rotor.

The engine that is illustrated comprises, generally, a stator 10, a rotor 11 in said housing and mounted on a shaft 12 journaled in bearings 13 in said stator, a fuel inlet 14 connected to the stator, means 15 to simultaneously and automatically scavenge spent burnt gases from the engine and supply the same with a fresh charge of fuel-compressing means 16, and means 17 controlled by the rotor 11 to move the means 16 into and out of fuel-compressing position in synchrony with the rotation of said rotor.

The stator 10 comprises a cylindrical housing 18 provided with a generally rectangular extension 19 which,



in the manner shown, is mainly disposed to one side of the axial center of said housing, represented by shaft 12, and, in part, depending below the housing proper. The housing extension 19 is substantially narrower than housing 18, as can be seen in Fig. 1, so that the internal bore 20 of housing 18 is, in part, interrupted by the space formed by housing extension 19. Side plates 21 and 22 close the sides of housing 18 and serve to carry bearings 13. The latter plate has a central opening that passes shaft 12 which is the power take-off of the engine. The housing extension 19 is closed at the sides by walls 23.

The manner in which the engine may be disposed in operation is immaterial. However, it will be assumed for the purposes of this description that inlet 14 is at the bottom and that housing extension 19 is as hereinbefore described.

The housing 18 is shown with a peripheral opening 24 at the top and with a similar opening 25 at the bottom. Both these openings constitute exhaust ports for burnt spent gases. Adjacent the upper end of housing extension 19, the housing 18 mounts a spark plug or similar ignition device 26, the electrodes of said device being directed toward the interior of said housing.

The rotor 11 has a running fit in the bore 20 of housing 18 and, at the opposite sides thereof, is provided with sealing rings 27 substantially as shown. Between the rings 27, the peripheral face 28 of the rotor is provided with three uniformly spaced recesses or pockets 29. While three pockets are shown, the number may vary as will later become clear.

The present rotor, in operation, turns in a counterclockwise direction, as indicated by arrow 30. Each pocket 29 is defined by a radial wall or abutment 31 that is the leading edge of said pocket, a convexly curved base wall 32 that extends from the bottom edge of wall 31 to a point 33 on the peripheral face 28 of the rotor, and lateral walls 34. The width of said pockets 29 corresponds to the width of housing extension 19 between the inner surfaces of walls 23 of the latter, the pockets and said extension being aligned. At one side thereof, the rotor 11 carries a cam 35 on the periphery of which is provided a set of uniformly spaced cam lugs 36 that control the means 17 in proper synchrony with the operation of the other components of the engine.

The fuel inlet 14 is shown as a T fitting 36*a* that is connected to any conventional supply source, such as a carburetor, and a port 37 in housing 18 in communication with said fitting and opening into bore 20 of said housing. The width of said port is shown as conforming to the width of pockets 29 and the same is aligned with said pockets.

The means 15 comprises a vane 38 that is slidably guided in a guide-way 39 formed in housing 18 and located immediately adjacent exhaust port 25 and radially beyond said port with respect to the direction of rotation of rotor 11. A spring 40 backed by a bracket 41 urges the rounded end 42 of said vane either against the peripheral face 28 of the rotor or against the convexly curved base walls 32 of the pockets. Hence, said vane 38 is of a width to slidingly fit the pockets.

The fuel-compressing means 16 is mounted in housing extension 19 on a transverse pivot 43 extending between walls 23. Said means is shown as comprising a main compression arm 44 that is carried by said pivot and extends upwardly in housing extension 19 into sealing engagement with an arcuate face 45 that defines the upper end of said housing extension. Sealing bars 46 are carried by the upper edge of said arm to effect efficient gas-tight sliding engagement between face 45 and the upper end of arm 44. Also, the side faces of arm

44 are provided with strips 47 that seal against the inner faces of walls 23. To complete the seal between arm 44 and housing extension 19, a convexly curved edge 48 of arm 44, generated on an arc with pivot pin 43 as the center, carries sealing strips 49 that are in sealing engagement with a similarly curved face 50 of the housing extension. In this manner, said arm 44 closes the opening in bore 20 that connects said bore and the interior of extension 19. The convexly curved edge 48 is continued upward as a concavely curved edge 51.

Intermediate its ends, arm 44 is provided with a transverse pivot pin 52 on which is carried an auxiliary arm 53 that resides in a recess 54 formed in arm 44 and has a T-shaped head or end 55 that is movable in a transverse slot 56 in said arm 44. Said auxiliary arm 53 has a concavely curved face 57 that complements the surface 51 of arm 44 when the former is retracted in recess 54. Said auxiliary arm is adapted to swing forwardly partly out of recess 54, as shown in Fig. 3. The T end of arm 53 has an upper extension 59 that defines faces 60 that cooperate with the walls of a pocket 29, with which arm 53 is in operative association, to define the limits of said pocket as a combustion chamber. The arms 44 and 53 are, in part, counterbalanced by a spring 61 which acts to urge said arms away from the rotor 11 on pivot 43.

The means 17 is controlled by cam 35 and moves the compression means 16 so that the same enters that pocket 29, which, at the time, is moving therepast. As shown, the means 17 comprises a cam roller 62 on a stem 63 directed radially with respect to the axis of shaft 12 outward from extension 19, a rocker 64 on a pivot 65 having one arm 66 thereof engaged with said stem 63, and another stem 67, parallel to stem 63, extending between the other arm 68 of the rocker and face 69 of arm 44. As shown, one of the stems, for instance stem 63, is made to be contractable by the provision of a spring-urged cap 70 thereon that obviates binding of the means 17 as a cam lug 36 acts to press said means and arm 44 into fuel-compressing position.

In operation, assuming that some means, such as a self-starter, sets up rotation of rotor 11, as a pocket 29 moves past vane 38, the rounded end 42 of the latter snaps into said pocket immediately adjacent wall 31. Thus, said pocket has an initially small capacity or size and as counter-clockwise rotation continues, a progressively larger size. Since a vacuum tends to form in the expanding pocket between wall 31 and vane 38, a full charge of fuel is drawn into said pocket from inlet 14.

As the rotor progresses, the fuel-containing pocket moves opposite arms 44 and 53 which are both retracted away from the rotor. However, leakage of the fuel is obviated by the sealing means 46, 47 and 49. Now, as the fuel-containing pocket reaches the point of the stator where spark plug 26 is located, a cam lug 36 causes inward movement of the means 16, to the position of Fig. 2, to effect compression of the fuel into a relatively small portion of said pocket, as shown. At this instant, plug 26 is electrically charged to produce a spark that ignites said compressed charge of fuel.

Substantially simultaneously, the cam lug 36 moves past cam follower 62 and releases the means 17. Consequently, arm 44 is free to swing outward on its pivot 43, as in Fig. 3. However, the expanding forces of the gases resulting from ignition of the fuel charge act on faces 60 of arm 53 to continue to press, at least the T head 59 of said arm against the bottom wall 32 of the pocket, as shown in said figure. Said T head, therefore, constitutes an abutment that takes the force of the exploding gases of ignition. Consequently, the radial pocket wall 31, also being an explosion-receiving abutment, is propelled in an anti-clockwise direction. This is the power stroke of the engine and induces power rotation of rotor 11.



When said pocket 29 is aligned with port 24, some of the spent gases will escape therethrough, venting said pocket to relieve the pressure therein. Then, when this pocket again reaches the lower port of the engine where a new charge of fuel is received, the vane 38 thoroughly scavenges the same and dispells residual spent gases through exhaust port 25.

The above recites one cycle of the operation which, thereafter, is continuous.

While only one bank of the engine is shown, it will be evident that two or more can be placed side-by-side with a common shaft 12 connecting them and circumferentially phased so that the power strokes of the different banks are radially phased.

While I have illustrated and described what I now contemplate to be the best mode of carrying out my invention, the construction is, of course, subject to modification without departing from the spirit and scope of the invention. It is, therefore, not desired to restrict the invention to the particular form of construction illustrated and described, but to cover all modifications that may fall within the scope of the appended claims.

Having thus described the invention, what I claim and desire to be secured by Letters Patent is:

1. A rotary engine comprising a housing having a single, hollow, cylindrical chamber, end plates for said housing for closing off said chamber, a rotor journaled in said housing, the periphery of said rotor having a cylindrical surface fitting into and in sliding engagement with said chamber, a plurality of firing chambers recessed in said rotor, each of said firing chambers comprising a radially-directed wall beginning at the outer surface of said rotor and an inner wall constituting a smooth, curved surface extending from said wall back to the periphery of said rotor, and two side-walls laterally closing off said chamber, an opening in said housing, a valve chamber closing off said opening, a first fuel-compressing arm pivotally mounted within said valve chamber having a concave cylindrical surface having a radius equal to the radius of said rotor, a second fuel-compressing arm pivotally mounted within said first arm and having a concave cylindrical surface matching the curvature of the inner wall of said firing chamber, spring-biasing means for normally holding said first and second arms away from said rotor, a cam mounted on one side of said rotor and journally mounted within said housing, a gas-seal between said cam, housing, and said rotor, means, including a pivoted arm actuated by said cam and a push rod actuated by said arm and engaging said first fuel-compressing arm, said means simultaneously actuating said first and second arms into fuel-compressing positions of said arms by engaging the concave surfaces of said arms against the cylindrical surface of said rotor and the surfaces of said firing chamber, respectively, the surfaces at the free ends of said arms being shaped to define a portion of the surface of a firing chamber when said arms are actuated by said cam, and a spring-biased vane slidably mounted within said housing for sliding into said combustion chamber, and an exhaust port on the trailing side of said vane for expelling exhaust gases from said chamber through said exhaust port.

2. A rotary engine as defined in claim 1, in which said arms includes a gas-seal between said first arm and the valve chamber.

3. A rotary engine comprising, in combination, a housing, a rotor mounted within said housing, said rotor having a plurality of peripheral pockets defining rotatable combustion chambers having radial forward walls and convexly curved base walls, means to charge said pockets with fuel, fuel-compressing means mounted in said housing adjacent the path of rotation of said pockets, said means being spring-biased away from said pockets, means mounted on said housing controlled by a cam on said rotor to move said fuel-compressing means into

fuel-compressing position in synchrony with the rotation of said pockets, ignition means to explode the fuel, and exhaust means including a spring-biased vane to exhaust said pockets after an explosion, said vane being mounted in said housing adjacent the path of rotation of said pockets.

4. A rotary engine according to claim 3: the means controlled by the cam comprising a rocker having oppositely directed arms, a stem interposed between one said arm and the cam, and a second stem interposed between the other rocker arm and the fuel-compressing member.

5. A rotary engine according to claim 1: the means



controlled by the cam comprising a rocker having oppositely directed arms, a stem interposed between one said arm and the cam, and a second stem interposed between the other rocker arm and the first fuel-compressing arm.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 1,767,097 | Richardson | June 24, 1930 |
| 1,894,480 | Beuoy | Jan. 17, 1933 |
| 2,055,137 | Sherman | Sept. 22, 1936 |
| 2,175,265 | Johnson | Oct. 10, 1939 |