F. BECK.

ROTARY EXPLOSION MOTOR.

APPLICATION FILED DEC. 7, 1909.

977,260.

Patented Nov. 29, 1910.

4 SHEETS—SHEET 1.

FIG_1_

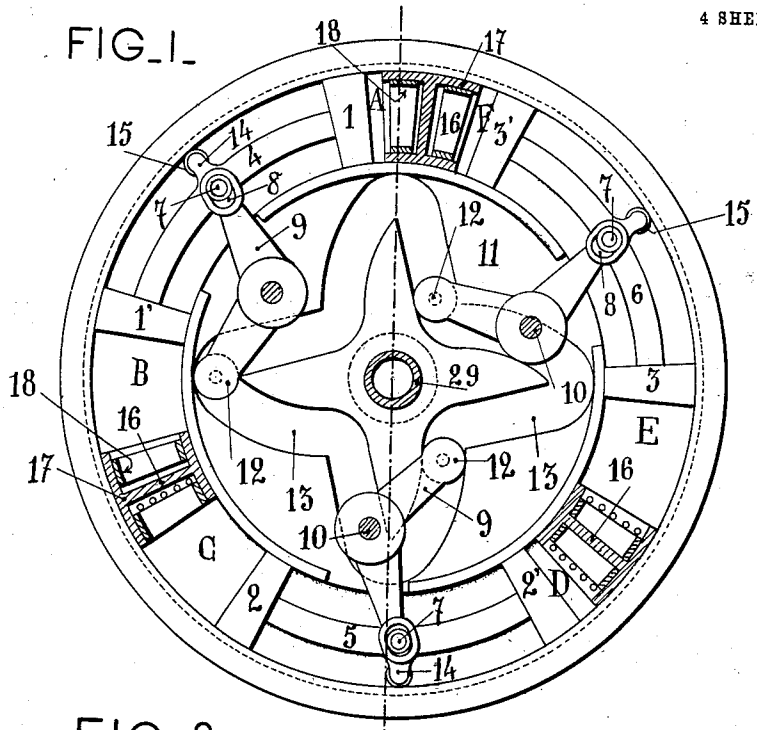
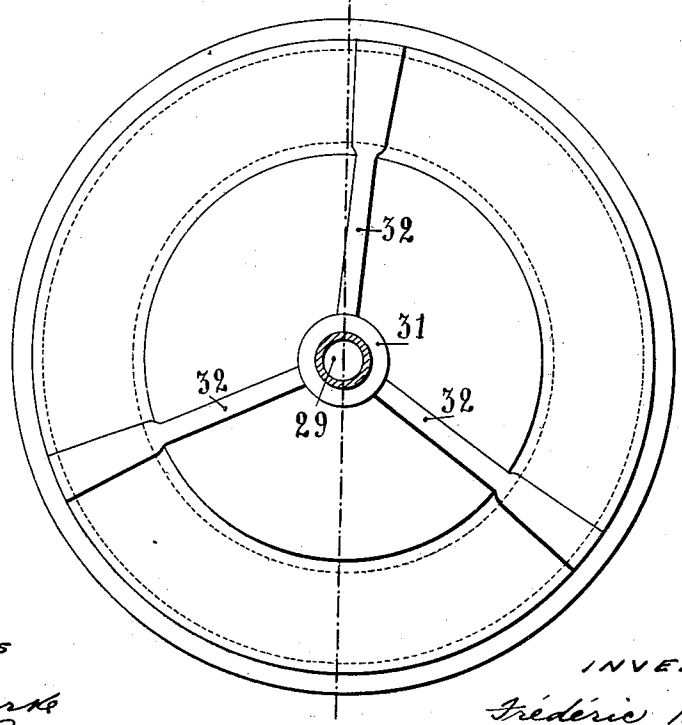


FIG_2_



WITNESSES

W. P. Burke

John A. Percival

INVENTOR

Frédéric Beck

BY J. M. Millan & Co.

ATTY.

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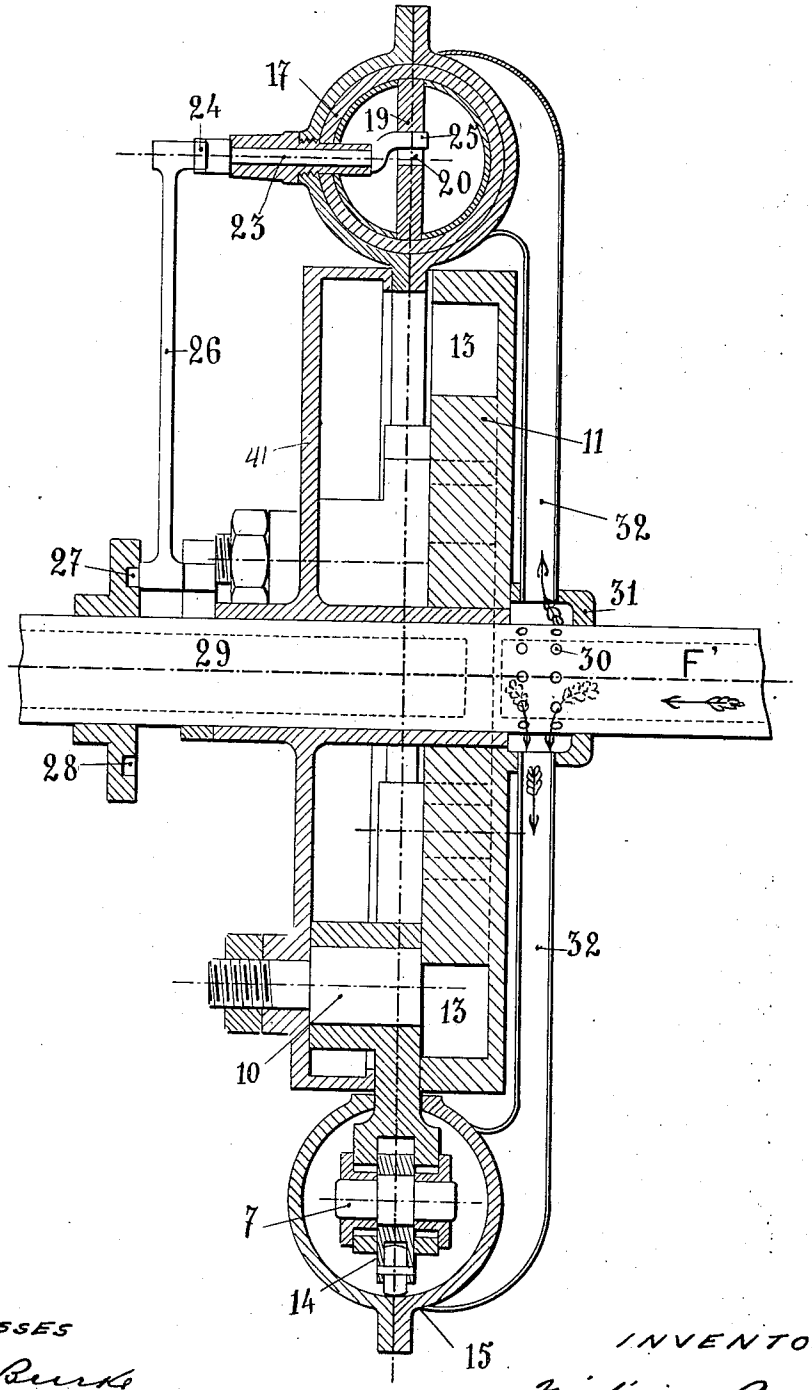
4 SHEETS—SHEET 2.

FIG_3_



WITNESSES

W. P. Burks

John A. Kincaid

INVENTOR

Frédéric Beck

BY Wm. Wallace Mitchell

ATTY.

F. BECK.

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4 SHEETS—SHEET 3.

FIG_4_

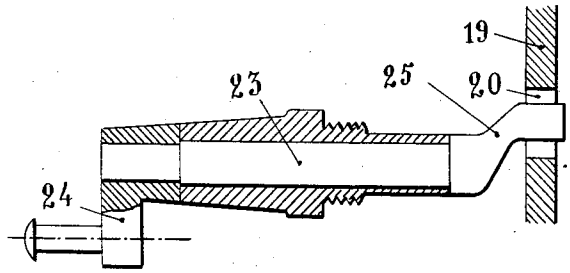


FIG_5_

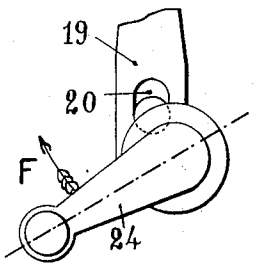
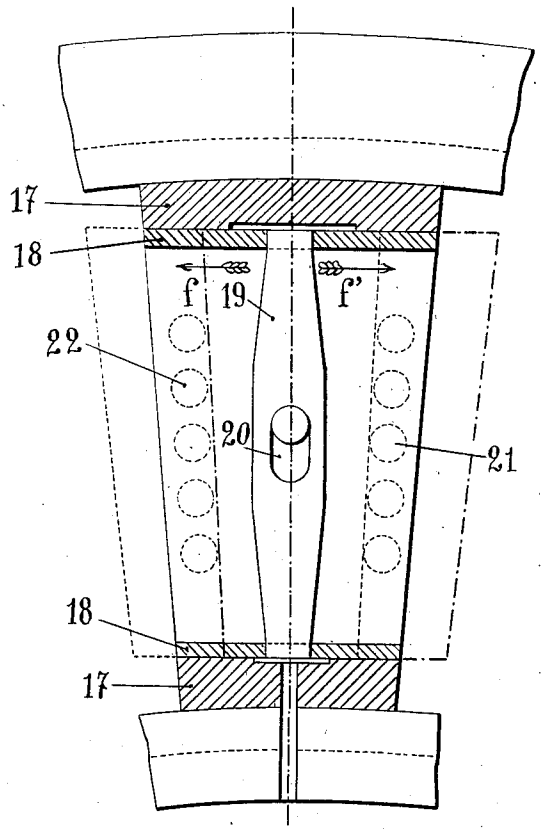


FIG_6_



WITNESSES

W. P. Burke

John A. Percival

INVENTOR

Frédéric Beck

BY Wm. Wallace Mein

ATT'Y.

F. BECK.

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4 SHEETS—SHEET 4.

FIG_7_

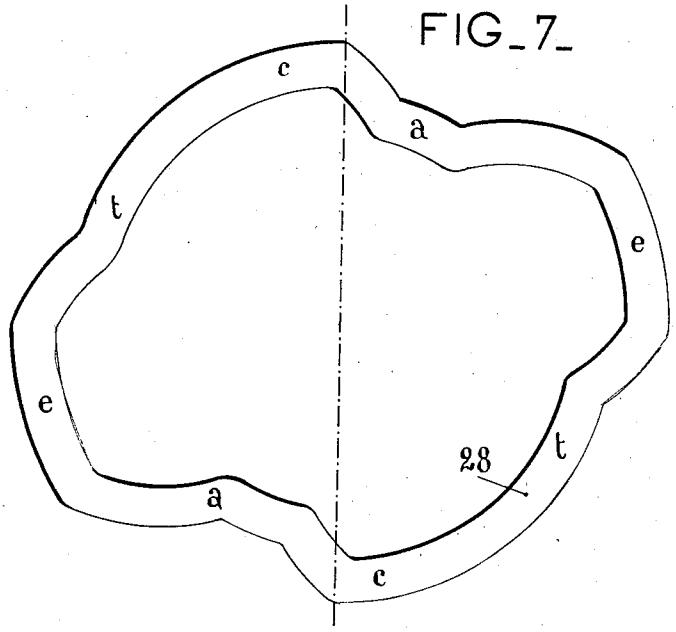
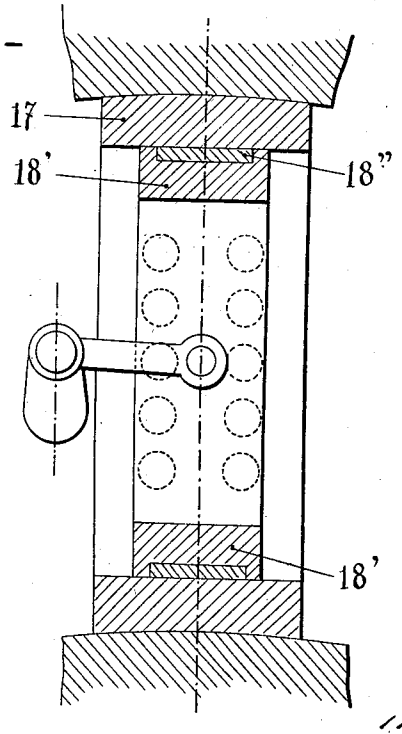


FIG_8_



WITNESSES

W. P. Burke

John A. Percival

INVENTOR

Frédéric Beck

BY Munn & Co

ATTY.

UNITED STATES PATENT OFFICE.

FRÉDÉRIC BECK, OF NEUILLY, FRANCE.

ROTARY EXPLOSION-MOTOR.

977,260. Specification of Letters Patent. Patented Nov. 29, 1910.

Application filed December 7, 1909. Serial No. 531,889.

To all whom it may concern:

Be it known that I, FRÉDÉRIC BECK, a subject of the French Republic, residing at 21 Rue Montrosier, Neuilly-sur-Seine, France, have invented certain new and useful Improvements in Rotary Explosion-Motors, of which the following is a specification.

This invention relates to reciprocating rotary explosion motors with reciprocating pistons of the kind comprising a motor cylinder in the form of an annular chamber (hereinafter called the "ring cylinder") having a rotary movement.

The invention provides improvements in motors of this type. These improvements consist in the simplification of the members transmitting, the movements of the pistons to the rotary ring cylinder; in the replacement of the inlet and exhaust valves by means of annular distributers, and in the method of operating these distributers.

One construction of the invention and a modification of the system of distribution are illustrated by way of example in the accompanying drawings, in which—

Figure 1 is an internal view of one of the halves of the working chamber; Fig. 2 is an external view of the motor showing the admission device for the working fluid, Fig. 3 is a section through the shaft drawn to a larger scale, Fig. 4 is an axial section, also drawn to a larger scale, of the operating mechanism of a distributer, Fig. 5 is an end view of the same, Fig. 6 a section of a distributer taken in the central plane of the working chamber, Fig. 7 a view showing the shape of the distribution cam groove; and Fig. 8 a modification of the distributer and its operating mechanism.

Referring to Fig. 1 the motor comprises a number of sets of two pistons. Three sets $1—1^1$, $2—2^1$, $3—3^1$ are shown, but this number may be varied. The two pistons of each set are connected by means of bars 4, 5 and 6 respectively. Each of these bars carries a roller 7 at its middle, which is displaceable in a slot 8 in the end of one of the arms of a bell crank lever 9. Each set of two pistons has its bell-crank lever 9. Each lever 9 is pivoted on an axis 10 fixed to a plate 41 (see Fig. 3) attached to and rotatable with the ring cylinder, and each lever 9 carries a roller 12 at its free end which engages in a groove 13 formed in a stationary frame plate 11. The reciprocating rotary motion of the pistons in the motor ring cylinder under the action of the explosion causes the corresponding lever 9 to turn on its axis 10. The displacement of the roller 12 in the groove 13 transforms the movement of the pistons into a continuous rotary movement of the ring cylinder. The same result as in the case of motors of the same type hitherto constructed is thus obtained, but in a much simpler manner and by dispensing with all gearing. On a projection 14 of each of the bars 4, 5, 6 is mounted a small roller 15 rolling on the internal face of the ring cylinder. This device is intended to prevent the tendency of the pistons to deform the ring cylinder under the action of the centrifugal forces. The three sets of two pistons $1—1^1$, $2—2^1$, $3—3^1$ are separated from each other by partitions 16 carried by the rings 17 (Fig. 1) thus constituting a motor having six cylinders A, B, C, D, E, F. The motor works on the four-stroke cycle.

The explosions may follow upon one another in any desired manner. The sequence depends on the method of regulation adopted for distribution and ignition. The following is an example of such regulation: With the position of the pistons shown in Fig. 1 there will be explosion at A, compression (commencement) at B, admission (end) at C, exhaust (end) at D, exhaust (commencement) at E, explosion at F, whereupon the strokes follow upon one another in the various cylinders in the ordinary way according to the four-stroke cycle.

In the improved motor, the inlet and exhaust valves hitherto used in motors of this kind are replaced by the distributers now to be described.

The distribution takes place in the following manner: In a motor having three sets of pistons, as shown in the drawings, rings 17 (Figs. 1, 3 and 6) are arranged at three points of the working chamber, being spaced 120° apart and having central partitions, as hereinbefore stated. In these rings 17 are movably arranged the distributers each consisting of a thin split spring ring 18 making a tight joint with the fixed ring 17. The distributing ring 18 might also be arranged to move directly in the working chamber, but they should then have a cylindrical external surface. When they are movable in the inserted rings 17, the distributing rings 18 may be in the form of short cylinders, and in this case the ring 17 is bored out cy-

lindrically while externally retaining the shape of a short cylinder. A cross-bar 19 in which is formed a slot 20 is mounted in each of the rings 18 along one diameter. The ring 17 is provided with two rows of holes 21 and 22. The holes 21 for instance, serve for the admission of the carbureted mixture, and the holes 22 for the expulsion of the burned gases. If the distributing ring 18 is displaced in the direction of the arrow f (Fig. 6) the holes 21 will be uncovered when it has reached its left-hand position indicated in dotted lines in the drawings, the holes 22 meanwhile remaining closed. The fresh gases are thus enabled to enter the motor cylinder. When the distributing ring is thereupon displaced in the direction of the arrow f^1, on reaching its central position the holes 21, 22 are covered. The motor cylinder is then closed and compression may take place. The distributing ring occupies the same position for the working stroke. When the distributing ring on continuing its movement in the direction of the arrow f^1 reaches the position indicated in dash-dot lines in Fig. 6, the holes 21 (admission) are covered while the holes 22 (exhaust) are uncovered. The burned gases can then escape to the outside. The simple movement in the direction of the arrows f^1 or f of the distributing ring just described therefore enables the four-stroke cycle to be obtained.

In order to produce the displacement of the distributing ring 18, the device illustrated in Figs. 3, 4 and 5 is used. The working chamber is traversed by a spindle 23 terminating externally in a small crank 24, and internally in a bent portion 25 whose end engages in the slot 20 of the cross-bar 19 of the distributing ring. If the crank 24 receives an oscillatory movement in the direction of the arrow F (Fig. 5) the corresponding displacement of the bent portion 25 of the spindle 23 will cause the cross-bar 19 of the distributer to move in the direction of the arrows f or f^1 (Figs. 5 and 6).

In order to produce this oscillation of the crank 24, the device illustrated in Fig. 3 is used. To the crank 24 is attached a rod 26 (there being a rod 26 and a spindle 23 for each distributing ring) whose other end carries a member 27 engaging in the groove of a cam, such as indicated in Fig. 7.

The cam illustrated in the drawings is formed by a groove 28. This cam is rigidly fixed to the shaft, and when the motor revolves, the members 27 being guided in the groove 28 of the cam, the spindles 23 of the distributers receive an oscillatory movement such that the opening and closing of the inlet and exhaust orifices is produced at the desired moment for obtaining the four-stroke cycle.

The portions a, c, t, e of the groove 28 (Fig. 7) correspond to the positions of admission, compression, explosion and exhaust respectively.

In the modification illustrated in Fig. 8, the distributing ring 18^1 is provided with a segment 18″ adapted to insure tightness of the joint.

In the improved motor, admission takes place through the shaft 29 which is hollow as shown in Fig. 3. Holes 30 are provided in this shaft, communicating with a chamber 31 which is mounted on the said shaft and to which are attached three tubes 32. These tubes terminate at their outer ends in a curved portion surrounding the ring cylinder and hermetically fixed thereon, opposite the holes 21 provided in the said ring cylinder. The gases therefore pass through the interior of the shaft 29 in the direction of the arrow F^1 and follow the path indicated in Fig. 3 in order to reach the working chamber. Lubrication likewise takes place through the hollow shaft, and generally on the side opposite to that of admission. It may also be performed on the same side. Ignition takes place in any desired manner, and has no characteristic feature.

The motor hereinbefore described is essentially a rotary motor having a revolving motor cylinder. It should be noted however, that the motor might also be worked by fixing the working chamber and in this case the motor shaft revolves. This arrangement may be of advantage for high-power motors, as it allows water cooling to be applied.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a rotary explosion motor, the combination with a ring motor cylinder divided by radiating partitions into a plurality of concentric working chambers and a pair of reciprocating motor pistons connected by a bar, in each working chamber, of a stationary frame plate formed with a star-shaped cam groove, a bell crank lever jointed at one end to said bar, and a roller mounted on the other end of said bellcrank lever, so as to roll in the star-shaped cam groove of said stationary frame plate whereby the reciprocatory motion of each pair of pistons revolving around the central axis of the motor is converted into a continuous rotary motion of the motor, as set forth.

2. In an explosion motor, the combination with a ring motor cylinder divided by radiating partitions into a plurality of concentric working chambers, a pair of reciprocating motor pistons in each working chamber, a bar connecting together the pistons of each pair, a stationary frame plate formed with a star-shaped cam groove, a bell crank lever jointed at one end to said bar, a roller mounted on the other end of said bell crank lever so as to roll in said star-

shaped cam groove, an extension of said bar, and a roller carried by said extension rolling on the internal face of the respective working chamber, whereby the deformation of the motor cylinder by the pistons under the action of centrifugal forces is prevented, as set forth.

3. In a rotary explosion motor, the combination with a ring motor cylinder divided by radiating partitions into a plurality of concentric working chambers, and a pair of reciprocating motor pistons connected by a bar, in each working chamber, of a stationary frame plate formed with a star-shaped cam groove, a bell crank lever jointed at one end to said bar, and a roller mounted on the other end of said bellcrank lever, so as to roll in the star-shaped cam groove of said stationary frame plate a distributing ring movable in each working chamber, and means operated by the motor shaft for moving said distributing ring to-and-fro to control the admission to and the exhaust from said working chamber, as set forth.

4. In a rotary explosion motor, the combination with a ring motor cylinder divided by radiating partitions into a plurality of concentric working chambers, and a pair of reciprocating motor pistons connected by a bar, in each working chamber, of a stationary frame plate, formed with a star-shaped cam groove, a bellcrank lever jointed at one end to said bar, and a roller mounted on the other end of said bellcrank lever, so as to roll in the star-shaped cam groove of said stationary frame plate, a distributing ring slidable in each working chamber, a partition in said distributing ring, a cranked axle engaging said partition, a rod connected at one end to said cranked axle, a pin on the other end of said connecting rod, and a cam rotated by the motor shaft, engaging said pin, whereby said distributing ring is moved to control the admission to and the exhaust from its working chamber, as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRÉDÉRIC BECK.

Witnesses:
DOMINIQUE CASALONGA,
MIGUEL FEROLO.