J. H. VAN DEVENTER.
ROTARY ENGINE.
APPLICATION FILED APR. 22, 1912.

1,070,086. Patented Aug. 12, 1913.

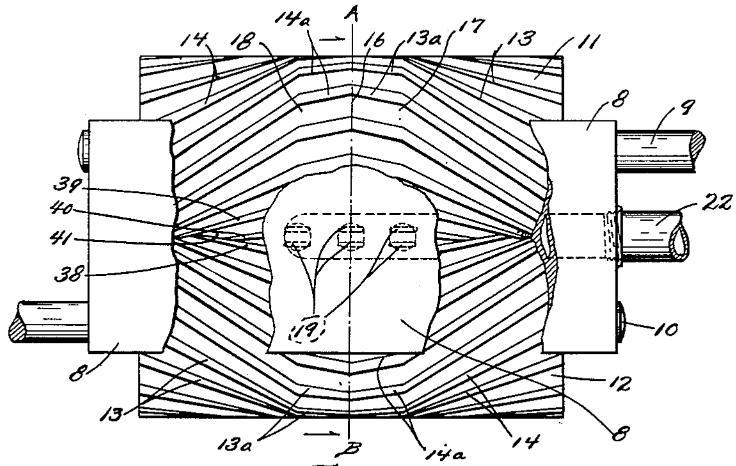

Fig. 1.

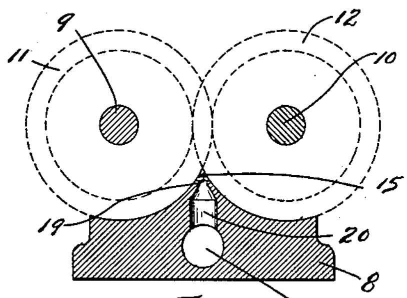

Fig. 2.

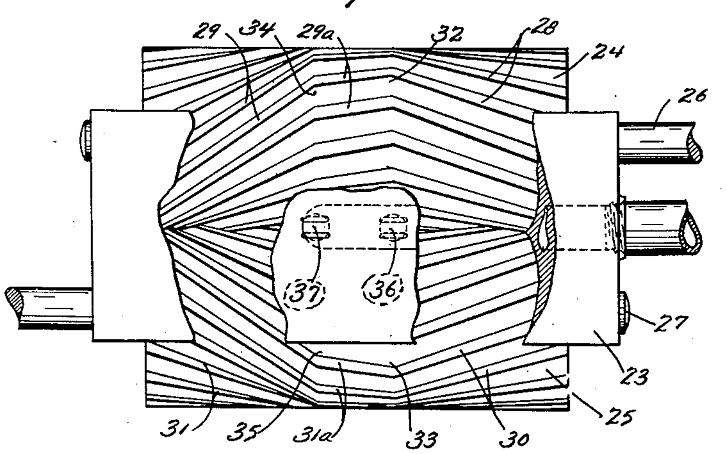

Fig. 3.

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ROTARY ENGINE.

1,070,086. Specification of Letters Patent. Patented Aug. 12, 1913.

Application filed April 22, 1912. Serial No. 692,311.

To all whom it may concern:

Be it known that I, John Herbert Van Deventer, a citizen of the United States of America, residing at Buffalo, Erie county, New York, have invented certain new and useful Improvements in Rotary Engines, of which the following is a full, clear, and exact description.

My invention relates to rotary engines and more particularly to engines with rotors, each having a plurality of spirally disposed and intermeshing tooth blades.

In general the objects sought to be obtained by the invention herein described are substantially the same as those set forth in my issued Patent No. 996169 and my pending application, Serial No. 627166.

By my present invention I have sought specifically to provide a rotary engine of the type having rotors, each provided with but one set of right-hand and left-hand intermeshing tooth blades and having a plurality of fluid inlet ports. Thus a plurality of starting points is provided for each bucket formed between the said intermeshing tooth blades, thereby making the application of motive power more uniformly distributed, the torque on the rotors more constant and the motive power of the engine greatly increased.

In the specification and the appended claims, the term "fluid" will be used as a general term for the pressure medium, but the engine is especially adapted for the use of steam and obviously it is applicable to be driven with either steam or compressed air, as well as any fluid under pressure.

Reference is to be had to the accompanying drawings forming part of this specification in which like characters of reference indicate like parts throughout the several views of which:

Figure 1 is a bottom view of my engine with the base shown broken away and the intermeshing tooth blades of the rotors shown in a diagrammatical manner. Fig. 2 is a sectional end elevation of my engine and is taken on line A—B of Fig. 1 and shows the rotors thereof in a diagrammatical manner. Fig. 3 is a modified form of the engine shown in Fig. 1.

Referring now more particularly to Figs. 1 and 2, 8 represents the base of my engine. Rotatably carried by suitable bearings by the base 8 are rotor shafts 9 and 10, upon which are rigidly mounted the rotors 11 and 12, respectively. Each of the said rotors is provided with a plurality of right-hand spirally disposed tooth blades 13 and 13ª, which extend across the rotors for substantially one-half of their length and a plurality of left-hand spirally disposed tooth blades 14 and 14ª are also provided which extend across the said rotors for substantially the remaining half of their length. The said right-hand and left-hand tooth blades 13ª and 14ª, respectively, are preferably shorter in length than the right-hand and left-hand tooth blades 13 and 14, respectively, and they are disposed so as to make a less angle with the axes of the rotors than the said tooth blades 13 and 14. The said right-hand tooth blades 13 and 13ª of one rotor are arranged to engage and mesh with the left-hand tooth blades 14 and 14ª of the opposite rotor. The right and left hand tooth blades 13ª and 14ª, respectively, meet and join one another at the center of each rotor and thus buckets are formed by the said tooth blades whereby the propulsion of the rotors is made possible. As the said tooth blades on opposite rotors mesh one with another, transmission of rotation is secured by the said rotors without the use of additional gearing.

Forming part of the base 8 is a rib 15. The said rib extends across the entire length of the rotors and projects up in between the rotors to the point of intersection of the perimeters thereof and is in conformity with the said perimeters and in bearing contact therewith. The extent to which this rib envelops the said rotors is governed by the number of tooth blades in each rotor and the angle which the said tooth blades make with the axes of said rotors, it only being necessary that this rib extend around the rotors far enough so as to confine the fluid under pressure to any pair of meshing tooth blades until the same have ceased to mesh or until each bucket formed by the said intermeshing tooth blades has developed its full capacity or volume. The rib may, if desired be continued around the rotors and substantially encase the same. When so formed the said rib provides a casing in which the exhaust fluid will be confined and from which the same may be carried to any desired place by suitable piping.

Formed by the junction of each intermeshing tooth blades 13^a and 14^a is an angular pocket 16 and at the junction of the intermeshing tooth blades 13 and 13^a is formed an angular pocket 17. An angular pocket 18 is also formed by the junction of the tooth blades 14 and 14^a. Provided in the rib 15 are a plurality of inlet ports 19 which are disposed preferably in a horizontal plane and extend across and through the said rib. Thus when the fluid under pressure enters the said ports, it will be caused to impinge on the tooth blades of each rotor at the same time. These ports are so disposed that one will register with each of the angular pockets 16, 17 and 18. Leading from the said inlet ports are vertical ports 20 which communicate with the manifold port 21. The said manifold port extends across the base 8 to the outer end thereof where it is internally screw-threaded and adapted to receive a fluid supply pipe 22.

In the modified form shown in Fig. 3 of the drawings, 23 is the base and 24 and 25 the rotors. The said rotors are rigidly mounted upon the shafts 26 and 27, respectively, which are rotatably carried by the base 23.

The rotor 24 is provided with a plurality of right-hand spirally disposed and intermeshing tooth blades 28 and a plurality of left-hand spirally disposed and intermeshing tooth blades 29 and 29^a. The rotor 25 is provided with a plurality of left-hand spirally disposed and intermeshing tooth blades 30 and also a plurality of right-hand spirally disposed and intermeshing tooth blades 31 and 31^a. The tooth blades 29^a and 31^a are shorter in length than the tooth blades 29 and 31, respectively, and make an angle with the axes of the rotors which is less than the angle made by the said tooth blades 29 and 31. The left-hand tooth blades 29 and 29^a on the rotor 24 mesh with the right-hand tooth blades 31 and 31^a on the rotor 25. Likewise the right-hand tooth blades 28 on the rotor 24 mesh with the left-hand tooth blades on the rotor 25. The left-hand tooth blades 29^a meet and join the right-hand tooth blades 28 and the right-hand tooth blades 31^a meet and join the left-hand tooth blades 30 and thus form angular pockets 32 and 33, respectively. The junctions between the tooth blades 29 and 29^a and 31 and 31^a also form angular pockets 34 and 35, respectively.

In the rib formed on the base 8 is provided two inlet ports 36 and 37 which are so disposed that they register with the angular pockets 32 and 34, respectively. This rib is provided with suitable ports for carrying the motive fluid to the inlet ports in a like manner to the other form of my invention hereinbefore described.

Referring now to Fig. 1 of the drawing, it will clearly be seen that the tooth blades 38 on the rotor 12, mesh with the tooth blades 39 and 40 on the rotor 11 and thus form between them a bucket 41. The rotors being each provided with right and left-hand tooth blades, two buckets will be formed simultaneously but only one double-sided bucket will be formed at any one time. As the rotors are revolving, at substantially the instant when a bucket is started, the fluid under pressure is made to impinge upon the tooth blades forming such bucket. Thus an impact action is secured and, as the rotors continue to revolve, the capacity or volume of said bucket is greatly increased, by reason of the recession of the points of mesh of said tooth blades forming the said bucket toward the ends of the rotors. It will be seen that in my present invention, each pocket has a plurality of starting points formed by the angular pockets 16, 17 and 18 in Fig. 1 and by the similar pockets 32 and 34 of Fig. 3. As the rotors continue to revolve, due to the fluid pressure contained in the bucket, the tooth blades forming the side of said bucket, when passing the inlet port 12, cut off the supply from said bucket. After the supply of motive fluid has been cut off from the said bucket, the fluid contained therein will expand and exert its increased energy against the points of mesh of the tooth blades forming the said bucket. This expansion will continue until the bucket has developed its full capacity or volume, or until the said tooth blades cease to mesh. Obviously the ratio of expansion in the buckets may be changed by altering the size and location of the inlet port or the angle and length of the spirally disposed intermeshing tooth blades.

As the fluid in my engine is admitted at the center of the rotors, the use of cylinder heads or other bearing parts near the point of application of the motive fluid is eliminated and as the oppositely disposed tooth blades meet and join and form angular pockets, as hereinbefore described, the leakage of fluid under pressure at the junction of said rotors or its point of admission is made impossible. The only place in my engine where leakage of fluid may occur is between the perimeters of the rotors and the rib but this may be reduced to a minimum as it is possible to make a very good and practically non-leaking contact or bearing between the said perimeters and the rib. My engine is therefore, very high in its efficiency.

Obviously some detail modifications of my invention as herein shown and described may be made without departing from the spirit of my invenion or the scope of the appended claims and I do not wish to be limited to the exact embodiment herein shown and described.

Having thus described my invention, what I claim is:

1. In a rotary engine, the combination of two or more intermeshing and engaging rotors, shafts secured in said rotors and rotatably mounted in suitable bearings, each of said rotors having a plurality of right-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at one end thereof and extending toward the center of said rotors and a plurality of left-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at the opposite end of and extending toward the center of said rotors, the inner end portions of some of said tooth blades making a less angle with the axes of said rotors than the remaining portions, said tooth blades being so formed that when they meet and join near the center of each of said rotors, they form a plurality of angular pockets, and a fluid inlet provided with a plurality of ports for conducting fluid under pressure to said rotors, said ports being so located and formed that said conducted fluid will be impinged within the angular pockets formed by said tooth blades.

2. In a rotary engine, the combination of two or more intermeshing and engaging rotors, shafts secured in said rotors and rotatably mounted in suitable bearings, each of said rotors having a plurality of right-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at one end thereof and extending toward the center of said rotors and a plurality of left-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at the opposite end thereof and extending toward the center of said rotors, the inner end portions of some of said tooth blades making a less angle with the axes of said rotors than the remaining portions, said right-hand and left-hand spirally disposed tooth blades of one rotor meshing, respectively, with said left-hand and right-hand spirally disposed tooth blades of another rotor, whereby buckets are formed between the meshing tooth blades of said rotors, and a fluid inlet provided with a plurality of ports for conducting fluid under pressure to said rotors, said ports being so located and formed that said conducted fluid will be impinged within the buckets formed by said tooth blades.

3. In a rotary engine, the combination of two or more intermeshing and engaging rotors, shafts secured in said rotors and rotatably mounted in suitable bearings, each of said rotors having a plurality of right-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at one end thereof and extending toward the center of said rotors and a plurality of left-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at the opposite end thereof and extending toward the center of said rotors, the inner end portions of some of said tooth blades making a less angle with the axes of said rotors than the remaining portions, said tooth blades being so formed that when they meet and join near the center of said rotors, they form a plurality of angular pockets, and said right-hand and left-hand spirally disposed tooth blades of one rotor meshing, respectively, with the said left-hand and right-hand spirally disposed tooth blades of another rotor, whereby, buckets are formed between the meshing tooth blades of said rotors, and a fluid inlet provided with a plurality of ports for conducting fluid under pressure to said rotors, said ports being so located and formed that said conducted fluid will be impinged within the angular pockets formed by said tooth blades.

4. In a rotary engine, the combination of two or more intermeshing and engaging rotors, shafts secured in said rotors and rotatably mounted in suitable bearings, each of said rotors having a plurality of right-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at one end thereof and extending toward the center of said rotors and a plurality of left-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at the opposite end thereof and extending toward the center of said rotors, the inner end portions of some of said tooth blades making a less angle with the axes of said rotors than the remaining portions, said tooth blades being so formed that when they meet and join near the center of each of said rotors, they form a plurality of angular pockets, and a rib extending substantially parallel to the axes of said rotors and in contact with the perimeters of said rotors for at least a portion of their peripheries, said rib being provided with a plurality of ports for conducting fluid under pressure to the said angular pockets of said rotors.

5. In a rotary engine, the combination of two or more intermeshing and engaging rotors, shafts secured in said rotors and rotatably mounted in suitable bearings, each of said rotors having a plurality of right-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at one end thereof and extending toward the center of said rotors and a plurality of left-hand spirally

disposed tooth blades starting from a plurality of circumferential points on said rotors located at the opposite end thereof and extending toward the center of said rotors, the inner end portions of each of said tooth blades making a less angle with the axes of said rotors than the remaining portions, said tooth blades being so formed that when they meet and join near the center of each of said rotors, they form a plurality of angular pockets, and a fluid inlet provided with a plurality of ports for conducting fluid under pressure to said rotors, said ports being so located and formed that said conducted fluid will be impinged within the angular pockets formed by said tooth blades.

6. In a rotary engine, the combination of two or more intermeshing and engaging rotors, shafts secured in said rotors and rotatably mounted in suitable bearings, each of said rotors having a plurality of right-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at one end thereof and extending toward the center of said rotors and a plurality of left hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at the opposite end thereof and extending toward the center of said rotors, the inner end portions of each of said tooth blades making a less angle with the axes of said rotors than the remaining portions, said right-hand and left-hand spirally disposed tooth blades of one rotor meshing, respectively, with said left-hand and right-hand spirally disposed tooth blades of another rotor, whereby buckets are formed between the meshing tooth blades of said rotors, and a fluid inlet provided with a plurality of ports for conducting fluid under pressure to said rotors, said ports being so located and formed that said conducted fluid will be impinged within the buckets formed by said tooth blades.

7. In a rotary engine, the combination of two or more intermeshing and engaging rotors, shafts secured in said rotors and rotatably mounted in suitable bearings, each of said rotors having a plurality of right-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at one end thereof and extending toward the center of said rotors and a plurality of left-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at the opposite end thereof and extending toward the center of said rotors, the inner end portions of each of said tooth blades making a less angle with the axes of said rotors than the remaining portions, said tooth blades being so formed that when they meet and join near the center of each of said rotors, they form a plurality of angular pockets, and said right-hand and left-hand spirally disposed tooth blades of one rotor meshing, respectively, with the said left-hand and right-hand spirally disposed tooth blades of another rotor, whereby, buckets are formed between the meshing tooth blades of said rotors, and a fluid inlet provided with a plurality of ports for conducting fluid under pressure to said rotors, said ports being so located and formed that said conducted fluid will be impinged within the angular pockets formed by said tooth blades.

8. In a rotary engine, the combination of two or more intermeshing and engaging rotors, shafts secured in said rotors and rotatably mounted in suitable bearings, each of said rotors having a plurality of right-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at one end thereof and extending toward the center of said rotors and a plurality of left-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at the opposite end thereof and extending toward the center of said rotors, the inner end portions of each of said tooth blades making a less angle with the axes of said rotors than the remaining portions, said tooth blades being so formed that when they meet and join near the center of each of said rotors, they form a plurality of angular pockets, and a fluid inlet provided with a plurality of ports each having lateral passages leading into said pockets, whereby the conducted fluid impacts in said pockets and against said tooth blades substantially in the direction of rotation of said rotors.

9. In a rotary engine, the combination of two or more intermeshing and engaging rotors, shafts secured in said rotors and rotatably mounted in suitable bearings, each of said rotors having a plurality of right-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at one end thereof and extending toward the center of said rotors and a plurality of left-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at the opposite end thereof and extending toward the center of said rotors, the inner end portions of each of said tooth blades making a less angle with the axes of said rotors than the remaining portions, said tooth blades being so formed that when they meet and join near the center of each of said rotors, they form a plurality of angular pockets, a rib extending substantially parallel to the axes of said rotors and in contact with the perimeters of said rotors for at least a portion of their peripheries, said rib being provided with a plurality of ports for conducting fluid under pressure to the said angular pockets of said rotors.

10. In a rotary engine, the combination of two or more intermeshing and engaging rotors, shafts secured in said rotors and rotatably mounted in suitable bearings, each of said rotors having a plurality of right-hand spirally disposed teeth blades starting from a plurality of circumferential points on said rotors located at one end thereof and extending toward the center of said rotors and a plurality of left-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at the opposite end thereof and extending toward the center of said rotors, the inner end portions of each of said tooth blades making a less angle with the axes of said rotors than the remaining portions, said tooth blades being so formed that when they meet and join near the center of each of said rotors, they form a plurality of angular pockets, and a rib substantially parallel to the axes of said rotors and in contact with the perimeters of said rotors for at least a portion of their peripheries, said rib being provided with a plurality of lateral passages leading into said pockets, whereby the conducted fluid impacts in said pockets and against said tooth blades substantially in the direction of rotation of said rotors.

11. In a rotary engine, the combination of two or more intermeshing and engaging rotors, shafts secured in said rotors and rotatably mounted in suitable bearings, each of said rotors having a plurality of right-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at one end thereof and extending toward the center of said rotors and a plurality of left-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at the opposite end thereof and extending toward the center of said rotors, the inner end portions of each of said tooth blades making a less angle with the axes of said rotors than the remaining portions, said right-hand and left-hand spirally disposed tooth blades of one rotor meshing, respectively, with said left-hand and right-hand spirally disposed tooth blades of another rotor, whereby buckets are formed between the meshing tooth blades of said rotors, and a rib extending substantially parallel to the axes of said rotors and in contact with the perimeters of said rotors for at least a portion of their peripheries, said rib being provided with a plurality of ports for conducting fluid under pressure to the buckets of said rotors.

12. In a rotary engine, the combination of two or more intermeshing and engaging rotors, shafts secured in said rotors and rotatably mounted in suitable bearings, each of said rotors having a plurality of right-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at one end thereof and extending toward the center of said rotors and a plurality of left-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at the opposite end thereof and extending toward the center of said rotors, the inner end portions of each of said tooth blades making a less angle with the axes of said rotors than the remaining portions, said right-hand and left-hand spirally disposed tooth blades of one rotor meshing, respectively, with said left-hand and right-hand spirally disposed tooth blades of another rotor, whereby buckets are formed between the meshing tooth blades of said rotors, and a rib extending substantially parallel to the axes of said rotors and in contact with the perimeters of said rotors for at least a portion of their peripheries, said rib being provided with a plurality of lateral passages leading into said pockets, whereby the conducted fluid impacts in said buckets and against said tooth blades substantially in the direction of rotation of said rotors.

13. In a rotary engine, the combination of two or more intermeshing and engaging rotors, shafts secured in said rotors and rotatably mounted in suitable bearings, each of said rotors having a plurality of right-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at one end thereof and extending toward the center of said rotors and a plurality of left-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at the opposite end thereof and extending toward the center of said rotors, the inner end portions of each of said tooth blades making a less angle with the axes of said rotors than the remaining portions, said tooth blades being so formed that when they meet and join near the center of each of said rotors, they form a plurality of angular pockets, and a fluid inlet provided with a plurality of ports, said ports being so arranged that the admission of the fluid under pressure into any one of said angular pockets is cut off by the succeeding pocket before the said first mentioned pocket has developed its full volume.

14. In a rotary engine, the combination of two or more intermeshing and engaging rotors, shafts secured in said rotors and rotatably mounted in suitable bearings, each of said rotors having a plurality of right-hand spirally disposed tooth blades starting from a plurality of circumferential points on said rotors located at one end thereof and extending toward the center of said rotors and a plurality of left-hand spirally disposed tooth blades starting from a plurality of circumferential points on said ro-

tors located at the opposite end thereof and extending toward the center of said rotors, the inner end portions of each of said tooth blades making a less angle with the axes of said rotors than the remaining portions, said right-hand and left-hand spirally disposed tooth blades of one rotor meshing, respectively, with said left-hand and right-hand spirally disposed tooth blades of another rotor, whereby buckets are formed between the meshing tooth blades of said rotors, and a rib extending substantially parallel to the axes of said rotors and in contact with the perimeters of said rotors for at least a portion of their peripheries, said rib being provided with a plurality of ports for conducting fluid under pressure to said buckets, said ports being so arranged that the admission of fluid under pressure into any pair of tooth blades forming a bucket, is cut off by the tooth blades forming the succeeding bucket before the first mentioned tooth blades have developed their full capacity.

In testimony whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

JOHN HERBERT VAN DEVENTER.

Witnesses:
J. Wm. Ellis,
Walter H. Kelley.