C. J. COLEMAN.

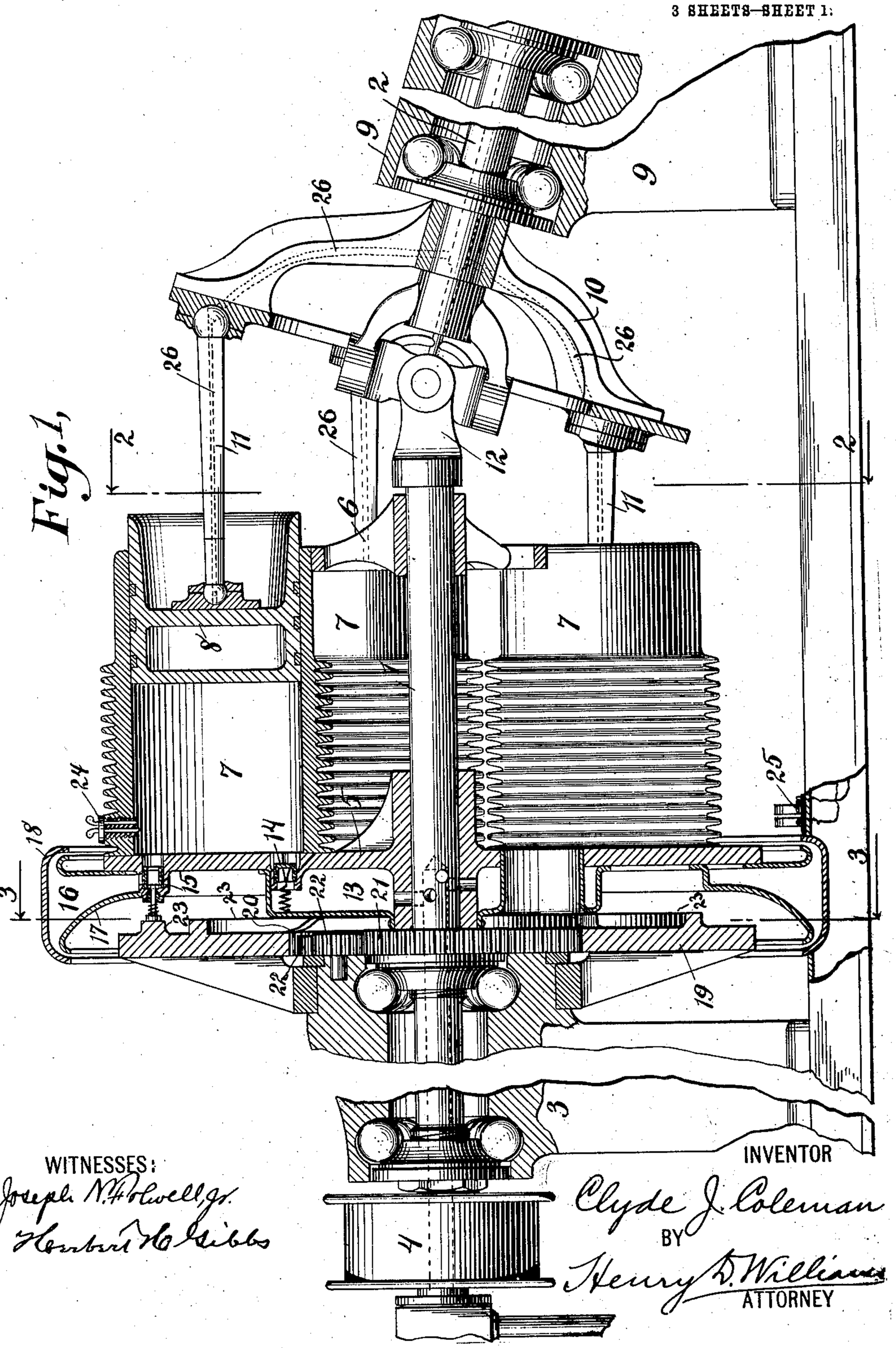
ROTARY CYLINDER EXPLOSION ENGINE.

APPLICATION FILED FEB. 1, 1901.

980,491. Patented Jan. 3, 1911.

3 SHEETS—SHEET 1.

Fig. 1.



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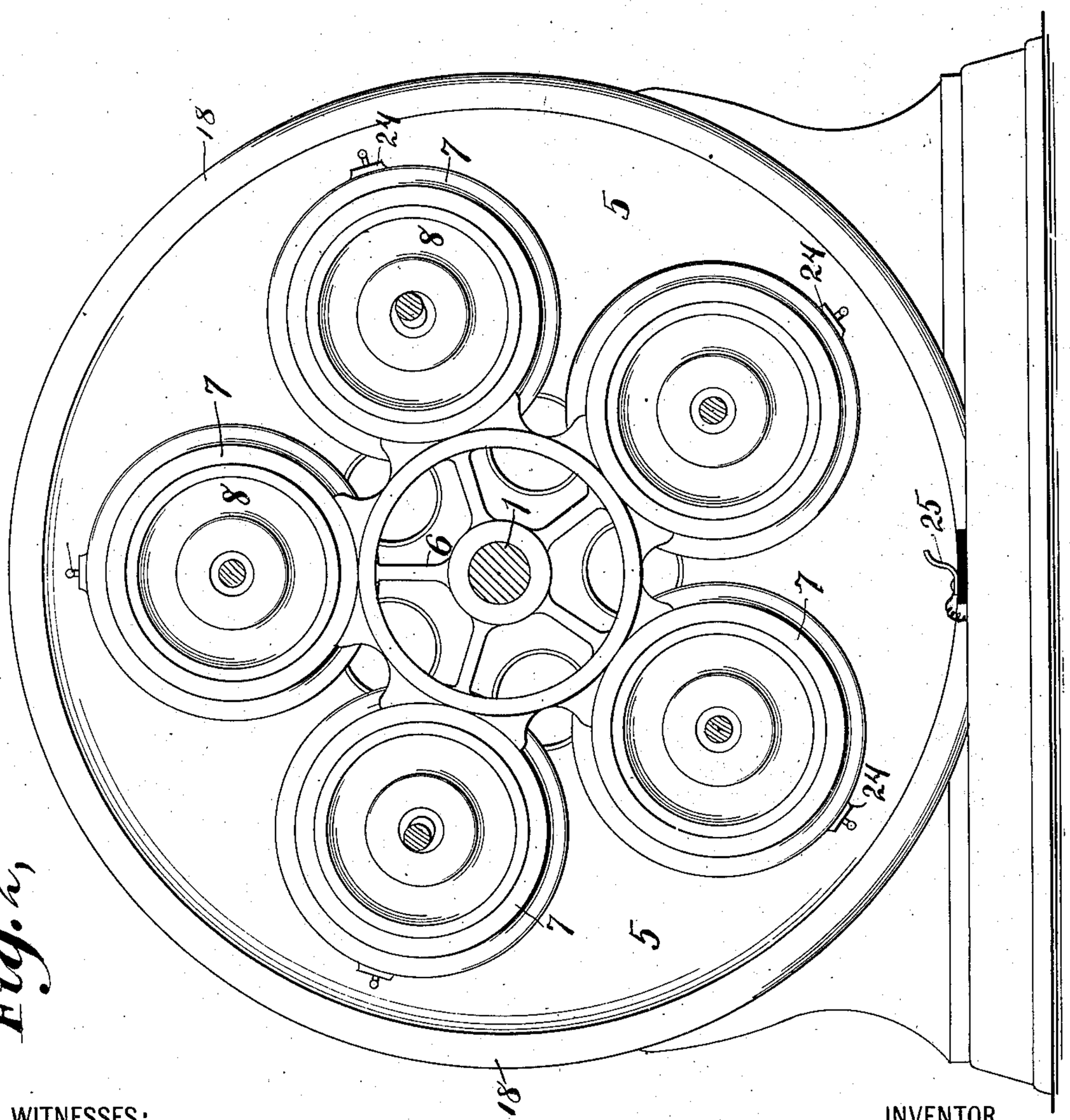

Fig. 2.

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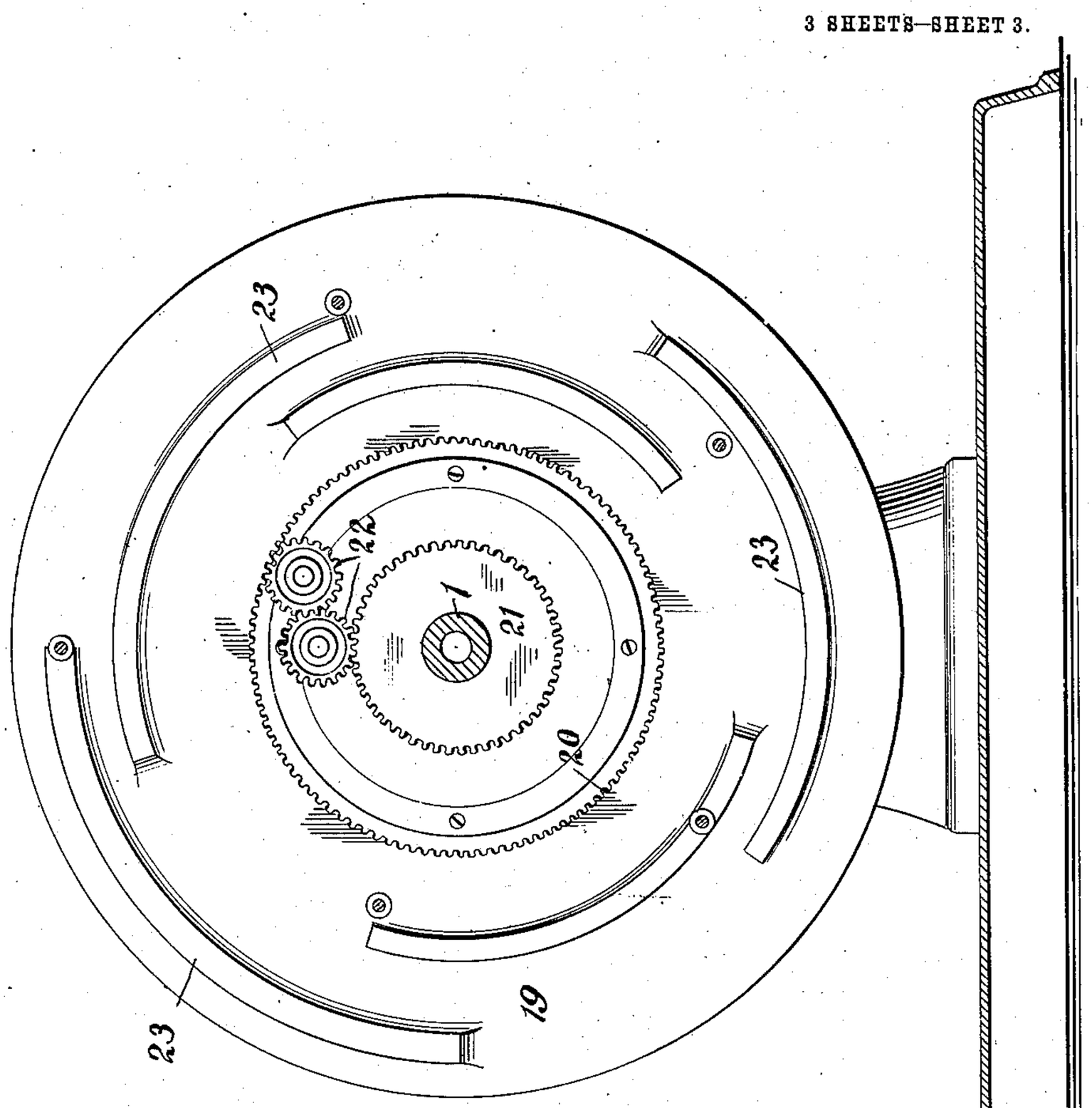

Fig. 3.

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UNITED STATES PATENT OFFICE.

CLYDE J. COLEMAN, OF NEW YORK, N. Y., ASSIGNOR TO ROCKAWAY AUTOMOBILE COMPANY, OF ROCKAWAY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ROTARY-CYLINDER EXPLOSION-ENGINE.

980,491. Specification of Letters Patent. Patented Jan. 3, 1911.

Application filed February 1, 1901. Serial No. 45,584.

To all whom it may concern:

Be it known that I, CLYDE J. COLEMAN, a citizen of the United States, and a resident of the borough of Manhattan, in the county of New York, city of New York, and State of New York, have invented new and useful Improvements in Rotary-Cylinder Explosion-Engines, of which the following is a specification, reference being had to the accompanying drawings, forming part thereof.

My invention relates to fluid motors, and is particularly adapted for use in connection with internal combustion or explosive motors, and consists in the arrangement of a plurality of rotating cylinders about a common axis and operated by internal combustion at the same point in their rotation and at equal intervals.

My invention further consists in the parallel arrangement of such cylinders.

My invention further includes two rotating parts connected to rotate together and arranged with their axis of rotation intersecting at an angle, one of the parts carrying a cylinder or a plurality of cylinders and the cylinder or each cylinder being provided with a piston, and the other rotating part being connected with the piston or with each piston.

My invention further includes means for circulating currents of a cooling medium, as air, for keeping down the temperature of the cylinders.

My invention further includes suitable intake and exhaust valves for admitting and exhausting motive fluid to and from the cylinders and means for mechanically operating the latter at predetermined points and during predetermined intervals, and includes suitable means for exploding the motive fluid in the cylinders at a predetermined point in the rotation of the shafts and at predetermined intervals; and my invention further consists in certain novel details of construction and combination of parts as hereinafter set forth.

The main object of my invention is to provide a simple form of engine of the internal combustion or explosive type in which power is developed uniformly.

In the ordinary type of explosive engine which is the single cylinder four cycle type, one explosion occurs, at the most at every other complete revolution of the main shaft, and hence impulse is given to the piston, at most, once in every four movements of the piston in either direction. If a plurality of cylinders is provided in this type of engine the attendant mechanism and structure are necessarily complicated and cumbersome, and the result is a heavy, complicated and expensive engine.

In my present invention I have provided a multi-cylinder engine of extreme simplicity and lightness, while obtaining therefrom a high efficiency. Other advantages will appear in the more detailed description hereinafter.

I will now proceed to describe a fluid motor embodying my invention and will then point out the novel features in claims.

In the drawings herewith, which form a part of this specification; Figure 1 is a longitudinal sectional elevation of a fluid motor embodying my invention. Fig. 2 is a transverse sectional elevation of the same, the plane of section being taken on the line 2—2 of Fig. 1. Fig. 3 is a transverse sectional elevation of the same, the plane of section being taken on the line 3—3 of Fig. 1.

In carrying out my invention I have provided two shafts, 1 and 2, of which the shaft 1 is the main or drive shaft and is journaled in stationary bearings 3, and is provided with a drive pulley 4 through which power may be transmitted. The drive shaft 1 further carries a plurality of cylinders, in this instance 5, secured to a suitable rotary plate 5 rigidly mounted upon the shaft. A spider 6 further operates to connect the cylinders and the rotary plate rigidly together. The cylinders 7, 7, are arranged upon the rotary plate at equal distances from each other and at equal distances from the axis of rotation of the shaft, and each cylinder is provided with a piston 8 mounted to reciprocate therein. The shaft 2 is also mounted in stationary bearings 9, and carries, rigidly mounted thereon, a spider 10, having one arm for each cylinder and piston carried by the shaft 1. Connecting rods or links 11 are provided, each of which is connected by spherical bearings at one end to the corresponding arm of the spider 10 and at the other end to the corresponding piston.

The shafts 1 and 2 are connected to rotate together by means of a universal joint 12. Bevel gearing or other suitable connecting means might of course be employed in lieu

thereof as a mechanical equivalent if so desired.

Upon the rotation of the shafts the pistons will reciprocate in their respective cylinders, and during one complete revolution of the two shafts each of the pistons will make a complete stroke in both directions, returning to its first position. The pistons will start from different positions in their strokes in the various cylinders but will always maintain the same relative positions toward each other. If successive impulses be given to successive pistons at each revolution of the shafts, and such impulses be given always at the same point in the rotation of the shafts, which point is substantially that opposite which a cylinder arrives when its piston is at the commencement of its stroke in a forward or outward direction, the result will be a very uniform development of power and equal distribution of forces. If the fluid motor be operated, however, as an internal combustion or explosive motor, the impulses given to the pistons would preferably be at every other revolution rather than at every revolution, in order to obtain the desired compression such as is obtained in the ordinary form of four cycle internal combustion or explosive motor in common use. But if impulse be given in all of the cylinders at every other revolution, and to none of them at the alternate revolution, then the equal distribution of the power is destroyed. For this reason I provide an uneven number of cylinders, such as five, and explode a charge in alternate successive cylinders. Thus in two revolutions the first cylinder will receive the first explosion, the third cylinder the second explosion, the fifth cylinder the third explosion, the second cylinder (during the second revolution) the fourth explosion and the fourth cylinder (also during the second revolution) the fifth explosion. The next successive alternate cylinder to receive an explosion will be the one which received the first explosion which has again arrived at the point at which it will be operated upon, which is at the beginning of the second revolution thereafter. In this manner five impulses are given to the pistons in two revolutions, all at the same fixed point, and such impulses are equally distributed over the two revolutions, and are applied once each in each cylinder during such time. Each cylinder will receive an impulse for its piston for one half of a revolution at each alternate revolution of the shafts, and during the other revolution and a half will exhaust, receive motive fluid and compress the same as is common in the four cycle type of internal-combustion or explosive motor.

The motive fluid, as here shown, is introduced through a hollow portion of the drive shaft 1 and thence into a chamber 13, which chamber connects with all of the cylinders 7 through intake valves 14. One such valve is provided for each of the cylinders. The form of valve which I have shown and which is a preferable form, is a piston valve provided with packing rings and spring actuated in one direction. When operated in the other direction by the pressure of the incoming motive fluid, the spring tension is overcome and the motive fluid passes through grooves or ports arranged in the sides of the cylindrical valve casing.

Exhaust valves 15 are provided, one for each cylinder and the preferred form of exhaust valve is a hollow piston valve provided with packing rings as shown, said valve spring actuated in one direction and operated by a cam in the other. When forced inwardly by the action of the cam against the spring pressure, the cylinder is opened through the valve to an annular exhaust chamber 16. The annular exhaust chamber is arranged within a muffler having stationary and rotary members. The rotary member 17 is secured to, and carried by, the drive shaft 1, while the stationary member 18 is secured to the frame and held relatively stationary thereto.

The cam disk 19 which carries the cam surfaces arranged to operate the exhaust valves 15 at the desired intervals, is suitably journaled upon the standard which carries the stationary bearing 3, and is provided with gear teeth 20 which form an internal gear as a part of the disk. A gear wheel 21 is rigidly mounted upon the main shaft 1, and has a relative proportion to the gear teeth 20 as of 1 to 2.

Two idlers 22 are freely mounted upon stationary studs upon the bearing standard 3, and intermesh with each other, and also the one with the gear wheel 21 and the other with the gear teeth 20. By this gearing motion will be transmitted from the shaft 1 to the cam disk 19, and the cam disk 19 will, by reason of the ratio of the gearing, be caused to make one revolution in the same direction upon every two revolutions of the main shaft.

The cam disk has a number of cam surfaces or projections 23, one of such cam projections being arranged for each valve; and the cam projections and the valves are so positioned, relatively to each other, that each valve is operated only by its own cam projection. The cam projections are furthermore arranged at such points around the disk as to successively operate the valves of alternate cylinders in the manner desired.

A sparking plug 24 is provided for each cylinder, and a circuit closing device 25 is secured to a stationary portion of the motor and is connected with an electric generator in a manner well known. The circuit closing device is so positioned that a spark will

be formed to explode a compressed charge in the cylinders at the most effective point in the stroke of the piston.

I have shown the cylinder 7 as provided with radiating ribs or projections in order to keep down the temperature of the cylinder, and I have shown openings in the rotary plate 5, and passages through the chamber 13 in register therewith, through which currents of air may pass in order to assist in the cooling action.

In order to avoid, as much as possible, friction upon the moving parts, particularly in the bearings of the shafts, and further in order to compensate for end thrust upon the shafts, I have shown the bearings provided therefor in the form of ball bearings. I have also shown a number of oil channels 26 which form a convenient means for distributing oil to the various places requiring lubrication.

It is obvious that various modifications and changes may be made in the construction shown and above particularly described within the spirit and scope of my invention.

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

1. The combination, in an internal combustion motor, of two rotating parts connected to rotate together and arranged at an oblique angle to each other and with intersecting axes, a plurality of cylinders carried by one of said rotating parts, a piston mounted in each cylinder, a connection between each of the pistons and the other rotating part, intake and exhaust valves for the cylinder and a cam disk having a plurality of cam projections for the valves of the respective cylinders and arranged to rotate so that such cam projections will operate the valves at fixed points in the rotation of their respective cylinders.

2. The combination, in an internal combustion motor of two rotating parts connected to rotate together and arranged to rotate about fixed axes at an oblique angle to each other and a plurality of cylinders carried by one of said rotating parts, a piston mounted in each cylinder, a connection between each of the pistons and the other rotating part, intake and exhaust valves for the cylinders, and a revoluble cam disk geared to rotate with the cylinders at the ratio of one to two, said cam disk having a plurality of cam projections, one for each of the exhaust valves, substantially as set forth.

3. The combination, in an internal combustion motor, of two rotating parts connected to rotate together and arranged at an oblique angle to each other and with intersecting axes, a plurality of cylinders carried by one of said rotating parts, a piston mounted in each cylinder, a connection between each of the pistons and the other rotating part, intake and exhaust valves for the cylinders, a cam disk having a plurality of cam projections, one for each of the exhaust valves, said cam disk loosely mounted upon a bearing and provided with gear teeth, a gear wheel secured to rotate with the cylinders and connected to the gear teeth of the cam disk so that the cam disk is caused to revolve once to every two revolutions of the cylinders, substantially as set forth.

4. The combination in an internal combustion motor, of two rotating parts connected to rotate together and arranged at an oblique angle to each other and with intersecting axes, a plurality of cylinders carried by one of said rotating parts, a piston mounted in each cylinder, a connection between each of the pistons and the other rotating part, intake and exhaust valves for each of the cylinders and means including a part rotatable independently of the other rotating parts for successively opening the exhaust valves of alternate successive cylinders, substantially as set forth.

5. The combination, in an internal combustion motor, of two rotating parts connected to rotate together and arranged at an angle to each other and with intersecting axes, an uneven number of cylinders carried by one of said rotating parts, a piston mounted in each cylinder, a connection between each of the pistons and the other rotating part, intake and exhaust valves for each of the cylinders and means including a part rotatable independently of the other rotating parts for successively opening, and holding open for half a revolution, the exhaust valves of alternate successive cylinders, substantially as set forth.

6. The combination, in an internal combustion motor, of two rotating parts connected to rotate together and arranged to rotate about fixed axes at an oblique angle to each other, a plurality of cylinders carried by one of said rotating parts, a piston mounted in each cylinder, a connection between each of the pistons and the other rotating part, and means including a part rotatable independently of the other rotating parts whereby a charge of motive fluid may be exploded in each cylinder at a given point at every other revolution of the rotating parts, substantially as set forth.

7. The combination in an internal combustion motor of two rotating parts connected to rotate together and arranged to rotate about fixed axes and at an angle to each other, a plurality of cylinders carried by one of the said rotating parts and having their respective axes arranged parallel to the axis of such rotating part, a piston mounted in each cylinder, a connection between each of the pistons and the other rotating part, intake and exhaust valves for each of the cylinders and means including a part rotatable independently of the other rotating parts

for successively opening the exhaust valves of the alternate successive cylinders.

8. The combination in an internal combustion motor of two rotating parts connected to rotate together about fixed axes, a plurality of cylinders carried by one of the said rotating parts, intake and exhaust valves, a common motive fluid chamber for all the cylinders, a common exhaust chamber, such chambers being arranged to rotate with the cylinders, and a cam disk fitted to rotate with such cylinders and having projections arranged thereon and adapted to actuate the exhaust valves of the respective cylinders.

Signed at New York, N. Y., this 31st day of January, 1901.

CLYDE J. COLEMAN.

Witnesses:

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