Dec. 10, 1929. H. TROPP 1,739,104

ROTARY INTERNAL COMBUSTION ENGINE

Filed March 7, 1929 2 Sheets-Sheet 1

Fig. 1.

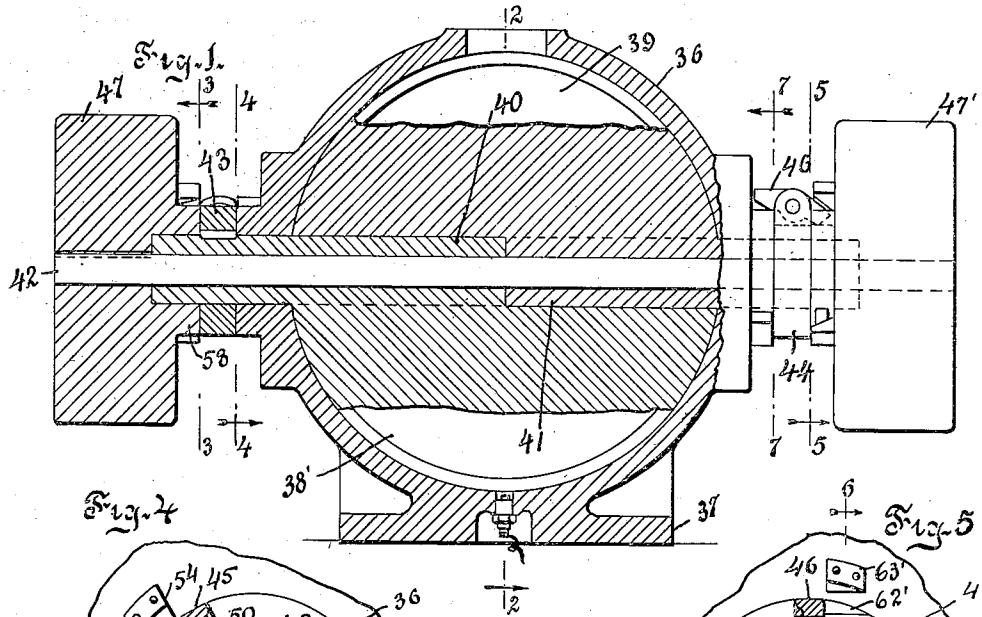


Fig. 4

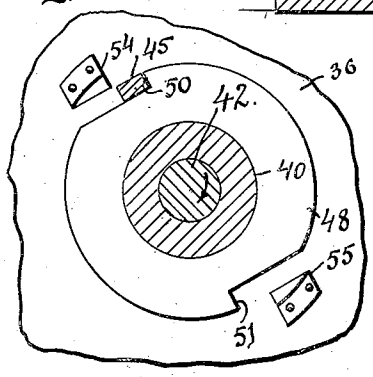


Fig. 6.

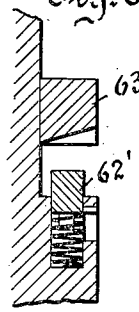


Fig. 5

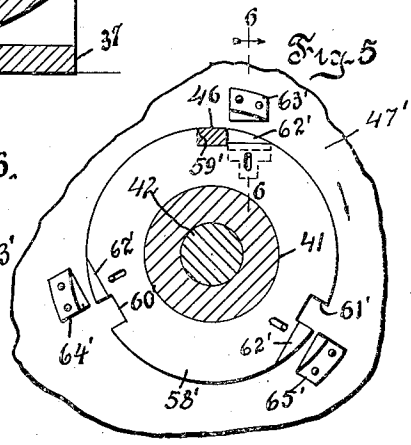


Fig. 2.

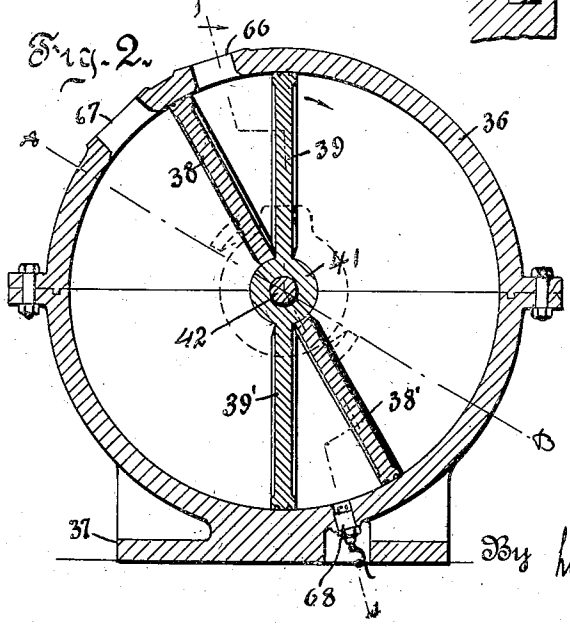
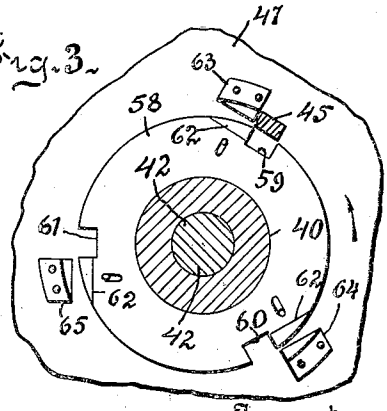


Fig. 3.



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Dec. 10, 1929. H. TROPP 1,739,104

ROTARY INTERNAL COMBUSTION ENGINE

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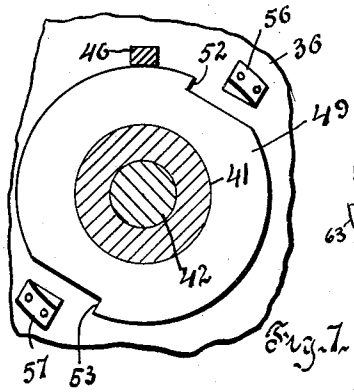
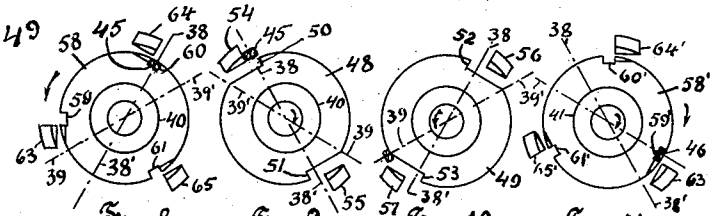
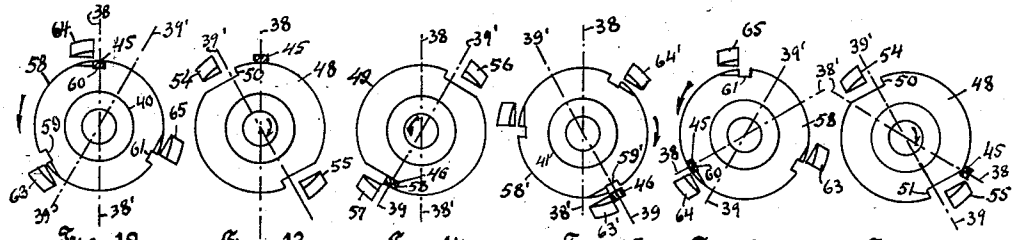
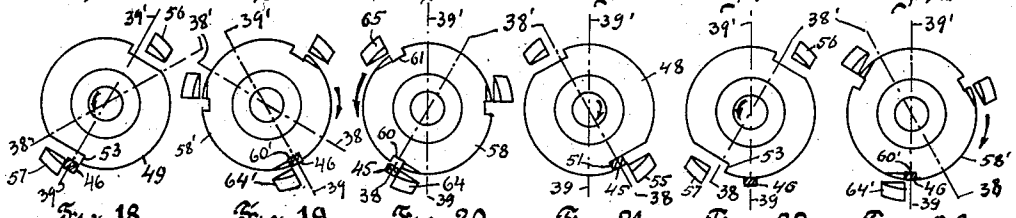
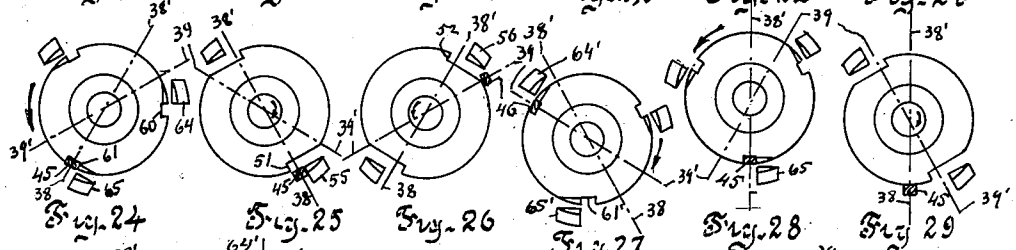


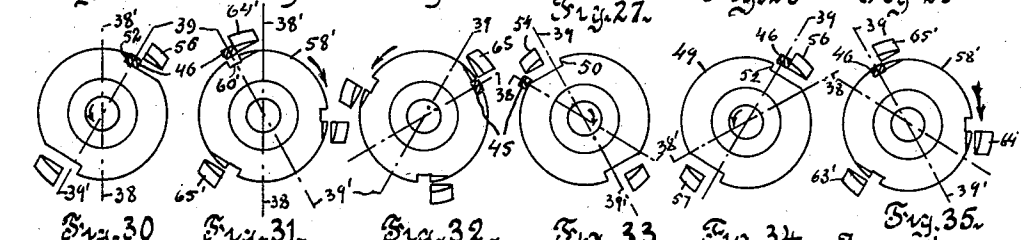
Fig. 7.


Fig. 8. Fig. 9. Fig. 10. Fig. 11.


Fig. 12. Fig. 13. Fig. 14. Fig. 15. Fig. 16. Fig. 17.


Fig. 18. Fig. 19. Fig. 20. Fig. 21. Fig. 22. Fig. 23.


Fig. 24. Fig. 25. Fig. 26. Fig. 27. Fig. 28. Fig. 29.


Fig. 30. Fig. 31. Fig. 32. Fig. 33. Fig. 34. Fig. 35.

Inventor
H. Tropp.

By his Attorney

Patented Dec. 10, 1929 1,739,104

UNITED STATES PATENT OFFICE

HERMAN TROPP, OF NEW YORK, N. Y.

ROTARY INTERNAL-COMBUSTION ENGINE

Application filed March 7, 1929. Serial No. 344,947.

My invention relates to internal combustion engines of the rotary type in which the impellers have an intermittent motion.

An object of the invention is to provide an efficient engine which is simple in construction, having few parts for transmitting the intermittent motion of the impellers into a continuous rotation of the engine shaft.

In the appended drawing, Figure 1 is a vertical section on line 1—1, Figure 2, a portion of the engine being left in elevation to better illustrate the construction.

Figure 2 is a transverse vertical section on line 2—2, Figure 1.

Figure 3 is a section on line 3—3, Figure 1.

Figure 4 is a section on line 4—4, Figure 1.

Figure 5 is a section on line 5—5, Figure 1.

Figure 6 is a section on line 6—6, Figure 5.

Figure 7 is a section on line 7—7, Figure 1.

Figures 8, 12, 16, 20, 24, 28 and 32 are diagrams of Figure 3 during one revolution of the impellers.

Figures 9, 13, 17, 21, 25, 29 and 33 are diagrams of Figure 4 during one revolution of the impellers of the motor.

Figures 10, 14, 18, 22, 26, 30 and 34 are diagrams of Figure 7 during one revolution of the impellers, and

Figures 11, 15, 19, 23, 27, 31 and 35 are diagrams of Figure 5 during one revolution of the impellers of the motor.

Referring to the drawings, 36 is the housing of the engine, which is preferably spherical in shape and provided with a suitable pedestal 37, whereby the engine may be anchored. Revolubly mounted in the housing 36 are rotors, each formed of a pair of diametrically opposed impellers 38, 38′ and 39, 39′, respectively. Each pair of diametrically opposite impellers, 38, 38′ and 39, 39′ is integral with a corresponding sleeve 40 and 41 respectively.

A shaft 42 is revolubly mounted in the sleeves 40 and 41 and it is coaxial with the sleeves and the housing in which the impellers revolve. The sleeves 40 and 41 each project out of the respective ends of the housing. To the projecting end of the sleeve 40, a collar 43 is secured and to the projecting end of sleeve 41, a collar 44 is secured, both collars being secured so that each is constrained to revolve with its sleeve.

A rocker arm 45 is mounted in collar 43 and a rocker arm 46 is mounted in collar 44. The shaft 42 projects out of the sleeves 40 and 41. The end of shaft at sleeve 40 has a fly wheel 47 and at end of sleeve 41, a fly wheel 47′, the two fly-wheels being secured to the shaft to revolve therewith.

The housing 36 adjacent to the collars 43 and 44 is provided with stationary cams 48 and 49 respectively, see Figures 4 and 7. The cam 48 is provided with two abutting surfaces 50 and 51, at an angular distance of 180 degrees, see Figure 4, the cam 49 having also abutting surfaces 52 and 53 similarly disposed, see Figure 7.

The housing at the cam 48 also carries cam blocks 54 and 55, cooperating with the abutting surfaces 50 and 51 respectively, see Figure 4. The housing at the cam 49 is similarly provided with cam blocks 56 and 57, cooperating with the respective surfaces 52, 53 of the cam 49, see Figure 7.

The fly wheel 47 has a cam 58 with three recesses 59, 60 and 61, the angular distance between the successive recesses being 120 degrees. Each of the recesses has a yielding depressible block 62, see details in Figure 6, the recesses of the cam 58 having cooperating cam blocks 63, 64 and 65 respectively, all of the blocks being carried by the fly wheel, see Figure 3. The fly wheel 47′, see Figure 5, has a similar cam 58′, with three depressions 59′, 60′ and 61′, each provided with a depressible block 62′, the recesses 59′, 60′ and 61′ having cooperating cam blocks 63′, 64′ and 65′ respectively.

The position of all the parts, as shown in Figures 1 to 7 inclusive, are when the impel-

lers are in the position shown in Figure 2. From said figure, it will be seen that the housing 36 has its intake opening at 66, the exhaust at 67, and the means for igniting the charge at 68. The impellers 38 and 38′, integral with the sleeve 40 and constrained to revolve with the collar 43, are coupled to the housing 36 by the rocker arm 45, and uncoupled from the fly wheel 47, see Figures 3 and 4. On the other hand, the impellers 39 and 39′, integral with the sleeve 41 and constrained to revolve with the collar 44, are coupled to the fly wheel 47′ by the rocker arm 46, and uncoupled from the housing 36, see Figures 5 and 7.

The impellers 39 and 39′ will rotate with the rotation of the fly wheels, while the impellers 38 and 38′ remain stationary. The movement of the impeller 39 from the impeller 38 draws a charge through the opening 66, until the fly wheels are moved through an angle of 120 degrees, when the impellers 39 and 39′ will reach the line A—B. See Figure 2.

The movement of cam 58 with the fly wheel 47 brings cam block 64 into engagement with the adjacent end of the rocker arm 45 and depresses it into the recess 60, in consequence, moving the other end of the rocker arm 45 out of engagement with the abutting surface 50 of the stationary cam 48, see diagrams 8 and 9. On the other hand, the rocker arm 46 in the recess 59′ of the cam 58′ is still in engagement therewith, see diagrams 10 and 11, the dash and dot line indicating the impellers.

The engagement of the rocker arm 45 with the cam 58 uncouples the impellers 38 and 38′ from the housing and couples them to the fly wheel 47, the impellers 39 and 39′ being still coupled to their fly wheel 47′. As the fly wheels continue to rotate further, they carry therewith not only the impellers 39 and 39′, but 38 and 38′ too. In consequence, the charge taken in between the impellers 38 and 39 is moved bodily until the stationary cam block 57 forces the approaching end of the rocker arm 46 into the engagement with the abutting face 53 of the stationary cam 49, see diagram 14. The other end of the rocker 46 has moved out from the recess 59′ of the cam 58′, see diagram 15.

The movement of the rocker arm 46 renders the impellers 39 and 39′ stationary, they being coupled to the casing, and therefore uncoupled from their fly wheel 47′, the impellers 38 and 38′ being still coupled to their fly wheel 47 and therefore free to rotate, see diagrams 12 and 13.

The four impellers have rotated together 30 degrees. Thus the charge taken in between the impellers 38 and 39 has been moved bodily through the same angle. As seen from diagrams 12 to 15 inclusive, the impellers 38 and 38′ have taken the position of the impellers 39 and 39′, as of Figure 2, and the impellers 39′, 39 have taken the position of the impellers 38, 38′, as of the same figure. The further rotation of fly wheels carry only the impellers 38 and 38′. Thus a charge is taken in between the impellers 38 and 39′ and the charge previously taken in between the impellers 38 and 39 is compressed, until the impeller 38 has travelled through an angle of 120 degrees, see diagrams 16 to 19 inclusive.

The movement of the fly wheels through the angle of 120 degrees brings the cam block 64′ into engagement with the rocker arm 46, forcing it into the recess 60′, see diagram 19, thereby disengaging the other end of the rocker arm 46 from the abutment 53, see diagram 18. The rocker arm 45, on the other hand, is still in the recess 60 of its cam 58. From the diagrams 16 to 19, it is seen that all the impellers are coupled to the fly wheels and are free to rotate until the end of the rocker arm 45 is brought against the abutment 51 by the stationary cam block 55, see diagram 21, thus disengaging the other end of the rocker arm 45 from the cam 58, see diagram 20. This change of position of the rocker arm 45 couples the impellers 38, 38′ to the casing, while the impellers 39, 39′ are free to revolve, see diagrams 22 and 23. The movement of the four impellers through an angle of 30 degrees move bodily through the same angle the charge taken in between the impellers 38, 39′, and the compressed charge between the impellers 38, 39. Thus, the compressed charge is in position to be ignited by the means 68, see Figure 2.

From diagrams 20 to 23 inclusive, it will be seen that each impeller revolved through 180 degrees where the fly wheels revolved through 300 degrees, as seen from the position of cam blocks 63, 64, 65 and 63′, 64′ and 65′ of cams 58 and 58′ respectively.

The explosion forces the impeller 39 away from the impeller 38, expanding the exploded charge. The impeller 39′ moves from the impeller 38′, taking in a charge through 66; see Figure 2. The previously taken in charge is compressed between the impellers 38, 39′; see diagrams 24 to 27 inclusive.

The movement of the impellers carries therewith the fly wheels, and as the same move through an angle of 120 degrees, the cam block 65 will engage the rocker arm 45 and move the same into the recess 61; see diagram 24, disengaging the other end of the rocker arm from the abutment 51; see diagrams 21 and 25. Thus, the impellers 38′, 38 are uncoupled from the casing and coupled to their fly wheel 47, the impellers 39′, 39 being still coupled to their fly wheel 47′, as will be seen from diagrams 26, 27.

The impellers continue to rotate by the inertia of the fly wheels to which they are

locked, see diagrams 28 to 31 inclusive, carrying bodily therewith the expanded gases of combustion between the impellers 38, 39, the taken in charge between the impellers 38′, 39′, and the compressed charge between the impellers 38, 39′, through an angle of thirty degrees, when the stationary cam block 56 will engage the end of the rocker arm 46 and move it against the abutment 52; see diagrams 26, 30, thereby disengaging the other end of the rocker arm 46 from the recess 60′ of the cam 58′; see diagrams 27, 31. Thus the impellers 39, 39′ are uncoupled from their fly wheel 47′ and coupled to the casing 36, the impellers 38, 38′ being still coupled to their fly wheel 47.

The explosion taking place now between the impellers 39′, 38 forces the impeller 38 away from the impeller 39′ and toward the impeller 39. Thus the exploded charge expands and the previously expanded charge exhausts through the aperture 67, between the impellers 38, 39; see diagrams 32 to 35 inclusive. On the other hand, the impeller 38′ moves away from the impeller 39, taking in a charge through the aperture 66 and compressing the previously taken in charge between the impellers 38′, 39′. This movement of the impellers 38, 38′ by the exploded charge carries therewith the fly wheels and as the same revolve through an angle of 120 degrees. The cam block 65′ engages the rocker arm 46 and couples it to cam 58′ while it uncouples it from the stationary cam 49; see diagrams 32 to 35. Again, all the impellers are coupled to their corresponding fly wheels and will rotate therewith under the inertia of the fly wheels through an angle of 30 degrees, when the stationary cam block 54 brings the rocker arm 45 against the abutment 50; see diagram 33 and Figure 4, thus disengaging the other end of the rocker arm 45 from the cam 58, see diagram 32 and Figure 3. The fly wheels under inertia carry bodily the expanded exploded charge, the previously compressed charge, the taken in charge, and the exhausted portion, to the position shown in Figure 2, ready for the next explosion of the charge. A complete revolution of the impellers has been described and the cycle of operation repeats itself in the manner described. The fly wheels have revolved through 600 degrees, as will be seen by advancing diagrams 32 and 35 through an angle of 30 degrees. Thus the cam blocks 63, 64, 65 of cam 58 and cam blocks 63′, 64′, 65 of cam 58′ will be 120 degrees off the position of the same cam in Figures 3 and 5 respectively.

I claim:—

1. In a rotary internal combustion engine, a housing having an inlet and exhaust openings, and means for igniting a charge, a pair of coaxial rotors relatively movable on their axes in said housing and each having diametrically opposite impellers, a sleeve extending from each rotor out of opposite sides of the housing, a shaft revolubly mounted in the sleeves, a rocker arm carried by each sleeve, a cam for each rocker arm carried by the housing and adapted to engage the corresponding rocker arm at intervals of 180 degrees, a second cam for each rocker arm carried by the shaft, said second cam adapted to engage the corresponding rocker arm at intervals of 120 degrees, said cams and rocker arms coupling and uncoupling said rotors to the shaft and housing.

2. In a rotary internal combustion engine, a housing having an inlet and exhaust openings, and means for igniting a compressed fuel charge, a pair of coaxial rotors relatively movable on their axes in the housing, and each rotor having diametrically opposite impellers, a sleeve extending from each rotor out of the opposite sides of the housing, a shaft revolubly mounted in the sleeves, a rocker arm for each sleeve and constrained to revolve therewith, a stationary cam for each rocker arm adapted to engage the corresponding rocker arm at intervals of 180 degrees, a movable cam for each rocker arm adapted to engage the corresponding rocker arm at intervals of 120 degrees whereby said rotors are coupled and uncoupled to said housing and shaft.

3. In a rotary internal combustion engine, a housing having an inlet and an exhaust opening, and means for igniting a fuel charge, a pair of coaxial rotors in the housing, said rotors being relatively movable on their axes, a sleeve extending from each rotor on the opposite sides of the housing, a shaft revoluble in the sleeves, a collar for each of the sleeves constrained to revolve therewith, a rocker arm in each of the collars, cams carried by the shaft for engaging each rocker arm at intervals of 120 degrees and cams carried by the housing for engaging the rocker arms at intervals of 180 degrees, said cams on the shaft and housing coupling and uncoupling said rotors to said shaft and housing.

4. In a rotary internal combustion engine, a housing having an exhaust and inlet opening, and means for igniting a charge, a pair of coaxial rotors in the housing, said rotors being relatively movable on their axes, a shaft revoluble in said rotors and housing, and means carried by said rotors, shaft and housing for intermittently coupling each rotor to the housing for an angular distance of 120 degrees and each rotor to the shaft for an angular distance of 180 degrees, said means being so arranged that both rotors are coupled to the shaft for an angular distance of 30 degrees, before and after each of the rotors is coupled to the housing for an angular distance of 120 degrees.

5. In a rotary internal combustion engine,

a housing having an exhaust and inlet opening and means for igniting a charge, a pair of rotors each having a sleeve projecting out of the housing, a shaft revoluble in the sleeves, a collar for each of the sleeves constrained to revolve therewith, a rocker arm in each of the sleeves, cams carried by the shaft for connecting the rocker arms, and cams carried by the housing for engaging the said rocker arms, the engagement of the said rocker arms with said cams on the shaft and housing coupling and uncoupling said rotors to the shaft and housing.

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