C. LA FONTAINE.

INTERNAL COMBUSTION ENGINE.

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1,181,463. Patented May 2, 1916.

Fig. 1

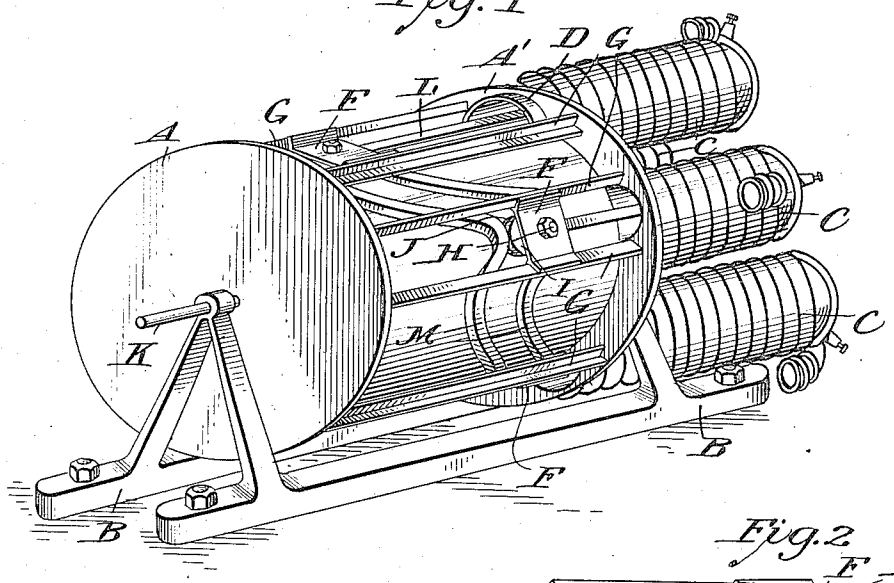
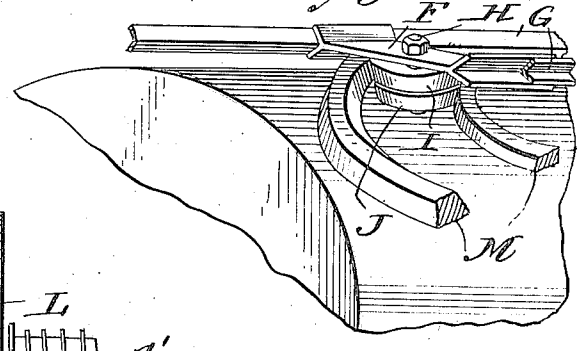


Fig. 2



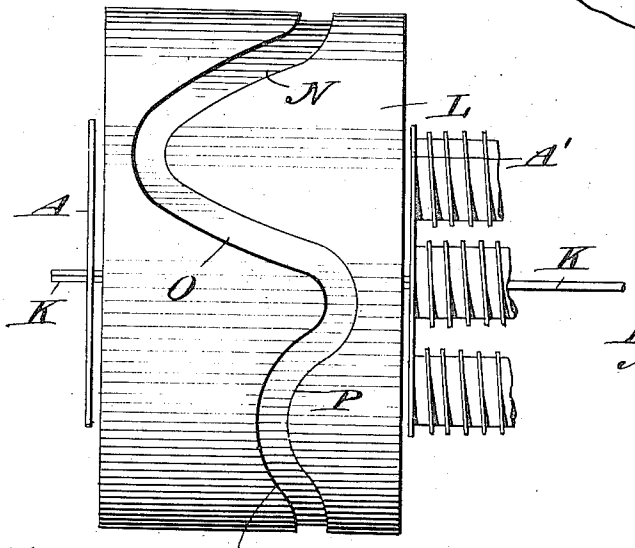


Fig. 3.

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INTERNAL-COMBUSTION ENGINE.

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To all whom it may concern:

Be it known that I, CHARLES LA FONTAINE, a citizen of the United States of America, residing at Bowling Green, county of Warren, State of Kentucky, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

The object of the invention is to provide an engine in which the power of a reciprocating piston will be transmitted directly to a shaft extending parallel with the piston rod and without the use of intermediate cranks.

In the accompanying drawings, Figure 1 is a perspective view of an embodiment of the invention; Fig. 2 is a detail view, on an enlarged scale, of the connection between one of the piston rods shown in Fig. 1 and the drum on the power shaft; Fig. 3 is a more or less diagrammatic plan illustrating the contour of the cam for a complete cycle of operation.

Referring to the drawings A A′ designate end plates of a supporting frame, shown as of cylindrical form and mounted upon a base B. On the end A′ of the supporting frame are mounted a plurality of power cylinders C, the rods of the pistons in which project through suitable openings in the frame member A′. To said projecting portions of the piston rods are secured cross heads F which engage guides G forming part of the main frame and connecting the end members A, A′ thereof.

On a shaft K journaled in suitable bearings in the supporting frame, and between the ends A A′, is mounted a drum L which is provided with an exterior circumferential cam. As shown this cam M is formed by a pair of radial projecting ribs, the adjacent faces of which are oppositely inclined or beveled, as shown particularly in Fig. 2. From Fig. 2 it will also be seen that the wall of the cam adjacent the end A′ extends radially from the drum L a distance less than the corresponding projection of the cam member adjacent the frame end A. Each piston rod cross head F is provided with a pin or stud H on which is mounted a pair of anti-friction contact rolls I, J. The relative arrangement of the two contact rolls I, J and the members of the cam M is such that the roll J will continuously contact with the surface of the cam adjacent the end A′ of the frame while the roller I similarly contacts continuously with the cam surface adjacent the frame end A, and the diameter of the roller J is less than the width of the cam way or groove in which it moves.

By the foregoing construction it will be seen that the reciprocating movement of each piston will be directly translated into rotary movement of the drum L and shaft K and the nature of the engagement between the piston rods and said drum reduces the wear of the several parts to a minimum.

The several sections of the irregular cam corresponding to the suction, compression, explosion, and exhaust strokes of each piston may be readily proportioned and shaped to insure the required direction and extent of movement of the piston and transmit the maximum power thereof to the shaft K. In Fig. 3 the section N represents that portion of the cam which is affected by the explosion stroke of the engine, the same extending substantially throughout the length of the drum L. The section traversed by the rollers I, J, during the exhaust stroke of the piston is represented at O, said section preferably extending nearer the frame end A′ than the corresponding end of the section N to insure that all of the products of combustion will be expelled from the engine cylinder. The section P corresponds to the suction stroke, the length thereof being determined by the amount of gas which it is desired shall constitute an explosive charge; and the section Q represents the compression stroke being usually shorter than the sections N, O, P.

It will be readily understood that the proportions of the cam corresponding to the several stages of a complete cycle of operation can be readily varied as desired and the illustration of the embodiment of the invention is more or less conventional.

By inclining the walls of the cam as shown and making the rollers I, J, in the form of frustums, any grinding between the rollers and cam surfaces is avoided. The rollers may be of any suitable type, having if desired anti-friction bearings between them and the supporting stud H. It will be seen that the two rollers I, J, each contact continuously with the coöperating surface of the cam, whereby each is only caused to rotate in one direction, the two

rollers being alternatively operative as the turning movement of the drum causes a shifting of the operative contact between it and the piston rod from one side of the cam groove to the other. For example the larger roller I will constitute the connection between the drum and piston rod during the power, exhaust and compression strokes of a cycle while the roller J constitutes such connection during the intake or suction stroke.

It will be evident that the invention is not in its broadest aspects limited to the particular construction of the embodiment selected for purposes of illustration but includes any modifications thereof that are within the scope of the following claims.

What is claimed is:—

1. In an engine, the combination of a rotary drum provided with a circumferential cam, a power cylinder, a piston in the cylinder having its rod adapted to reciprocate across said cam, and a pair of contact rolls, of different diameters, on the piston rod and engaging the cam, the larger roll contacting with the cam at a greater radial distance from the drum than the other roll.

2. In an engine, the combination of a rotary drum provided with two exterior circumferential ribs forming an irregular cam-way, one of said ribs projecting radially from the surface of the drum to a greater extent than the other, a power cylinder, a piston therein having its rod arranged to reciprocate across said cam-way, and two rolls mounted on a common axis on the piston rod and extending into said cam-way, so that each will contact with one wall thereof only.

3. In an engine, the combination of a rotary drum provided with an exterior circumferential irregular cam, having two oppositely inclined surfaces extending different radial distances from the body of the drum, a power cylinder, a piston in the cylinder having its rod adapted to reciprocate across the cam on the drum, and two frustum shaped rolls mounted on the piston rod at different distances from the drum to respectively engage opposite surfaces of said cam.

4. In an engine, the combination of a rotary drum, provided with an exterior circumferential irregular cam, having two oppositely inclined surfaces extending different radial distances from the body of the drum, a power cylinder, a piston in the cylinder having its rod adapted to reciprocate across the cam on the drum, and two frustum-shaped rolls, the diameter of the smaller end of one roll being longer than the diameter of the larger end of the other, mounted to turn about a common axis on the piston rod, and respectively engaging opposite surfaces of said cam, the engagement of the larger roll and cam being at a greater radial distance from the drum than the engagement of the other roll and cam.

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