Aug. 5, 1924. 1,503,741

J. O. ALMEN

PACKING PLATE FOR INTERNAL COMBUSTION ENGINES OR THE LIKE

Filed Aug. 10, 1920

Fig. 1

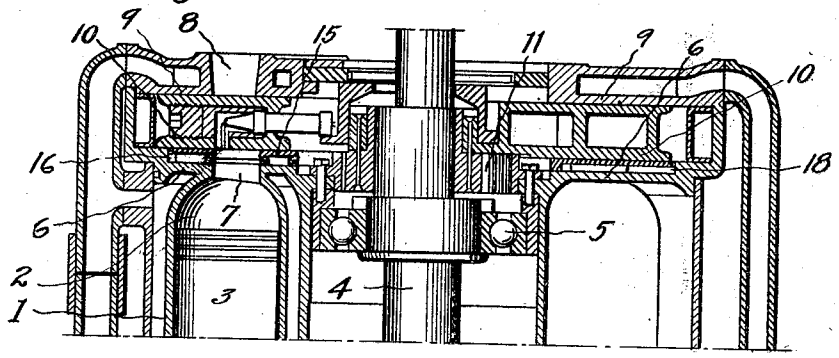


Fig. 2

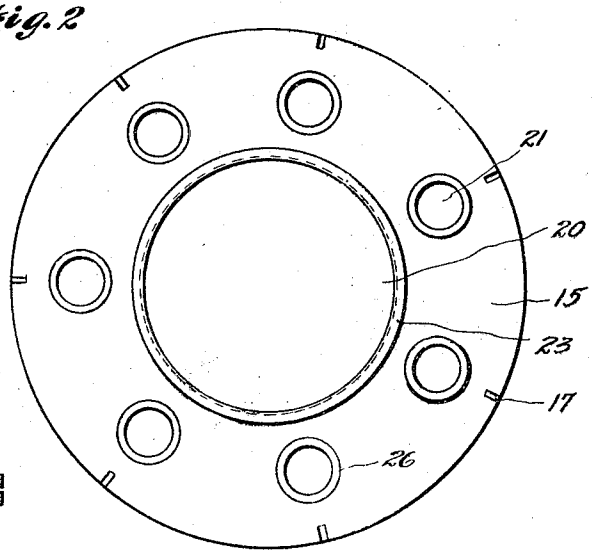


Fig. 6

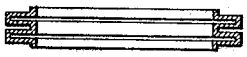


Fig. 4

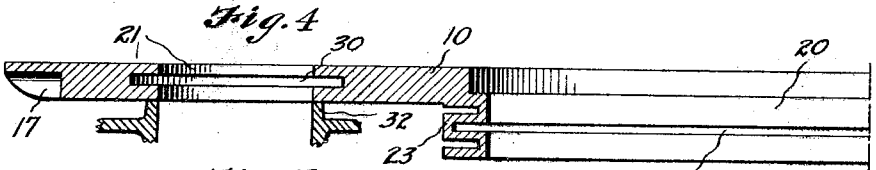


Fig. 3

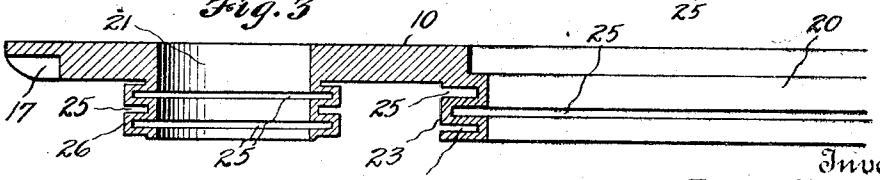


Fig. 5



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Patented Aug. 5, 1924. 1,503,741

UNITED STATES PATENT OFFICE.

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PACKING PLATE FOR INTERNAL-COMBUSTION ENGINES OR THE LIKE.

Application filed August 10, 1920. Serial No. 402,566.

To all whom it may concern:

Be it known that I, JOHN O. ALMEN, a citizen of the United States, and resident of the city of Seattle, county of King, State of Washington, have invented certain new and useful Improvements in Packing Plates for Internal-Combustion Engines or the like, of which the following is a specification.

This invention relates to improvements in internal combustion engines, pressure pumps, or the like, and more particularly to expandable packing plates, and rings, for use in engines of that character wherein a plurality of cylinders are arranged circularly about and in parallel relation to a central power shaft, and wherein fuel charges are admitted into and exhausted from the cylinders through passages provided in a rotating or sliding valve that is mounted to operate between the ends of the cylinders and the end walls of the engine casing, and which is rotated by connection with the power shaft to admit and exhaust full charges from the cylinder in proper sequence to affect operation of the engine.

Heretofore, in engines of this character, difficulty has been experienced because of the non-provision of a desirable gas and air tight connection between the rotating valve plates and the cylinder ends, and because of this difficulty, the efficiency of the engine is greatly reduced. It is, therefore, the principal object of the present invention to provide a packing plate whereby a non-leaking connection may be made between the ends of the several cylinders and the rotating valve, with a minimum amount of friction, and which provides in its construction means for retaining it in its proper relation to these parts.

It is also an object of the invention to provide a packing plate of this character wherein provision is made for utilizing the force of the explosions in the various cylinders to affect expansion of the plate at the vital points and to prevent leakage of gas between the valve plate and the cylinder casing at the time of the explosion.

In accomplishing the objects of the invention I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein—

Figure 1 is a transverse sectional view of a portion of an engine, wherein a packing plate, constructed according to the present invention, is utilized.

Figure 2 is an inner face view of the preferred type of packing plate.

Figure 3 is an enlarged transverse sectional view of one-half the same.

Figure 4 is a similar view of a plate of a modified or alternate type of construction.

Figure 5 is a sectional view of an alternative construction of an expandable character, not integral with the plate.

Figure 6 is a similar view of another alternative construction.

Referring more in detail to the drawings—1 designates a casing section comprising a plurality of cylinders 2 wherein pistons 3 are operatively mounted for reciprocation. Extending longitudinally and centrally through the casing, parallel with its cylinders, is a power shaft 4, which is supported revolubly by an anti-friction bearing 5.

The casing section 1 has an outer end wall 6 provided with ports 7 which lead into the outer ends of the cylinders 2 and which are alined with openings 8 in the end wall 9 of the engine casing, and said end walls 6 and 9 are spaced apart for the interposition of a valve plate 10 which is adapted to be revolved about the power shaft by any suitable gearing connection with the same, as indicated at 11, to effect the intaking and exhausting of fuel charges from the several cylinders.

The valve plate 10 is of substantial thickness with parallel and smooth opposite faces, and contains a plurality of passages which are brought by rotation of the plate into registration with the cylinder and casing openings in proper sequence to effect operation of the engine.

Heretofore difficulty has arisen in providing a non-leaking connection between the rotating valve plate and the end wall 6, and leakages about the cylinder openings have been detrimental to successful operation of the engine. Other trouble has arisen from leakage of air from about the crank shaft into the fuel distributing manifold. In the present invention I have overcome these objectionable features by the interposition of a packing plate 15 between the cylinder end wall 6 and the rotating valve 10.

The preferred type of packing plates, as best shown in Figures 2 and 3, is of a circular form to fit within a circular pocket 16 comprising the fuel manifold, in the end wall 6, and is provided about its periphery with notches 17 for the reception of lugs 18 about the periphery of the pocket, to hold it against rotation.

At the center of the plate 15 is an opening 20 through which the power shaft extends, and about this opening is a plurality of openings 21 which register with the several cylinder ports 7. The outer face of the plate is perfectly smooth to fit the face of the rotating valve, and is held in an air tight connection against the valve by means of a yieldable, annular flange 23, formed about the opening 20 and extending inwardly to seat against the wall 6.

This flange has an accordion construction, that is, deep annular channels 25 are cut therein alternately from inner and outer sides, overlapping each other, so that the flange will be yieldable in its axial direction and will hold the plate against the valve, without a great amount of friction, and will effect an air tight connection that will prevent any possible leakage of air from about the crank shaft into the valve chamber where it would mix with the fuel gases.

Flanges 26, similar to the flange 23, and which assist the latter in supporting the plate against the valve, are formed about each of the openings 21 in the plate to seat about the openings 7 of the cylinder wall. These latter flanges also have annular channels 25 cut therein alternately from the inner and outer sides in overlapping relation, to give flexibility to the same and permit them to be expanded or compressed in their axial direction.

Since the inner channels of the flanges 26 open into the passages wherein gases art confined under pressure when fuel charges are ignited, it is apparent that such pressure will effect the expansion of the flange sufficiently to tighten the plate against the valve in a non-leaking fit.

In Figure 4 I have illustrated a modified type of construction, wherein the extension flanges 26 have been eliminated and annular channels 30 are formed in the plate within the openings, forming flexible diaphragms at opposite sides of the channel which will be moved apart by a pressure of gas thereagainst to seal the connection at the time of the explosion.

With this latter construction, the cylinder wall 6 would be provided with annular, extending flanges 32, which would seat against the peripheral edge of the lower diaphragm, as shown in Figure 4.

In Figure 5 I have shown an alternative construction, which consists of a metal tube that may be formed with deep annular corrugations, which will provide a construction similar to the flanges 23 and 26 on the plate. However, this construction is not a part of the plate but may be used independently thereof or attached in a suitable manner to the plate or about the cylinder openings.

Figure 6 is another alternative construction, similar to that of Figure 5, but consisting of a metal ring wherein the channels have been cut. This is, however, the same construction as the flanges 23 and 26, but is independent of the plate and in use would be interposed between the plate and cylinder wall.

Assuming that the plate is so constructed and assembled with the engine, between a revolving valve and casing end wall, as shown in Figure 1, it is apparent that the tendency of the flanges 23 and 26 to expand will normally hold the plate in functional position and a non-leaking connection, and that when an explosion takes place within any one of the cylinders, the expanding gases will enter within channels of the flanges to expand the same and effect a still tighter connection which will prevent any possible leakage between the cylinder ports and valve, while the flange 23 prevents leakage of air into the fuel manifold.

What I claim as new, is:

1. In an engine of the class described, the combination with a cylinder having a fuel exhaust port therein and a valve plate operable to control the passage of gases through the cylinder opening, of a packing plate interposed between the said valve plate and cylinder, having an opening therethrough in registration with the cylinder port, and means whereby said plate will be expanded by pressure of fuel charges exhausted through its opening.

2. The combination with a cylinder casing wall having a port communicating with the pressure chamber of the cylinder and a valve plate operable to control the flow of gases through said port, of a packing plate interposed between the wall and valve plate having an opening in registration with the wall port and having an annular channel formed therein within the opening wherein expanding gases from the pressure chamber may enter to expand the plate in the direction of its thickness about the opening, for the purpose set forth.

3. The combination with a cylinder casing wall having a port communicating with the pressure chamber of the cylinder and a valve plate operable to control the flow of gases through said port, of a packing plate interposed between the wall and valve plate having an opening in registration with the wall port and having an annular flange thereon for functionally supporting the packing plate against the valve; said flange

having annular channels formed therein alternately in its inner and outer surfaces to give the flange flexibility in its axial direction, for the purpose set forth.

4. The combination with a cylinder casing wall having a port communicating with the pressure chamber of the cylinder, and a valve plate operable to control the flow of gases through said port, of a packing plate interposed between the wall and valve plate having an opening in registration with the wall port and having a supporting flange formed thereon about the opening at one side of the plate; said flange having annular channels formed therein in alternate relation on inner and outer sides thereof to give flexibility to the flange in its axial direction with the inner channels opening into communication with the cylinder port to receive expanding gases from the cylinder, for the purpose set forth.

5. In an engine of the character described, in combination, a casing body having a valve recess therein, cylinders arranged circularly and in parallel relation within the casing and having ports opening into the said recess, a power shaft revoluble in said casing centrally of said casing and parallel with said cylinders, a valve plate revoluble in the recess to control the flow of gas through said ports, a packing plate interposed between the cylinders and valve plate having ports in registration with the cylinder ports and a central opening through which said power shaft extends, expandable flanges formed about all of said ports engageable with the cylinder wall to prevent leakage and an expandable flange formed about the periphery thereof for preventing leakage of air from about the power shaft into the valve recess.

Signed at Seattle, Washington, this 4th day of August, 1920.

JOHN O. ALMEN.