

April 7, 1931.

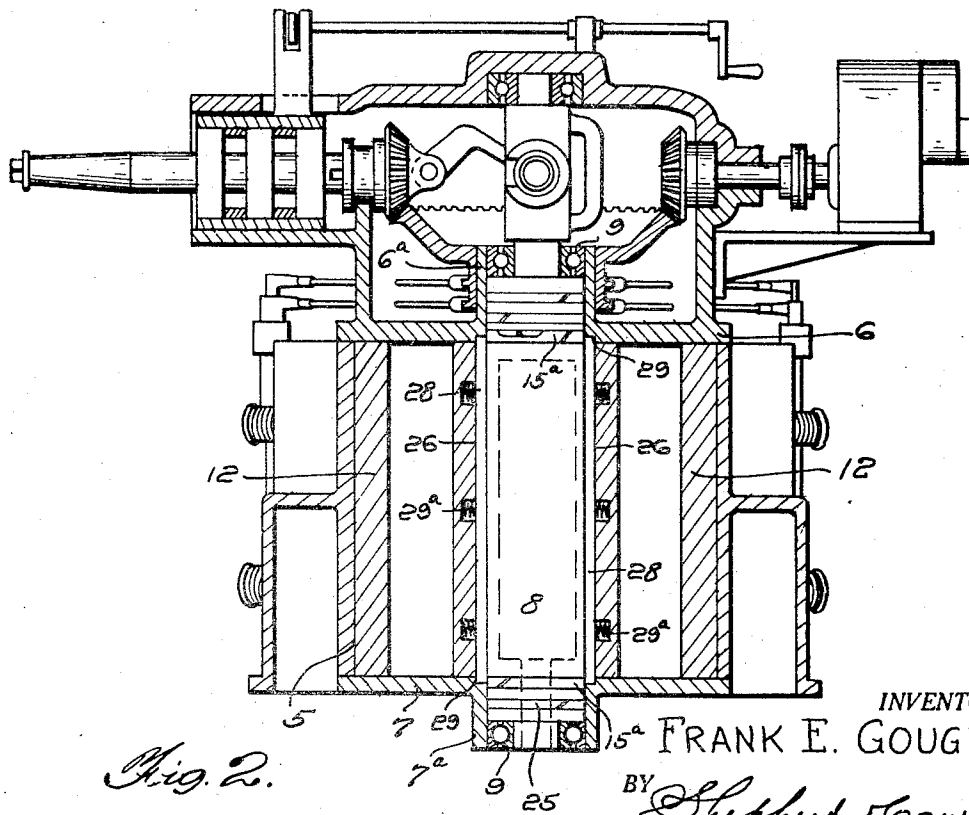
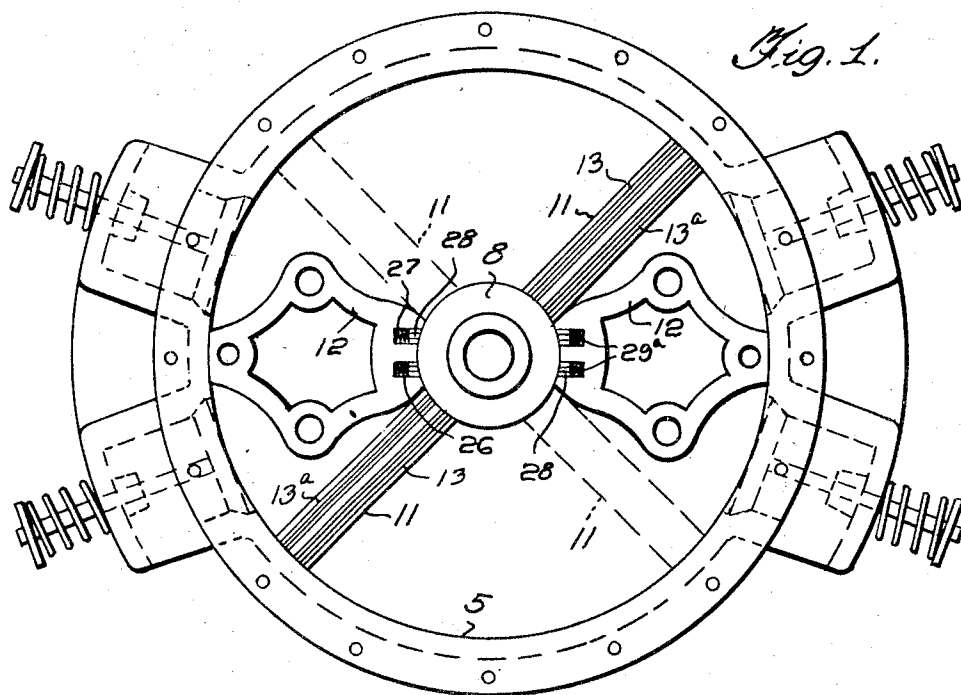
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PACKING MEANS FOR INTERNAL COMBUSTION ENGINES

Filed June 27, 1929

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

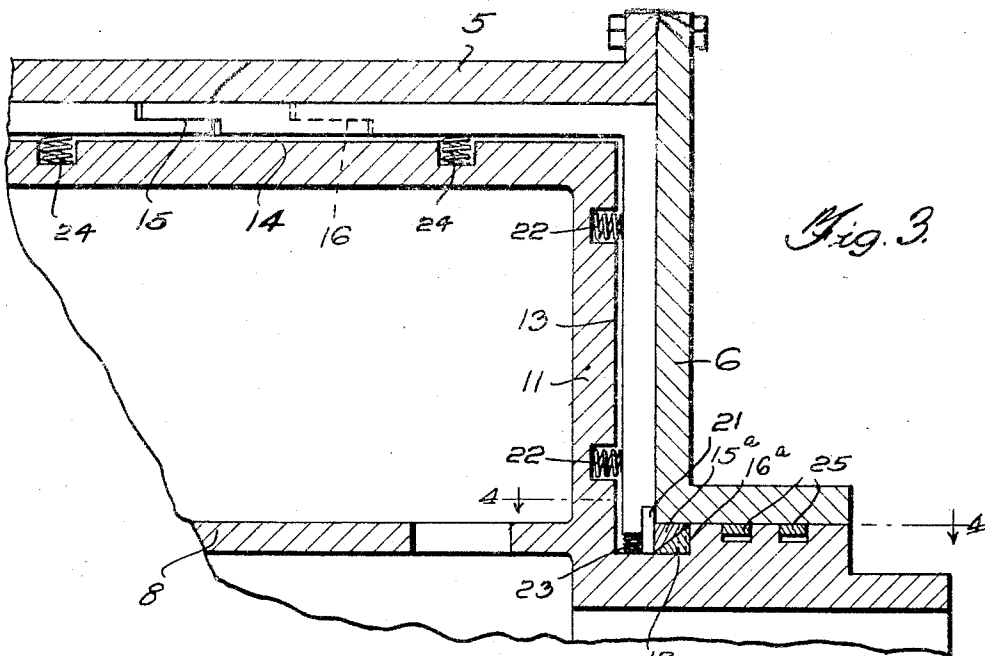


Fig. 3.

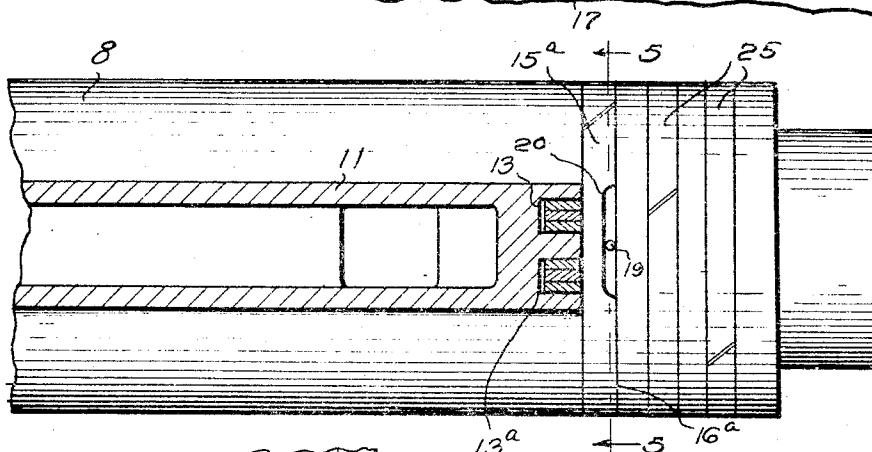


Fig. 4.

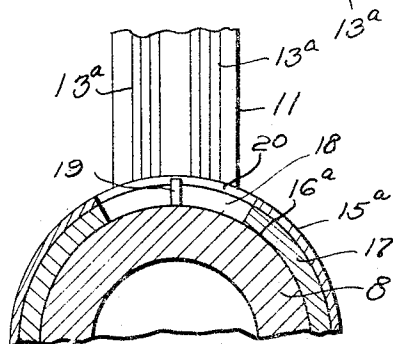


Fig. 5.

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PACKING MEANS FOR INTERNAL-COMBUSTION ENGINES

Application filed June 27, 1929. Serial No. 374,229.

This invention relates to internal combustion engines of the character of that shown in my Patent No. 1,737,082, dated November 26th, 1929, this application being a continuation, in part, of said patent, and being intended to cover the sealing elements, by means of which effective packing of all the moving parts is effected.

The engine of the present invention, like the engine of the parent case, has for its object to provide a device adapted to yield the maximum efficiency in operation in proportion to the weight of the engine. In accomplishing that object the engine is constructed to permit variation of compression to meet the conditions existing, at any given moment, and to operate under high compression, under certain conditions. The engine is of the oscillatory type and presents a very considerable piston area and a very considerable displacement. Consequently, it is of very great importance to insure that there will be no leakage of the gases. The problem is more than that of merely preventing the escape of the gases to the atmosphere. The real problem is to prevent the escape of gas from one combustion chamber over into the other combustion chamber, and it is a primary object of the present invention to accomplish this end.

Further objects and advantages of the invention will be set forth in the detailed description which follows.

In the accompanying drawing:

Fig. 1 is a plan view of the engine with the head thereof removed to illustrate the internal abutments and the pistons,

Fig. 2 is a vertical sectional view through the engine, on a line through the abutments,

Fig. 3 is an enlarged vertical sectional view through a portion of the piston carrying shaft and hull pistons.

Fig. 4 is a fragmentary horizontal sectional view on line 4—4 of Fig. 3.

Fig. 5 is a fragmentary vertical sectional view on line 5—5 of Fig. 4.

Like numerals designate corresponding parts in all of the figures of the drawing.

The engine of the present invention comprises a cylinder 5, having an upper head 6

and a lower head 7. A hollow shaft 8 is mounted by means of anti-friction bearings 9 in the hubs 6^a—7^a of the upper and lower cylinder heads, respectively. The shaft 8 is an oscillatory one, and it carries a pair of opposed radially disposed pistons or vanes 11, which move from the full to the dotted line position illustrated in Fig. 2. Abutments 12 extend from the cylinder head 6 to the cylinder head 7, and from the inner periphery of the cylinder 5 to the outer periphery of the shaft 6. The present invention relates particularly to the means for maintaining fluid-tight contact between the inner faces of the abutments, and the outer periphery of shaft 8; between the outer edges of the vanes or pistons 11 and the walls of the cylinder; between the ends of the vanes or pistons and the cylinder heads, and between shaft 8 and the inner peripheries of the hubs 6^a—7^a.

To this end, the pistons 11 are provided with pairs of grooves or channels 13—13^a at their opposite ends and with corresponding channels 14 along their outer edges. Each channel carries a plurality, preferably three, packing strips, said packing strips being, as a whole, of U-shape, with the leg portions of the U disposed in the channels 13—13^a and the connecting portions disposed in the channels 14. However, these packing strips are provided with lap-joints in the connecting portions thereof, as indicated at 15, said lap-joints being staggered, as indicated at 16. The inner ends of the leg portions of the packing strips project downwardly behind split wear rings 15^a that are disposed in grooves 16^a, of the hubs. I prefer to dispose in the same groove a beveled feeder ring 17. At a suitable point in the circumference of the rings 15^a and 17, the feeder ring 17 is cut back or recessed, as indicated at 18, to permit the passage outwardly of pins 19, said pins, in the oscillation of the shaft 8, work back and forth in recessed portions of the ring 15^a. By virtue of this construction, the shaft 8 can move through a portion of its travel without turning the ring 15^a, but will, through the remaining portion of its travel, cause the ring 15^a to move with it.

The lower ends of the packing strips 13—13^a may bear directly against ring 15^a, but I preferably provide the lower ends of these strips with wear sections 21, of a material softer than the metal of the ring 15^a or of the cylinder head 7. The result is that the sections 21 wear away rapidly enough to permit the springs 22 to always maintain the legs 13—13^a of the packing strips in tight engagement with the cylinder head and in tight engagement with the ring 15^a.

Further, I may provide springs 23 to thrust against the inner ends of the legs 13—13^a, the action of these springs, in conjunction with the action of the springs 24, serving to thrust the runs 14 of the packing strips into tight engagement with the inner periphery of the cylinder wall. The lap joints 15 permit such necessary bodily end-wise movement of the sections of any given packing strip, to insure the tight engagement of the end sections 13—13^a thereof, with the cylinder heads. The oscillatory movement imparted to ring 15^a by the action of pins 19, not only brings about the desired wearing action between this ring and the wear elements 21, but it brings about a wearing action between said ring and the side of the groove in which said ring is seated, so that a very tight fit is had between these parts. In addition, when the pins reach the ends of the cut-out portions 20 of the ring 15^a, they ride into the tapered end parts of said cut-out portions in such manner as to exert a wedging action which thrusts the ring bodily toward the side wall of the groove, and in'o tight engagement therewith. As many additional conventional split packing rings 25 may be employed as may be desired.

In packing the inner faces of the abutments, I provide a pair of grooves 26—27 in said abutments, each of which receives a plurality, in this case three, of packing strips 28, which packing strips may have springs or any other resilient elements 29^a mounted behind them to thrust them toward the periphery of the shaft 8. These packing strips project beyond the ends of the abutments into recesses 29, formed in the cylinder heads in such manner as to cause them to overlap rings 15^a for about one-half the width of said rings.

Thus, the runs of the packing strips that are disposed in the grooves 14, pack the pistons with respect to the cylinder walls. The runs 13—13^a of the packing strips pack the pistons with respect to the cylinder heads, while the rings 15^a, 17 and 25 pack the shaft with respect to the hubs, and leakage at the point of contact between the packing strips 13—13^a and the ring 15^a is prevented by the novel wearing action described. At the same time, leakage entirely around the ring 15^a is prevented by said wearing action.

In like manner, the abutments are packed with respect to the shaft by the elements 28

and associated parts, and these elements are, in turn, maintained in fluid-tight condition by the overlapping of their ends upon ring 15^a, as indicated at 29, in Fig. 2.

It is to be understood that the invention is not limited with respect to the number of packing strips, whether they are disposed in one groove or two, or in more than two grooves, nor is it limited with respect to the character of material of which the parts are made. It is to be understood that the invention includes within its purview any changes fairly coming within either the terms or the spirit of the appended claims.

Having described my invention, what I claim is:

1. An engine of the character described, comprising a cylinder, opposed cylinder heads, an oscillatory shaft journaled in said cylinder heads, diametrically opposed vanes carried by said shafts, diametrically opposed abutments in said cylinder, packing means between the inner faces of the abutments, and the outer periphery of the shaft, packing strips extending along the outer end and along each side of the vanes, packing rings carried by the shaft, and lying within, and having peripheral contact with the opposed cylinder heads, the end packing strips of the vanes projecting downwardly behind said rings.

2. A structure as recited in claim 1, said end packing strips being provided with soft wear pieces at their point of contact with said rings.

3. A structure as recited in claim 1, in combination with means for causing said rings to turn with the shaft through at least a portion of its movement.

4. A structure as recited in claim 1, in combination with pins carried by the shaft and entering cut-away portions of the ring to cause the ring to travel with the shaft through at least a portion of the movement of the latter, and to act to thrust the ring laterally.

5. An engine of the character described, comprising a cylinder and cylinder head, an oscillatory shaft and radially disposed vane carried by said shaft, a packing ring carried by the shaft, and means for causing said ring to turn with the shaft through a portion of its movement while remaining stationary through the remainder of its movement.

6. An engine of the character described, comprising a cylinder, opposed cylinder heads, an oscillatory shaft journaled in said cylinder heads, a split packing ring disposed in a groove of the shaft and peripherally engaging the associated cylinder head, said ring having a cut-away portion through a portion of its circumference, and members carried by the shaft and projecting into said cut-away portions to cause the ring to travel with the shaft through at least a part of its oscillation.

7. A structure as recited in claim 6, in combination with a feeder ring disposed in the groove with the said packing ring, said rings having inclined contacting faces.

8. In combination with an oscillatory shaft, a pair of radially disposed pistons carried thereby and having a plurality of grooves formed about their edges, both at the ends and at the sides, a plurality of packing strips disposed in each of said grooves, and means for thrusting said strips both radially and longitudinally with respect to the pistons, a split packing ring disposed in a groove of the shaft, an element in which the shaft is journaled and which is peripherally engaged by said packing ring, and means for causing the packing ring to turn with the shaft through a portion of its stroke only.

9. A structure as recited in claim 8, in combination with a feeder ring disposed in the groove with the aforesaid packing ring, and thrusting it toward a side of the groove and toward the element in which the shaft is journaled, said first named ring being overlapped and engaged by the inner face of the end portions of the packing strips.

10. An engine of the character described, comprising a cylinder, an abutment therein, cylinder heads, a shaft mounted for movement in the cylinder heads, a packing strip disposed in a groove of the abutments and bearing upon the periphery of the shaft, the end of said packing strip being projected beyond the end of the abutment and into a recess formed in the cylinder head.

11. An engine of the character described, comprising a cylinder, an abutment therein, cylinder heads, a shaft mounted for movement in the cylinder heads, a packing strip disposed in a groove of the abutments and bearing upon the periphery of the shaft, the end of said packing strip being projected beyond the end of the abutment and into a recess formed in the cylinder head, and a packing ring seated in a groove of the shaft, said packing ring being at least partially overlapped by said projecting end of the packing strip of the abutment.

12. An engine of the character described, comprising a cylinder, cylinder heads, fixed abutments, an oscillatory shaft between the abutments, a plurality of packing strips carried by each of the abutments and bearing upon the oscillatory shaft, said packing strips extending the full length of the abutments and projecting therebeyond into recesses formed in the cylinder heads.

13. A structure as recited in claim 12, in combination with split packing rings carried by the oscillatory shaft and bearing circumferentially upon the cylinder heads and being overlapped by the projecting ends of the abutment carried strips.

14. In a packing structure for internal combustion engines, the combination with a

shaft, of a radially disposed piston carried thereby having a groove along its side and end portions, a plurality of packing strips in said groove, each of which, as a whole, is of general U-shape formed by two co-acting L-shaped portions, which, at their confronting ends, are provided with lap joints, the lap joints of the several strips being staggered with respect to each other, a split packing ring seated in a groove formed circumferentially about the shaft, and an element in which the shaft is journaled and with which said ring makes peripheral contact, the inner ends of the packing strips overlapping and being engaged by said ring.

15. A structure as recited in claim 14, in combination with a projecting element carried by the shaft and engaging in a cut-away portion of said ring and serving to cause the ring to turn with the shaft, through a portion only of the movement of said shaft.

In testimony whereof I affix my signature.
FRANK E. GOUGH.