W. R. FASEY.

TWO-CYCLE INTERNAL COMBUSTION ENGINE.

APPLICATION FILED JULY 10, 1918.

1,374,915.

Patented Apr. 19, 1921.

2 SHEETS—SHEET 1.

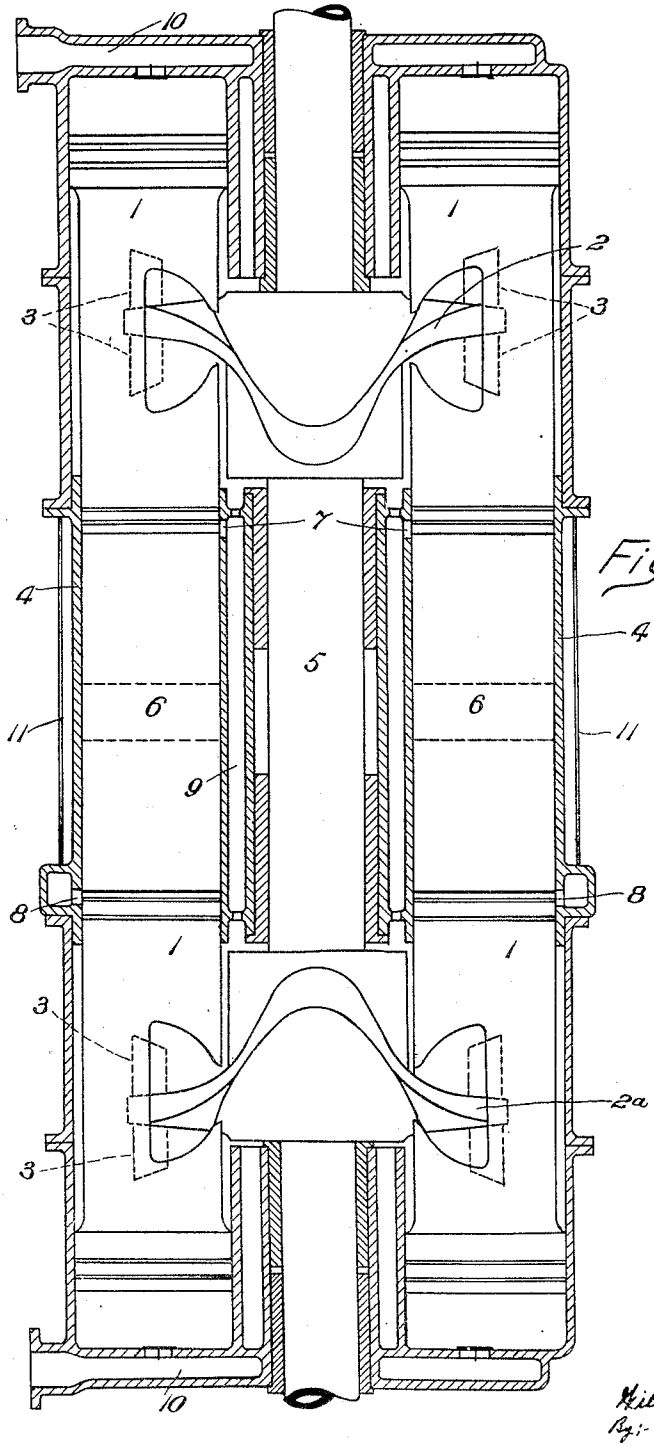


Fig. 1.

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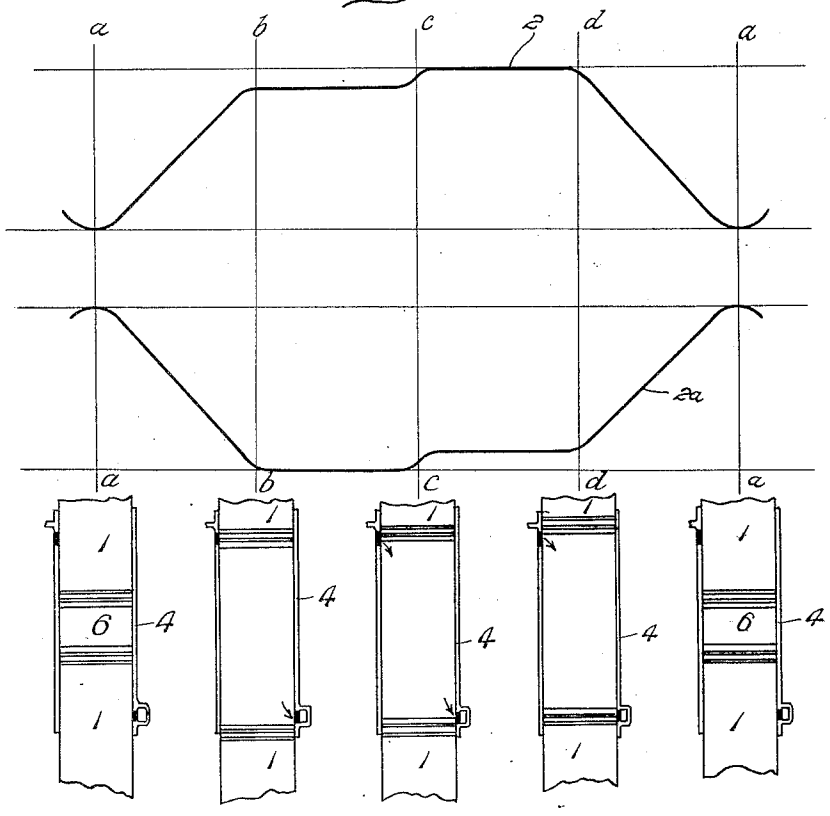
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2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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TWO-CYCLE INTERNAL-COMBUSTION ENGINE.

1,374,915. Specification of Letters Patent. Patented Apr. 19, 1921.

Application filed July 10, 1918. Serial No. 244,304.

To all whom it may concern:

Be it known that I, WILLIAM ROBERT FASEY, a subject of the King of Great Britain, and resident of Snaresbrook, Essex, England, have invented certain new and useful Improvements in Two-Cycle Internal-Combustion Engines, of which the following is a specification.

This invention relates to improvements in and connected with two cycle internal combustion engines and has reference to two cycle engines of the kind wherein the reciprocation of the pistons is converted into rotation of a shaft by means of cam driving mechanism and the cylinder ends are utilized for induction and initial compression of the charge.

The present invention consists broadly of an engine of the foregoing type having opposed power or working pistons reciprocating in non-rotatable cylinders which pistons coöperate with rotatable cams and the cylinder ends are utilized for the induction and initial compression of the charge which is then transferred to and compressed and fired in a combustion chamber located between the ends of the opposed pistons.

An important feature of the invention is the particular curvature of the cam paths which has its straight portions which correspond to rest periods of the pistons divided into two or more portions so that immediately exhaust has taken place the piston moves sufficiently to close the exhaust or open the inlet ports as desired.

As previously indicated an engine in accordance with my invention has two cam paths and the combustion chambers are formed between pairs of opposed pistons and the arrangement of the cam path relative to each other is preferably such that just prior to the closure of the exhaust ports opening of the inlet ports occurs—or rather the inlet ports open slightly in advance of the closure of the exhaust ports—so that the incoming charge operates to complete the exhaust. In some cases, however the scavenging may be effected by an air charge and upon further movement of the piston the combustible charge may be admitted.

The invention involves many features and details which are of practical importance, and in order that the invention may be readily understood and carried into practice, reference is made to the accompanying drawing in which Figure 1 illustrates diagrammatically the preferred form of my invention, and Fig. 2 shows the preferred curvature of the cam paths, diagrams of the positions of the pistons relative to the inlet and exhaust ports being shown at various positions.

In accordance with the form of the invention shown in the drawing, I provide opposed pistons 1 which operate in opposite ends of the cylinder and are operated by cam driving mechanism 2 and 2^a. The cam wedge of said cam driving mechanism engages between rollers 3 which are carried by the piston. The cams are arranged at opposite ends of a rotor 5 and the cam webs are so constructed as to cause the piston to move in opposite directions in the cylinders 4. The combustion space 6 of the cylinders is surrounded by a cooling jacket 11. One of the ends of the cylinder may be used if desired for compressing air to provide a scavenging charge in which case the cam paths may be modified to cause one of the pistons to expose the inlet port to admit the air charge slightly prior to the admission of the fuel charge, or a cam operated or other valve may be provided. The engine may be regarded as a valveless engine in that the only valves required are constituted by ports such as 7 and 8 cut in the cylinder wall, which ports are covered and uncovered by the operation of the pistons. The ports 7 in the example illustrated operate as inlet ports and the ports 8 as exhaust ports. The charge compressed in the outer ends of the cylinders may be delivered to an annular internal casing 9 surrounding the central rotor shaft 5, or the gases may be passed through the center of the shaft, for instance, through spring loaded non-return valves adapted to open upon the attainment of a given pressure within the cylinder ends. In any case it will be appreciated that the charge is compressed into a compression chamber or pipe of some form which has access to the combustion chamber through the inlet ports 7 in the cylinder wall. In the present example the charge is compressed as aforesaid into the annular casing 9. The engine functions in the following manner dealing for simplicity with one pair of opposed pistons. By reason of the relative curvature of the two cam paths 2, 2^a—which are preferably ribs formed on the rotor ends—the two opposed pistons 1 come together to compress a charge between them

in the space indicated by dotted lines in Fig. 1, both the inlet and exhaust ports 7 and 8 respectively being closed by the pistons during this compression stroke. Ignition or firing then occurs and the two pistons separate. At the end of the combustion stroke of the exhaust port 8 is opened at one end of the combustion chamber by reason of the piston at that end having reached its extreme position. The piston at the other end has not however uncovered the inlet port 7 because the curvature of the cam at that end is such that the piston has not quite reached the end of its stroke. The pistons, have, however, both reached rest periods and no movement takes place but exhaust to atmosphere occurs. The curvature of the cams relative to each other is now such that there is a small movement of both pistons in the same direction. That is to say, there is a rise on one cam and a fall on the other and as a consequence the piston at one end moves inward to cover the exhause port 8 and the piston at the other end moves outward—in the same direction—to open the inlet port 7 at that end, and the arrangement is as aforesaid preferably such that the inlet port 7 begins to open slightly in advance of the closing of the exhaust port 8. Thus a charge which has of course been compressed into the compression chamber by the outward movement of the pistons rushes in through the inlet port 7 and sweeps out any combustion gases remaining in the cylinder prior to final closure of the exhaust port. There is then a period when the pistons both remain stationary with the inlet port 7 fully open, and the exhaust port 8 fully closed. The curvature of the cams is now such that the two pistons come together to compress the charge between them and firing again occurs and the cycle of operations is repeated. This cycle of operations will be readily understood upon reference to Fig. 2 which shows the curvatures of the two cam paths 2 and 2^a relatively one to the other. When the pistons are at about the line *a* firing occurs and the combustion stroke continues until the pistons have reached the line *b*. At this point the piston at one end opens the exhaust port 8 but the piston at the other end has not yet uncovered the inlet port. From *b* to *c* both pistons remain stationary while passing the straight portions of the curve, the inlet remaining closed while the exhaust is fully open. By reason of the rise on the cam 2 and the depression on the cam 2^a the inlet port now opens and the exhaust port closes but the curvature is such that the inlet opens slightly before the exhaust port is fully closed and for a brief period scavenging occurs. While the pistons are passing from *c* to *d* the inlet port is fully open and the exhaust port is fully closed, and during this period the fresh charge being under pressure enters the cylinder between the two pistons and while the pistons are operating upon the sloping portions *d*—*a* the pistons come together and compress the charge between them, both the inlet and exhaust ports remaining fully closed and when the position *a* is reached firing again occurs. It will be understood that when the pistons come together to compress the charge between them a fresh charge is being drawn into the pump end of the cylinder which during the firing stroke or compression stroke of the pump is forced into the casing 9, a non-return or other valve being provided in the induction pipes 10 and between the cylinder ends and the chamber 9. It will of course be understood by those conversant with this type of engine that any convenient number of cylinders and pistons may be arranged in a circle around the axis of the engine and that the arrangement may be such that the cylinders form the rotor and revolve around stationary cam paths or ribs and of course the curvature of the track giving the desired cycle of operations may be repeated as many times as required around the circle. Moreover a single ended engine may be constructed and the charge compressed between one end of the single piston and the cylinder end and the other end of the piston and cylinder utilized as a pump to compress the charge into a compression chamber, but in this case it will be preferable to employ exhaust valves actuated by cam or other mechanism while the inlet arrangements may remain as before constituted by ports in the cylinder wall adapted to be covered and uncovered by the piston in its travel.

What I claim and desire to secure by Letters Patent is:—

1. In an internal combustion engine, a cylinder provided at points spaced from its ends with an inlet port and an exhaust port, said ports being spaced apart; a pair of pistons for operation in the opposite ends of the cylinder and arranged one to open and close the inlet port and the other to open and close the exhaust port; a revoluble shaft, and cams on said shaft and arranged to operate said pistons, so that one of said pistons uncovers the exhaust port at the end of the combustion stroke and then closes the same, and the other piston opens the inlet port shortly in advance of the final closing of the exhaust port.

2. A two cycle internal combustion engine comprising opposed pistons, rollers carried by said pistons, cam paths carried by a rotor with which cam paths said pistons cooperate, induction and initial compression chambers formed in the cylinder ends, combustion chambers formed between the oppositely moving pistons, inlet and exhaust ports

formed in the cylinder wall, said cam paths having straight portions which correspond to rest periods of the pistons, said straight portions being divided into two parts, whereby at the end of the combustion stroke the exhaust port opens to permit exhaust to atmospheric pressure prior to the opening of the inlet port and inlet port opens prior to the usual closing of the exhaust port.

3. A two cycle internal combustion engine comprising opposed pistons, rollers carried by said pistons, cam paths carried by a rotor with which cam paths said pistons cooperate, induction compression chambers formed in the cylinder ends, combustion chambers formed between the oppositely moving pistons, inlet and exhaust ports formed in the cylinder walls, said cam paths having straight portions which correspond to rest periods of the pistons, said straight portions being divided into two parts, whereby at the end of the combustion stroke the piston at one end uncovers the exhaust port to permit exhaust to atmospheric pressure, and the piston at the other end then opens the inlet port shortly in advance of the final closing of the exhaust port whereby a final scavenging is effected prior to the closing of the exhaust port.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM ROBERT FASEY.

Witnesses:

ELIZA FASEY,

EMMA WOODS.