L. V. LAURENTS.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED JAN. 18, 1916.

1,217,020.

Patented Feb. 20, 1917.

2 SHEETS—SHEET 1.

Fig. 1.

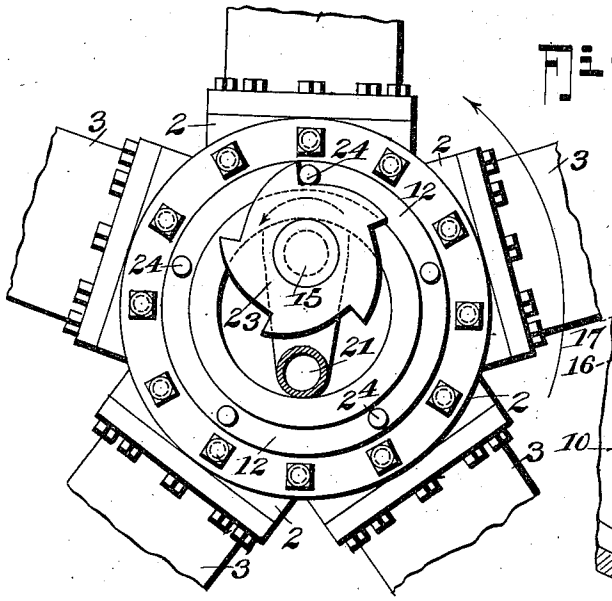


Fig. 4.

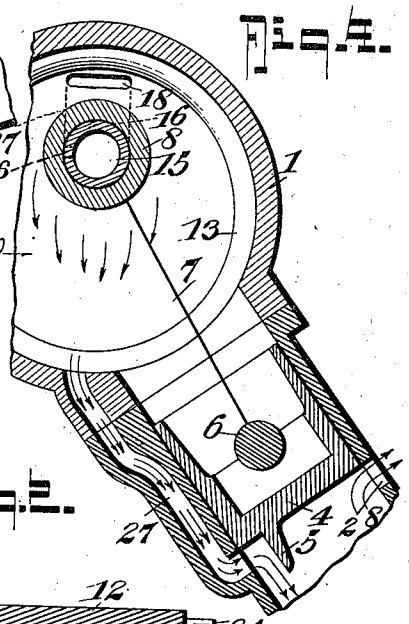


Fig. 2.

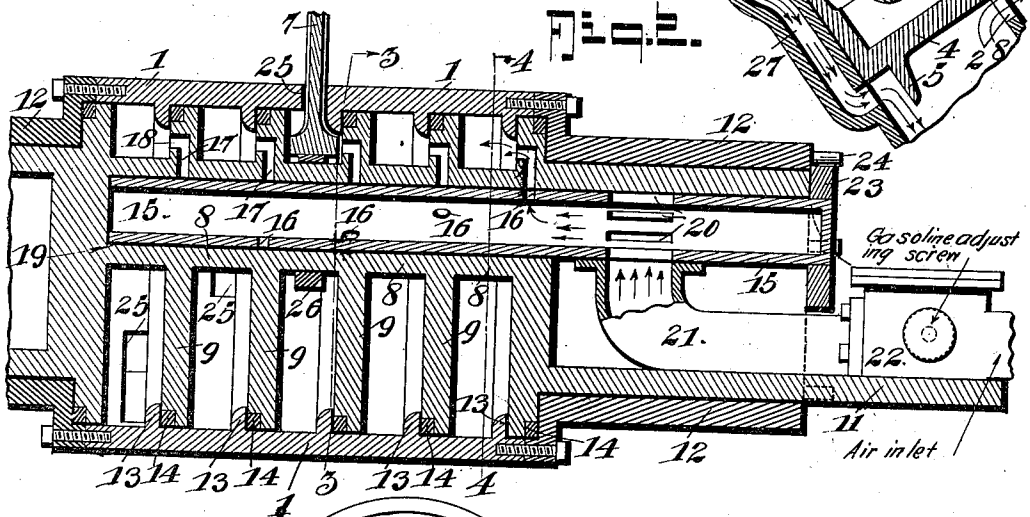
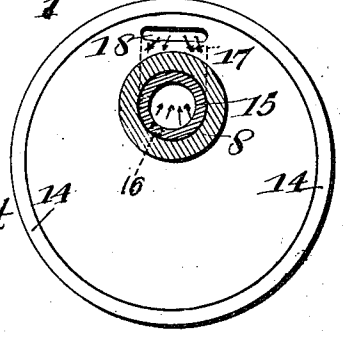


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 5.

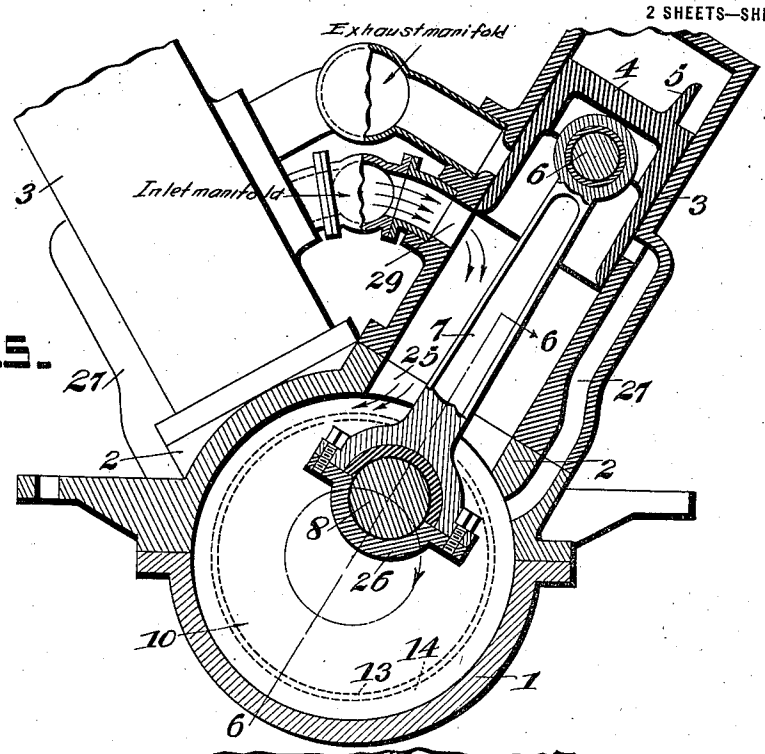
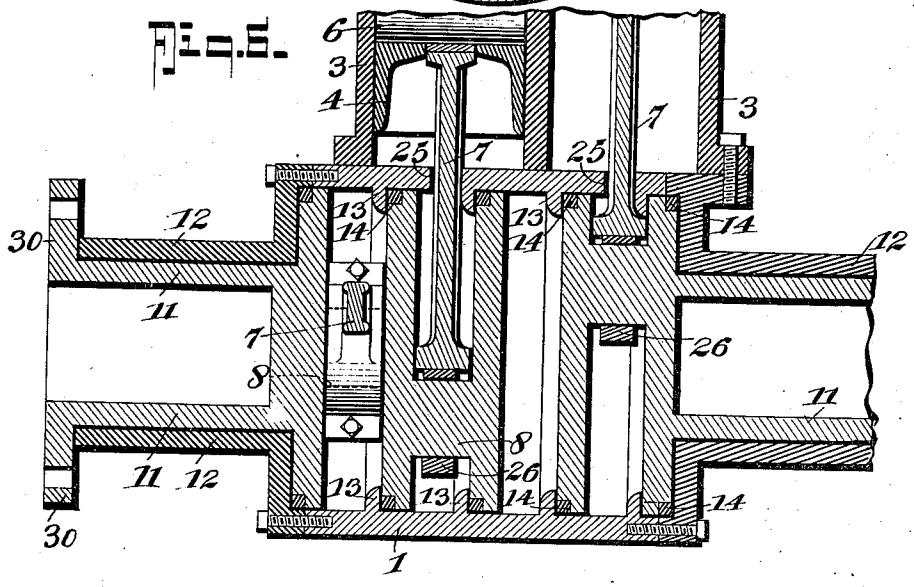


Fig. 6.



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INTERNAL-COMBUSTION ENGINE.

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To all whom it may concern:

Be it known that I, LOUIS V. LAURENTS, a citizen of the United States, and a resident of Lake Arthur, in the parish of Jefferson Davis and State of Louisiana, have invented a certain new and useful Improvement in Internal-Combustion Engines, of which the following is a specification.

My invention relates to an improvement in crank shafts for internal combustion engines and consists in the combinations, arrangements, and construction of parts that will be hereinafter described and claimed.

The principal object of my invention is, to provide a crank shaft for an engine, which is of such a construction that it may perform the functions of the usual fly-wheel and in doing so, to permit the building and operating of the engine with the usual fly-wheel, omitted.

Another object lies in the formation of the crank shaft into division plates which are located and rotate in the crank case of the engine. The spaces between the division plates form chambers to which the gaseous mixture is fed and from which the fuel is drawn by the piston which operates in the cylinder over the chamber.

Another object lies in the combination with the crank shaft, of a fuel inlet valve which co-acts with a certain one of the several types of crank shaft constructions.

Other objects and advantages will become apparent in the following description, reference being directed to the accompanying drawings in which—

Figure 1 is an end view of a rotary cylinder engine embodying my improved crank shaft,

Fig. 2 is a longitudinal section of the crank case with the cylinders and all but the central connecting rod, omitted,

Fig. 3 is a section on line 3—3 on Fig. 2.

Fig. 4 is a section on line 4—4 on Fig. 2, the gas inlet being closed as when the piston reaches the limit of the outward stroke.

Fig. 5 is a cross sectional view parts being in elevation, and showing a modified form of the crank shaft embodied in a motor of the V-type.

Fig. 6 is a section on line 6—6 on Fig. 5.

In the drawings, 1 is the crank case which is formed with bases 2 on which the cylinders 3 rest and are bolted. A piston 4 operates in each of the cylinders 3 and is provided with a deflector 5 on its upper surface. Each piston also has the usual wrist pin 6 to which the rod 7 connects, the other end of the connecting rod having bearing on the coöperating crank-pin 8 of the crank body 10.

It should be stated, that for the purposes of assembling the engine, the crank case 1 is provided with a removable lower portion as is quite common in engine constructions and as is shown in Fig. 5 of the drawing. The peculiar construction of the crank case, as will hereinafter be more fully explained, will not permit of the telescoping of the crank shaft into the crank case, and it therefore becomes necessary to remove the removable lower portion of the crank case, and place the crank body into position, whereupon the lower portion of the crank case may be replaced and secured.

Each of the two forms of engines shown in the drawings are of the two-cycle type, the one in Figs. 1 and 4 being a rotary cylinder engine while the one in Figs. 5 and 6 is a stationary cylinder engine of the V-type. In both types, the crank case 1 is circular in cross-sectional shape so that the division plates 9 of the crank 10 may move against the surface of the crank case and have a smooth running fit against the wall.

In Figs. 1 to 4, the crank shaft 10 is stationary and for the purpose of bolting it firmly to a support, the shaft is extended as shown in one place at 11, through which bolts or other suitable securing means may pass to a fixed support (not shown) and thus hold the crank shaft from rotational movement.

The cylinders 3 which rotate around the crank shaft 10 in this form, have suitable bearing on the laterally extended ends of the crank 10 as at 12 both of these bearings 12 being removable as indicated by the bolts. The crank case 1 is formed with a number of internal abutments or ribs 13 against which the division plates 9 of the crank 10 bear each one of the inner division plates 9 being grooved at the edge nearest one of the ribs 13 so that a spring ring 14 may be inserted. The two outer ones of the division plates 9 are grooved at the outer edges and the rings 14 are inserted there.

The spaces between the adjacent division

plates 9 form chambers into which a charge of gaseous fuel is discharged when the piston is traveling its inward or compression stroke. The charge of gas drawn into the crank case 1 through the then alining gas inlet ports, is subsequently compressed during the outward or working stroke of the piston, the inlet port being then out of alinement as shown in Fig. 4. When the piston 4 nears the end of its outward stroke, the inlet port 27 is uncovered and the then compressed gases in the crank case 1 are transferred to the cylinder above, as indicated by the arrows in Fig. 4. The gas is fed to the spaces through a valve 15 which rotates intermittently so as to bring one of its openings 16 of which there is one for each space into registration with the duct 17 of a port 18 in each one of the division plates 9 as shown in Fig. 2.

The crank pins 8 in this form are all in alinement as is common in rotary cylinder engines, the crank pins 8 and the plates 9 as well as the lateral extensions 11 being cast *en bloc;* the extensions 11 are cored as shown to lessen the weight of the crank. A bore 19 is formed through the center of the alining crank pins 8 in which the valve 15 before mentioned, is located.

The valve 15 which is hollow and closed at its outer end, has an annular series of elongated slots some of which are constantly in registration with the discharge tube 21 of the carbureter 22. The carbureter 22 is of any approved design and supplies the gaseous fuel to the engine cylinders 3 in the manner indicated.

A "star wheel" 23 is secured to the closed end of the valve 15 there being five points on the star wheel each one coöperating with one of the five cylinders of the engine. The points of the star wheel are successively engaged by the pins 24 which are driven in the edge of the rotating bearing number 12. As the crank case 1 rotates, the pins 24 strike successive ones of the star wheel points thus causing the star wheel to rotate intermittently and to bring the openings 16 in the valve 15 into registration with that one of the ports 18 which is then in communication with that one of the cylinders 3 to which a fresh charge is to be admitted.

As shown in the drawings, one of the cylinders 3 in the rotary cylinder type, is mounted over each one of the chambers just described, the casing 1 being slotted as at 25 to permit the passage of the connecting rods 7 of the various pistons. The connecting rods 7 are joined with the crank pins 8 by a bronze strap 26 which is narrower than the end of the connecting rod. The purpose of making the strap 26 narrower is, to obviate the possibility of the flow of the gas through the adjoining port 18 being obstructed when the gas is to be admitted into the cylinder 3 which is to be charged by that port.

The specific purpose of the bronze straps 26, is to leave room for a free passage of the incoming gas into the chamber between the partition plates 9 when the gas inlet ports have moved into proper registration. If the strap 26 was as wide as the head of the connecting rod 7, the free passage of the gas would be obstructed. The necessity of making the strap 26 narrower, as just pointed out, may readily be observed by reference to Fig. 2.

A transfer port 27 connects the crank case chamber with the cylinder 3 into which the compressed charge is injected when the piston reaches the limit of its expansion stroke as shown in Fig. 4. The incoming charge strikes the deflector 5 causing the charge to travel outwardly and simultaneously expel the residue of the previously exploded charge through the exhaust port 28.

The engine shown in Figs. 5 and 6 is a four cylinder, two cycle engine of the three-port type in which the construction of the crank shaft 10 is different from that of the preceding figures, in that, the crank pins 8 are not in alinement and consequently the valve 15 is omitted. The valve 15 is omitted because the engine is of the three-port type as just explained but in engines of other types the valve may be located in the usual inlet manifold and operated in a similar manner as previously described.

When the inlet port 29 is uncovered by the lower portion of the piston 4 as shown in Fig. 5, a charge of gas is drawn into the crank case chamber from the supply manifold. The charge then in the chamber will be compressed to a certain degree by the piston in moving on its expansion stroke. When the limit of the expansion stroke is reached then the upper end of the piston will have uncovered the cylinder opening of the transfer port 27 and permitted the compressed charge to enter the cylinder 3 with the effects previously described.

As before stated, the crank 10 differs from the crank in Fig. 2 in that the crank pins 8 are positioned 90° apart so as to cause the pistons to perform their various strokes in proper order. In this form the crank rotates and the cylinders are stationary and since the valve 15 is omitted the ducts 17 and ports 18 are also omitted.

A flange 30 is provided at one end of the extensions 11 of the crank 10 to which a balance wheel may be bolted if it is found necessary. In an engine where there are a greater number of cylinders, the crank 10 will be heavy enough to dispense with the balance wheel but it may be found necessary to add a light one in an engine of a few cylinders as in Fig. 6.

The operation of the device is as fol-

lows:—In Fig. 2 the crank 10 is stationary and the crank case and cylinders revolve around it. The valve 15 which is located in bore 19 of the alining crank pins 8 is intermittently rotated by the pins 24 on the crank case as they strike the projections of the star wheel 23.

The action of the valve 15 is so timed that when one of the pistons 4 reaches the end of its outward stroke as in Fig. 4, then the opening 16 which coöperates with that particular crank case chamber (see Fig. 2) will have moved out of registration with the duct 17 and port 18 so that the previously admitted charge of gas may be injected into the cylinder. The rings 14 and the ribs 13 prevent the leakage of the gas in any particular one of the chambers, into the next one.

In Fig. 6 the crank revolves and the crank case 1 remains stationary the action of the crank pins 8 which are stationed on the quarters of the circle, being to reciprocate the pistons 4 as explained before. A chamber is formed between each division plate 9 into which chamber the gas is fed from the passageways 29 of the supply manifold. The gas is transferred from the crank case chamber to the cylinder in the manner previously explained.

Obviously modifications in the structural arrangements of the crank shaft may be made without departing from the spirit of the invention or the scope of the claims.

I claim:—

1. In an internal combustion engine, the combination of the cylinders and the crank case, said case having slots in communication with the cylinders and crank case, a crank body located in the crank case and having a plurality of gas chambers, crank pins on the crank body, pistons located in the cylinders, connecting rods joining the pistons and the respective crank pins the connecting rods passing through the crank case slots, means for admitting gas to the gas chambers, and means for transferring the gas from the chamber to the cylinder above the piston.

2. In an internal combustion engine, the combination of a crank case having a bore circular in cross section, a plurality of ribs depending internally from the bore of the crank case, a crank body located in the bore of the case and having a plurality of division plates spaced apart to form gas chambers between them, the plates being adapted to contact with the ribs, crank pins joining the division plates, bearing members extending from each end of the crank body and having bearing on the crank case, and means for admitting gas to the gas chambers.

3. In an internal combustion engine, the combination of the crank case having a circular bore, a crank body located in the crank case and consisting of a plurality of circular division plates spaced apart to form gas chambers, crank pins joining adjacent ones of the division plates, said pins being in longitudinal alinement and having a bore therethrough, means coöperating with the crank pin bore for admitting gas to the respective gas chambers, and means for rendering the gas chambers gas-tight.

4. In an internal combustion engine, the combination of the crank case having a circular bore, a crank body located in the crank case and consisting of a plurality of circular division plates spaced apart to form gas chambers each of said division plates having a port and a duct, crank pins joining adjacent ones of the division plates, said pins being in longitudinal alinement and having a bore therethrough, said bore communicating with the ducts, a hollow valve located in the crank pin bore and normally closing the ducts, said valve having openings for intermittent registration with the ducts, means for rendering the chambers gas-tight, means for admitting gas to the valve and means for intermittently turning the valve.

5. In an internal combustion engine, the combination of the crank case having a circular bore and pins at one end, a circular crank body fitted into said bore the body consisting of a plurality of division plates spaced apart to form gas chambers between them each of the said plates having a duct and a port, crank pins joining adjacent ones of the division plates, said pins being in longitudinal alinement and having a bore therethrough said bore communicating with the ducts, a hollow valve located in the crank pin bore, said valve having an annular series of gas inlet slots and an opening for each one of the ducts in the division plates, said openings being in "staggered" relationship, a star wheel secured to the end of the valve adjacent to the pins on the crank case, said pins being adapted to strike the points of the star wheel and turn the valve intermittently.

6. In an internal combustion engine, a circular crank case having bearing members secured thereto at its ends, annular ribs or abutments depending internally of the crank case, a crank body located in the crank case bore and consisting of a plurality of circular division plates spaced apart to form gas chambers between them, each of said plates having a port and a duct and a circumferential groove at one edge the crank having bearing sleeves adapted to rotate in the aforesaid bearing members, packing rings fitted in each one of the grooves and contacting with the crank case and ribs, crank pins joining adjacent ones of the division plates said pins being in longitudinal aline-

ment and having a bore therethrough said bore communicating with the ducts, a hollow gas valve located in the crank pin bore having an annular series of gas openings in communication with a source of gas supply, said valve having annular openings adapted to register with the respective ones of the ducts as the valve is rotated, and means for intermittently rotating the valve.

7. In an internal combustion engine, a circular crank case, cylinders mounted on the crank case, said crank case being slotted, a piston in each cylinder, each cylinder having communication with the crank case through a transfer port, a crank body having a plurality of spaced division plates to form a chamber in the crank case for each cylinder, each division plate having a port and a duct, a crank pin joining adjacent ones of the division plates, the pins being in alinement and having a bore therethrough, said bore communicating with the ducts, a connecting rod between the pistons and the crank pins, said rods projecting through the slots in the crank case, a hollow gas valve located in the crank pin bore, said valve having an annular series of gas inlet slots and a plurality of openings in "staggered" relationship, each one of which cooperates with each one of the ducts, and means for rotating the valve to bring one of the openings into registration with the duct and port when the piston of that cylinder has completed its expansion stroke.

8. In an internal combustion engine, a circular crank case, a cylinder mounted on the case and having a reciprocating piston therein, a crank body located within the crank case, the crank body being formed of spaced division plates and having a gas duct communicating with the space between the plates, a crank pin joining the adjacent ones of the plates, a connecting rod extending between the crank pin and the piston, a strap secured to the end of the connecting rod and inclosing the crank pin, said strap being disposed adjacent to the duct opening and narrower than the connecting rod head to provide a gas passage from the duct.

9. In an internal combustion engine, of the rotary cylinder type, a rotating crank case having bearing extensions, pins secured at intervals to one of the extensions, a stationary crank body located in the crank case the body being subdivided into a plurality of spaced partition plates to form gas chambers, said plates having gas ports, crank pins joining the plates of the crank and having a bore therethrough, a hollow gas valve located in the bore said valve having gas ports, and a star wheel secured to the end of the valve and adjacent to the pins, said star wheel being rotated step by step as successive pins strike the successive points of the star wheel to move the ports in the crank and valve in registration at proper intervals.

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