

C. H. TANGEMAN.
 ROTARY COMBUSTION ENGINE.
 APPLICATION FILED APR. 26, 1910.

1,060,297.

Patented Apr. 29, 1913.
 3 SHEETS—SHEET 1.

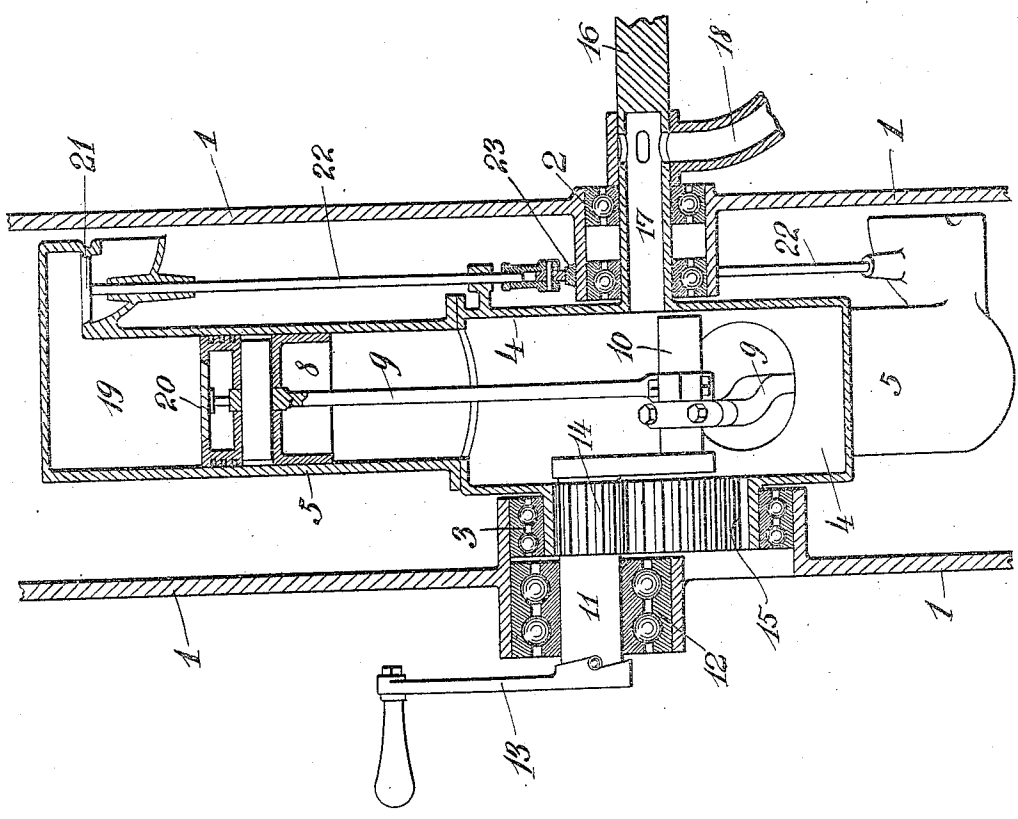


Fig. 1

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 By his Attorneys
 Edwards, Lager, Wooster.

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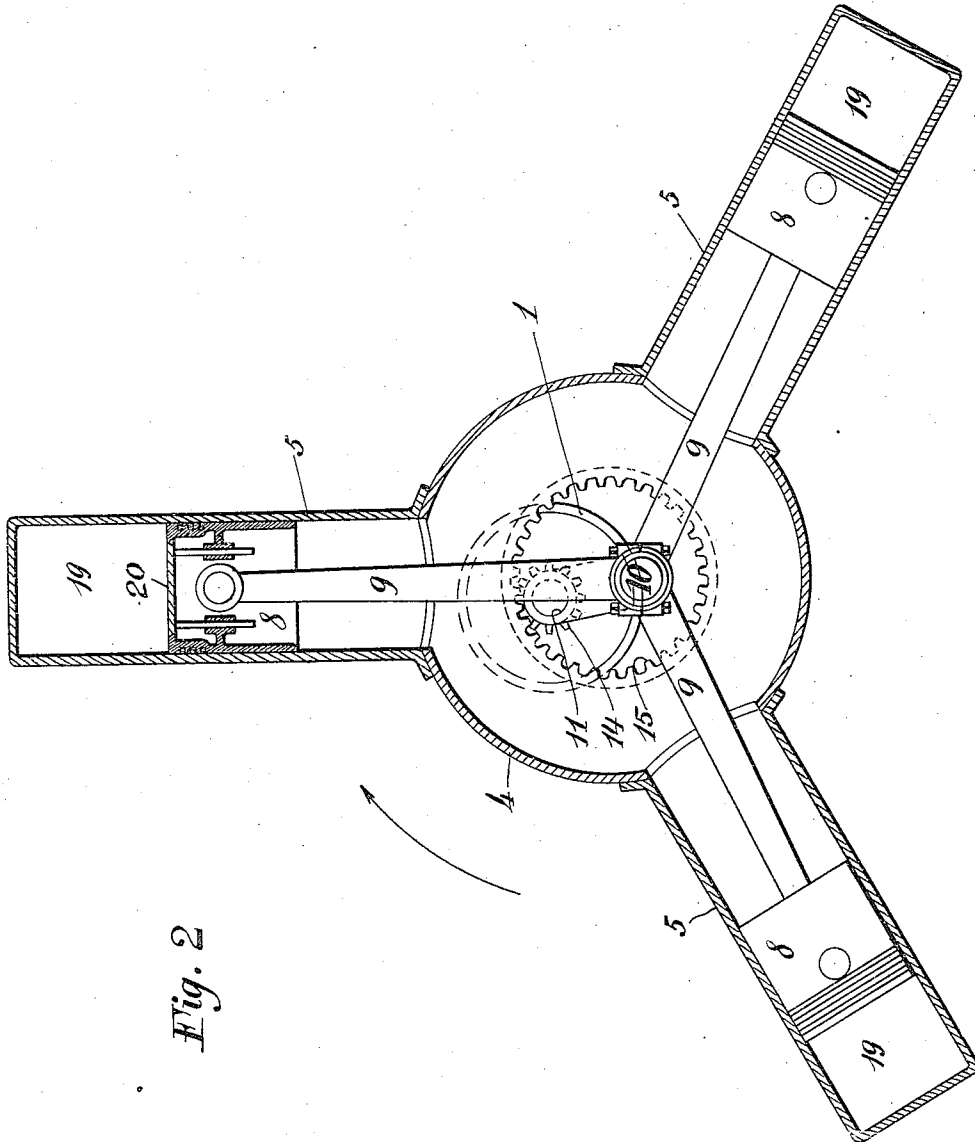


Fig. 2

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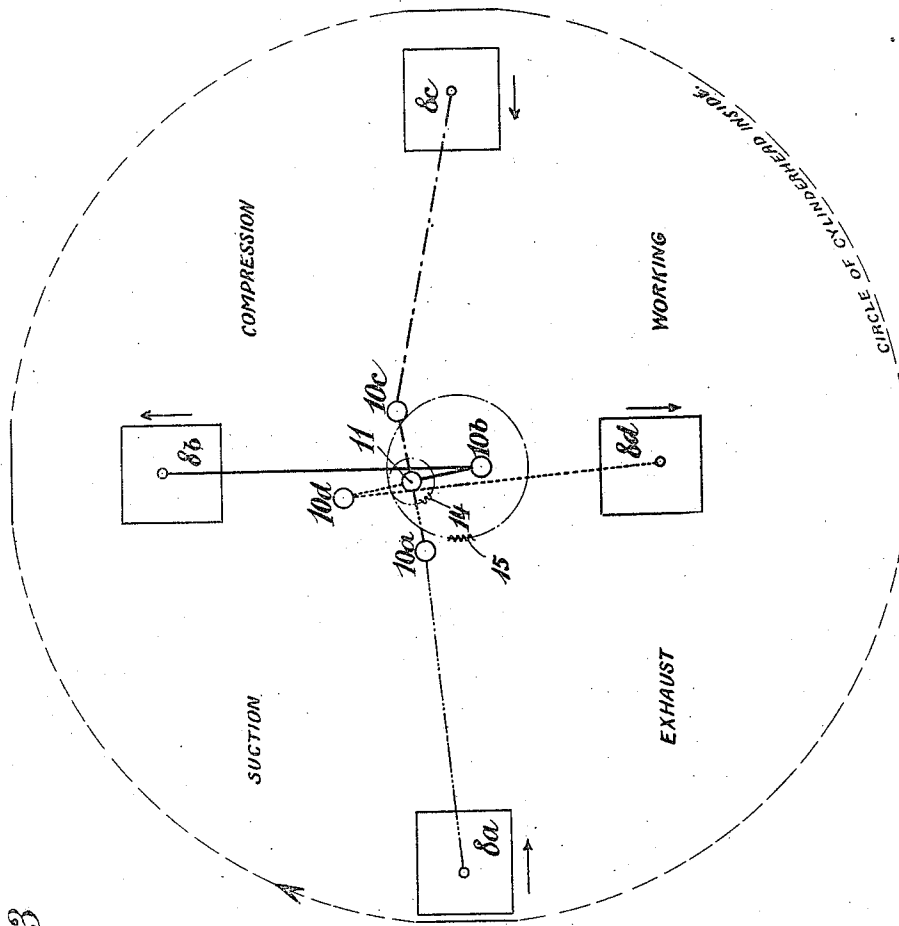


Fig. 3

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UNITED STATES PATENT OFFICE.

CORNELIUS H. TANGEMAN, OF NEW YORK, N. Y.

ROTARY COMBUSTION-ENGINE.

1,060,297.

Specification of Letters Patent.

Patented Apr. 29, 1913.

Application filed April 26, 1910. Serial No. 557,823.

To all whom it may concern:

Be it known that I, CORNELIUS H. TANGEMAN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Rotary Combustion-Engines, of which the following is a full, clear, and exact specification.

10 This invention relates to combustion engines, and has especial reference to the provision of a four-stroke engine wherein the working and scavenging strokes of the piston will be greater than the suction and
15 compression strokes in order to secure increased economy.

The object of the invention is to provide a piston engine in which the suction and compression strokes will be relatively short
20 as compared with the working and scavenging strokes, thereby permitting a greater expansion of the charge than is possible in engines as usually constructed, also to provide that the scavenging stroke will be
25 longer than the working stroke, thereby permitting the compression clearance space to be positively scavenged, and also a rapid power stroke thereby minimizing the loss of heat through the cylinder walls.

30 As herein shown, the invention is embodied in an engine of the rotary type, comprising one or more cylinders mounted to rotate relatively to an eccentric moving abutment or crank shaft connected to the
35 piston, at such a ratio that in one revolution of the cylinder the piston makes four strokes of different lengths, as above described. This result is effected by gearing the cylinders and eccentric abutment to-
40 gether to rotate simultaneously, so that at each quarter revolution of the cylinder, the piston makes a complete stroke, varying in length according to the relation of the abutment and the cylinder during such
45 stroke.

A further feature of the invention resides in the provision of means for securing a longer exhaust stroke than working stroke by offsetting the axis of the rotatable abutment toward the exhaust portion of the arc
50 of the cylinder.

Further objects of the invention relate to the general arrangement and details of construction, which will be more fully un-

derstood in connection with the description 55 of the accompanying drawings, wherein—

Figure 1 is a longitudinal section of a multiple cylinder engine embodying the invention, Fig. 2 is a cross-section, and Fig. 3 is a diagrammatic view showing the positions of the piston during a complete
60 four-stroke cycle.

1, 1 represent the stationary frame of the engine, in which is journaled in bearings 2, 3, a rotary casing 4, on which are mounted
65 one or more cylinders 5. As herein shown, three (or a multiple thereof) cylinders have the piston rods connected to a common crank, and a four-stroke cycle per revolution produced, provided the ratio of revolution
70 of the crank and cylinder be predetermined so that the crank will make three complete revolutions while the cylinder makes one revolution, thereby producing a
75 four-stroke cycle for each cylinder revolution. In order to accomplish this, the ratio of revolution is made 3 to 1, that is, for every revolution of the cylinder the crank
80 shaft will make three revolutions in the same direction.

Each cylinder 5 contains a piston 8 having a connecting rod 9 connected to crank pin 10 carried by a crank shaft 11, which is eccentric to the axis of rotation of the cylinders 5 and casing 4. The crank shaft
85 11 is journaled in bearings 12, and 13 is a starting handle. On the shaft 11 is a gear 14 which meshes with an internal gear 15 on the casing 4. The casing 4 is connected to the main shaft 16, which is made hollow
90 at 17 and connected with a gas in-take pipe 18. The gas passes from the pipe 18 through the hollow shaft 17 to the interior of the casing 4 and passes into the firing chambers 19 through check valves 20 in the
95 pistons.

21 is a mechanically operated exhaust valve mounted on rod 22 and operated by a stationary cam 23 carried on the frame 1.

Other methods for supplying and controlling gases can be used without departing from the scope of the invention.

Fig. 3 shows diagrammatically the positions of one piston and crank at each quarter revolution, the others having positions corresponding to their angular displacement. Starting with the piston 8 at its nearest position to the cylinder head marked 8^a, the

crank will be in the position marked 10^a. The piston will move in the direction of the arrow through the quadrant marked "Suction", at the end of which the piston will have come to the position 8^b and the crank to the position 10^b. During the next quadrant, marked "Compression" the piston will go to the position 8^c and the crank to the position 10^c, while during the next quadrant marked "Working" the piston will go to the position marked 8^d and the crank to the position 10^d. During the last or "exhaust" stroke, the piston will go back to the position 8^a and the crank from 10^d around to 10^a. It will be seen that for each quarter revolution of the cylinder the crank makes three-fourths of a revolution, which is equivalent to an advance of 180° and thereby during any quarter revolution of the cylinder the piston makes a complete stroke. During a complete cylinder revolution there will consequently be four piston strokes. By this arrangement one of the four piston strokes will be longer than any other, and this stroke will preferably be the exhaust stroke. In order to further lengthen the exhaust stroke, so as to more completely scavenge the compression space near the cylinder head, the center of the shaft 11 may be offset slightly, as shown in Figs. 2 and 3. This offset is made toward the end of the exhaust quadrant, so that the crank at position 10^a comes nearer the cylinder head than at position 10^c. This offsetting to secure a longer exhaust stroke of the piston causes a somewhat shorter compression stroke, but an advantage is obtained in that the entire cylinder space is practically cleared by the long exhaust stroke of the piston. By not offsetting the crank shaft 11, the exhaust stroke would not be quite as long, while the working and suction strokes would be practically the same as before.

Various modifications and changes in the specific construction shown may be made without departing from the scope of the invention.

It will be seen that I have provided a construction wherein greater economy and efficiency will be secured by means of a long working stroke, while also permitting more complete scavenging during the exhaust stroke than is commonly the case. Also, it will be seen that I have provided what might be called a four-stroke cycle engine, inasmuch as in one revolution of the cylinder the piston makes four strokes, thereby securing more frequent power impulses. Furthermore, the arrangement herein described comprising a plurality of pistons acting on a common crank, is balanced, and no fly-wheel is essential, while the number of cylinders having their pistons connected to a single crank may be varied as desired.

Having thus described my invention, I declare that what I claim as new and desire to secure by Letters Patent, is:—

1. The combination with a rotatable cylinder, and a piston reciprocating therein, of a crank shaft mounted eccentrically with respect to the axis of revolution of the cylinder, a connecting rod between the crank shaft and the piston, and mechanical connections between the cylinder and the crank shaft for rotating the crank shaft at such a rate of revolution greater than that of the cylinder as to cause the piston to make a full stroke in the cylinder while the cylinder is rotating 90°.

2. The combination with a rotatable cylinder, and a piston reciprocating therein, of a crank shaft mounted eccentrically with respect to the axis of revolution of the cylinder, a connecting rod between the crank shaft and the piston, and gearing between the cylinder and the crank shaft causing one stroke of the piston in the cylinder while the cylinder rotates 90° and the crank shaft 270°.

3. The combination with a rotatable cylinder, and a piston reciprocating in said cylinder, of a crank shaft mounted in stationary bearings eccentric to the axis of rotation of said cylinder, and gearing between the crank shaft and cylinder causing the piston to make one full stroke while the cylinder makes a quarter revolution.

4. The combination with a rotatable cylinder and a piston reciprocating therein, of a rotatable crank shaft mounted eccentrically with respect to the axis of rotation of the cylinder, gearing connecting the crank shaft and the cylinder for rotating the crank shaft at such rate of revolution greater than that of the cylinder as to cause the piston to make four strokes during one revolution of the cylinder, the crank shaft being located in such position as to make a predetermined one of said four piston strokes longer than the others.

5. In a four stroke cycle engine, the combination with a cylinder, a piston, a crank shaft and a connecting rod between said crank shaft and said piston, of valve mechanism controlling the inlet compression, firing and exhaust of the gas with respect to corresponding piston strokes, and means for causing a predetermined one of said piston strokes of each cycle to be longer than the other strokes of that cycle.

6. In a four stroke cycle engine, the combination with a rotatable cylinder, a piston, a crank shaft and a connecting rod between said crank shaft and said piston, of valve mechanism controlling the inlet, compression, firing and exhaust of the gas with respect to corresponding piston strokes and means comprising gearing connecting the crank shaft and said rotatable cylinder for

causing a predetermined one of said piston strokes of each cycle to be longer than the other strokes of that cycle.

7. The combination with a rotatable crank shaft mounted in stationary bearings, of a plurality of rotatable cylinders mounted eccentrically with respect to said crank shaft, a piston in each cylinder, a separate connecting rod between each piston and a common crank on said shaft, and gearing connecting said crank shaft and said cylinders of such ratio as to cause the piston of each cylinder to make four strokes during one complete cylinder revolution.

8. The combination with a support, of a plurality of cylinders rotatably mounted thereon, a piston reciprocating in each cylinder, a crank shaft journaled in said support eccentrically to the axis of revolution of said cylinders, a separate connecting rod between the crank shaft and said pistons, and a gear connecting between said cylinders and said crank shaft for effecting simultaneous rotation, and for effecting four piston strokes for each cylinder revolution, one of which strokes in each revolution will be longer than any other stroke.

9. The combination in a combustion engine with a support and a rotatably mounted cylinder carrying a piston, of a shaft having a crank to which said piston is connected, three to one gearing between said shaft and said cylinder whereby to cause simultaneous rotation at different speeds while reciprocating the piston, and means whereby one of the strokes of the piston in each four stroke cycle is longer than any other stroke.

10. The combination in a combustion engine with a support and a rotatably mount-

ed cylinder carrying a piston, of a shaft having a crank to which said piston is connected, three to one gearing between said shaft and said cylinder whereby to cause simultaneous rotation at different speeds while reciprocating the piston, said crank shaft being offset to render one stroke of the piston in each four stroke cycle longer than any other stroke.

11. The combination in a combustion engine with a frame, of a plurality of cylinders rotatably journaled therein, pistons in said cylinders, a common crank pin to which said cylinders are connected by separate connecting rods, a shaft carrying said crank and journaled in said frame, and gearing between said shaft and said cylinders proportioned to cause four strokes of each piston during one complete cylinder revolution.

12. The combination in a combustion engine with a frame, of a plurality of cylinders rotatably journaled therein, pistons in said cylinders, a common crank pin to which said cylinders are connected by separate connecting rods, a shaft carrying said crank and journaled in said frame, gearing between said shaft and said cylinders proportioned to cause four strokes of each piston during one complete cylinder revolution, each of said pistons having an inlet valve to admit charge during one inward stroke, and a mechanically operated exhaust valve open during one outward stroke.

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

CORNELIUS H. TANGEMAN.

Witnesses:

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