Sept. 25, 1951 J. DEMATTEIS 2,569,293

EXPANSIBLE CHAMBER ENGINE HAVING A RECIPROCATING PISTON CYLINDER AND A RECIPROCATING PISTON IN SUCH CYLINDER

Filed May 7, 1947 3 Sheets-Sheet 1

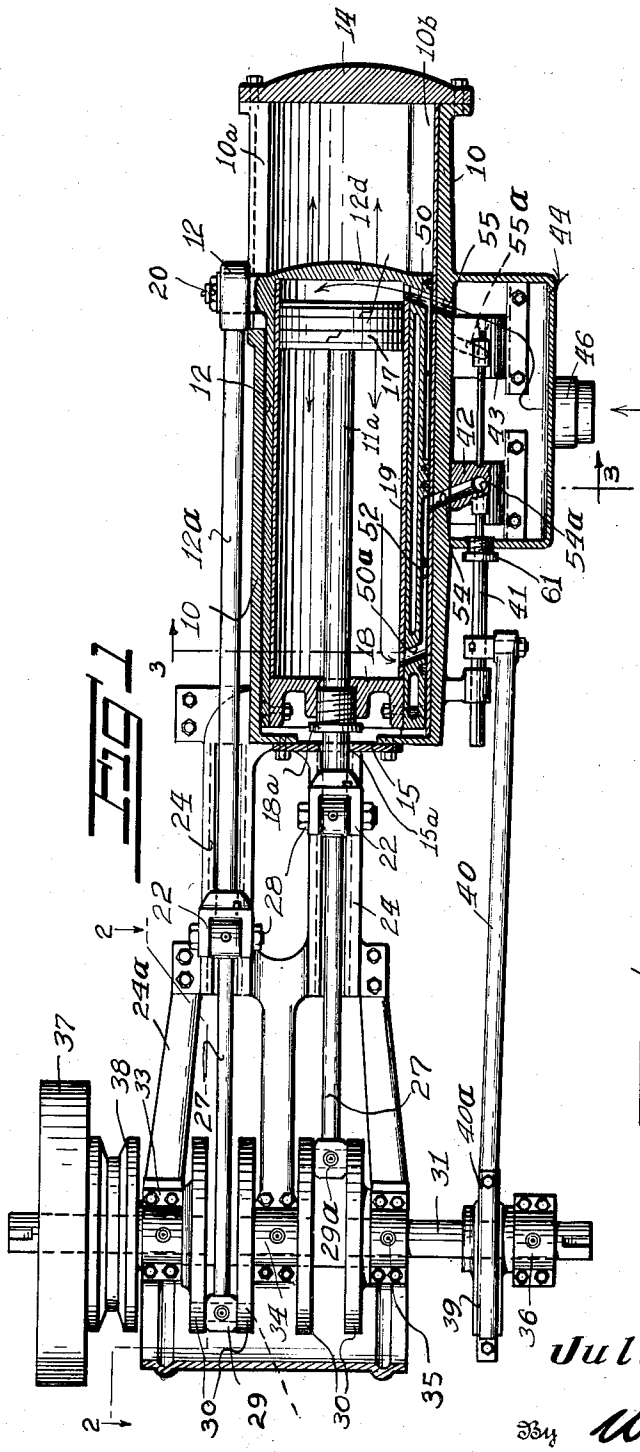

Fig. 1

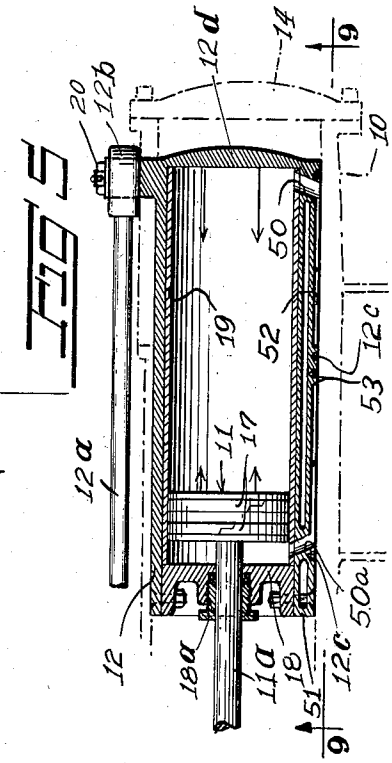

Fig. 5

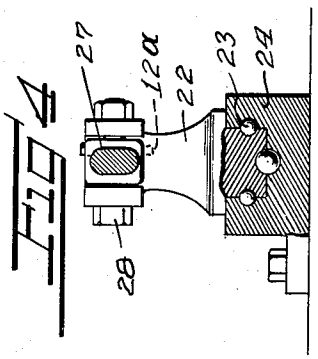

Fig. 4

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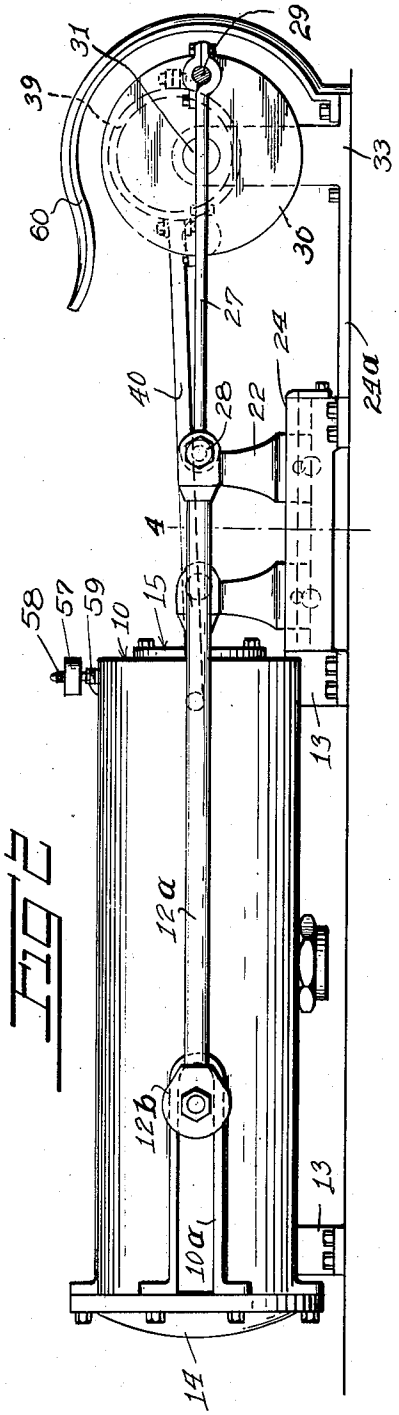

Fig 2

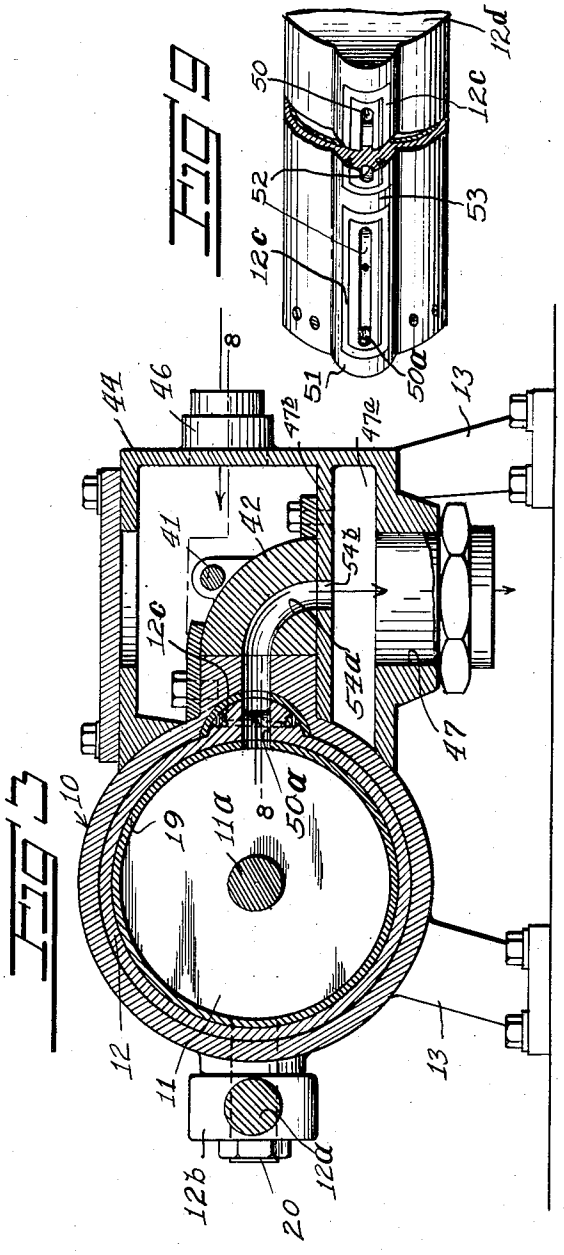

Fig 3

Fig 9

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Fig 6

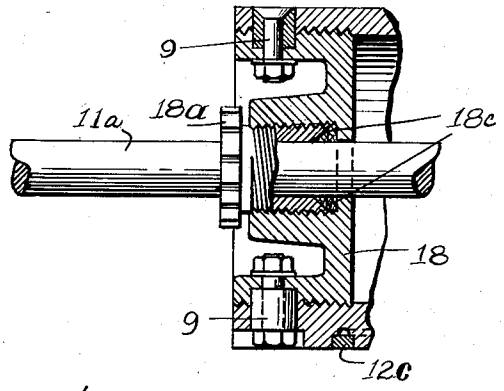


Fig 7

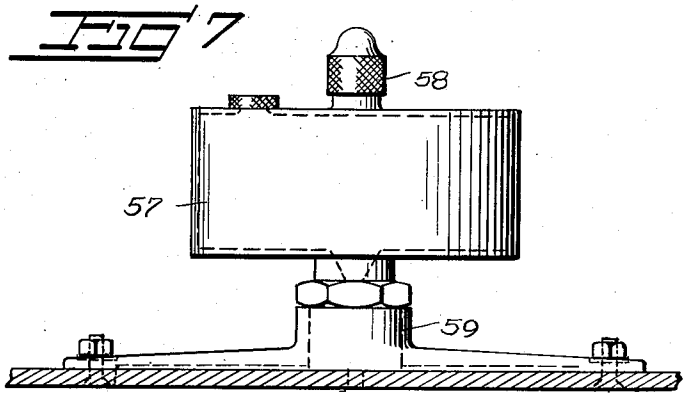


Fig 8

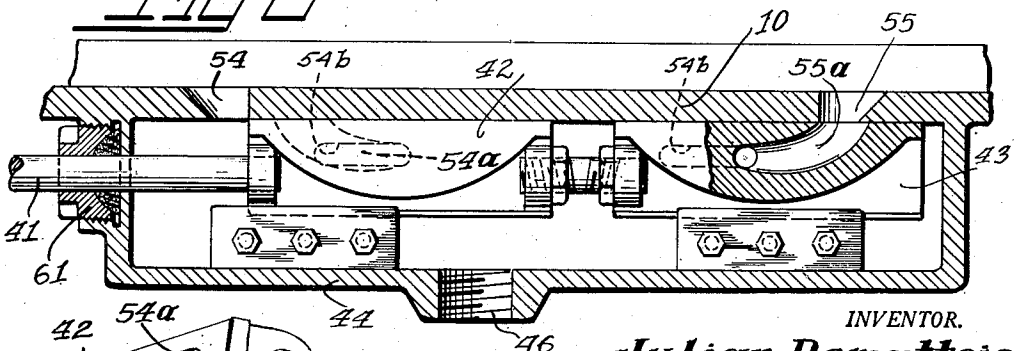
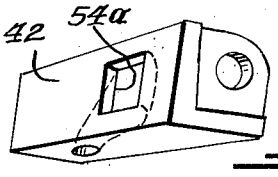


Fig 10



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UNITED STATES PATENT OFFICE

2,569,293

EXPANSIBLE CHAMBER ENGINE HAVING A RECIPROCATING PISTON CYLINDER AND A RECIPROCATING PISTON IN SUCH CYLINDER

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Application May 7, 1947, Serial No. 746,588

2 Claims. (Cl. 121—50)

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My invention relates to a reciprocating fluid pressure or steam engine of great efficiency and simple construction, being easy to assemble and very easy to take down. The engine is provided with a novel type of valve having short fluid passages making the engine quick acting. One of its characteristics is the provision of two axially alined pistons, mounted to reciprocate in a single surrounding cylindrical sleeve or casing and connected with a single drive shaft by a pair of crank rods.

This reciprocating engine has many features that make it simpler, more efficient and less costly than present power plants, whether steam engines, turbines, locomotives or other engines.

These and other objects and advantages of this invention will be made clear in the subjoined description, aided by the accompanying drawings.

Like numerals relate to the same details in the different views;

Figure 1 is a view in top plan and in part axial section of Figure 2;

Figure 2 is a sectional view taken substantially on the line 2—2 of Figure 1 of the double acting engine with a portion of the engine in side elevation;

Figure 3 is an enlarged transverse section taken along line 3—3 of Figure 1;

Figure 4 is a vertical transverse section through a connecting link and guide block, taken in the plane of line 4—4 on Figure 2 and showing a sliding standard in elevation;

Figure 5 is an axial section of Figure 1 showing the relative position of the pistons at the end of the out stroke;

Figure 6 is a vertical section of the rear end of the casing for the pistons, indicating the manner of securing the end plug and showing the steam packing;

Figure 7 is the oiling device of the engine in side elevation;

Figure 8 is a horizontal section through the valve box taken substantially on the line 8—8 of Figure 3, with the piston and parts carried thereby removed;

Figure 9 is a fragmentary side view in partial perspective of the hollow piston alone as seen from the ridge portion side, looking up from line 9—9 of Figure 5; and

Figure 10 is a perspective view of one of the valve slides in Figure 8.

In the drawing numeral 10 denotes a sleeve like casing in which the inner and outer pistons 11 and 12 are mounted to reciprocate.

The casing 10 is cylindrical and has four legs

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secured to the floor on feet 13. It is provided at its forward end with a cover 14, bolted thereto and at the rear end with a similar cover 15 also bolted to close the same except for a central hole 15a thru which slidably extends the rod 11a of the piston 11. Expansible packing rings 17 of metal are provided around the piston head and conventional packing 18a, 18c around the piston rod 11a.

In this casing is mounted to slide the second or hollow piston 12 having a closed forward end 12d and an open rear end fitted with a plug 18 threaded and secured therein by thimble bolts 9, Figure 6. This plug 18 is provided with a central opening for piston rod 11a which opening has a threaded bushing 18a fitting around the piston rod 11a. A liner 19 is fixed in the bore of the hollow piston and extends from end to end between parts 12d and 18, constituting the compression chamber for the two pistons. The packing around rod 11a is of any suitable kind, and consists of soft packing material 18c and metal glands 18a to make the sliding connection leak proof around the piston rod 11a.

The piston rod 12a for the hollow piston 12 is mounted concentrically but parallel to the common axis of the pistons, outside of the casing 10 and has its forward end provided with an eye 12b secured to a boss by a stud 20 at the forward end of said hollow piston 12. This boss travels back and forth with its piston in a slot 10a along the side wall of the casing 10 and the rear end of said rod 12a is secured, threaded or pinned fast to the head of a short sliding standard 22, which is mounted on bearings 23 on a twin guide-block 24, so as to participate in the reciprocation of said pistons. This guide also serves as a grease or oil box and has rigid connection by bars 24a wtih the casing feet 13 as well as with the crank shaft bearings 33.

Similarly the rear end of the inner piston rod 11a is rigidly secured in a sliding standard 22 and each of said standards has a link connection 27, oscillating on a pivot pin 28 of the sliding standard 22.

The opposite ends of the connecting rods 27 are carried on crank pins 29, 29a between disks 30 on a crank shaft 31. The crank pins 29, 29a are located diametrically opposite each other between said disks, so that one rod 27 produces a pull, while the other simultaneously produces a push action on the crank shaft 31. The shaft 31 is supported in the bearings 33, 34, 35 and 36, and on one end of the crank shaft is fixed a balance wheel 37. Next to the wheel 37 there is

fixed on the shaft a pulley 38 for a V-belt, or other means, for transmitting power to the machine to be driven.

On the opposite end of the crank shaft 31 is shown an eccentric disk 39 engaged in the eccentric strap 40*a*, secured to an end of a cam link 40. The inner end of link 40 is mounted to oscillate on a spindle 41, which is guided in a suitable bearing 61 in the end wall of a steam chest 44, to reciprocate two slide valves 42 and 43, one for each piston, such slide valves being located in the steam chest.

A steam port 50 is slanted inwardly at the front end of the hollow piston 12 through the half round longitudinally extending ridge portion 51 forming a part of the hollow piston 12 and a similar port 50*a* oppositely inclined is furnished at the other end of the hollow piston 12. The casing 10 has a channel 10*b* longitudinally in its inner wall into which the side of the steel lining extends and receives the ridge 51, and the ports 50 and 50*a* extend through the sleeve lining, as illustrated in Figures 1 and 3. From each of the ports 50, 50*a* is shown an exhaust passage or groove 52, which extends longitudinally along the outer surface of the ridge portion 51 of the hollow piston 12, to each side of a dividing lug 53 which is provided with packings 12*c*. Corresponding inlet and outlet ports 54, 54*a*, and 55, 55*a* are provided. These ports are located substantially symmetrically relative to the ends of the casing 10 and its transverse axis and 55 adjacent to the forward end of the casing 10. These ports also are correspondingly inclined so that proper registration will occur at the opposite ends of the piston stroke.

With the ports in the relative position shown in Figure 1, steam entering the chest 44 from inlet 45, proceeds through the alined ports 55 and 50 into the narrow space between the piston heads 11 and 12 at the beginning of a stroke, thereby forcing them apart, piston 11 to the left and piston 12 to the right. The port 50*a* and passage 52 are, as shown, in communication through port 54, with outlet port 54*a*.

Beneath the steam chest 44 is a steam exhaust box or chamber 47*a* which is divided from the steam chest by the horizontal wall 47*b*. This chamber 47*a* has the steam outlet 47 as shown in Figure 3.

The wall 47*b* is provided with two elongated, longitudinally extending ports 54*b* with which the exhaust ports 54*a* of the two valve members 43 are in communication as shown in Figure 8. Accordingly it will be seen that when the valves are in the position shown in Figure 1 the outlet port 54*a* of the valve 42 will establish an escape passage for the exhaust port 50*a* leading to the chamber 47*a* and the outlet 47.

As the cylinder 12 moves forwardly and the piston 11 moves rearwardly reducing the area between the piston 11 and the end wall 18, the fluid within this area will pass out through the chamber 47*a* and port 47.

At the end of the instroke, by which is meant the stroke in which piston 12 moves into the end of cylinder 10 remote from the crank shaft 31, conditions will be reversed, so that steam pressure will then act against adjacent inner surfaces of the two pistons, namely forwardly against piston head 11 and rearwardly against the piston plug 18.

Figure 7 is a side elevation of the outer housing, with an oil cup 57, a removable cap 58, and secured on a lug 59 with countersunk heads inside and hexagonal nuts outside. Figure 8 shows the valve blocks with port holes and oblong outlets.

A packing for the valve rod 41 is also provided with conventional steam packing 61 similar to packing 18*c* as used for piston rod 11*a*.

Each of the ports 50 and 50*a* and the channel 52 associated with each, is encircled by a packing material 12*c* which is embedded in the face of the rib 51 as shown in Figure 9. The adjacent ends of the channels 52 are spaced apart a sufficient distance to provide the intermediate face area 53 within which a portion of each of the packing rings is embedded as is also shown in Figure 9.

With some slight modifications this engine construction may be used for locomotive and other engines.

This double acting steam engine has several points of merit over other such engines, of which the following are worth mentioning.

The now prevailing construction for such engine is the provision of only one pair of bearings for the crank shaft, between which two or three rod heads of connecting rods are carried from the pistons. Such construction does not hold up at the bearing points, but causes crystallization of the crank shaft and excessive wear on the bearings, when running at high speed, a very bad feature.

In my construction on the other hand a special bearing is provided between each crank, thereby preventing wear on shaft and bearing.

Another point of advantage in my machine consists in the perfect lubrication from the outside of the hollow piston, which requires a considerably smaller amount of oil, for one double ringed inner piston thus being more economical to operate. All other steam engines have several ringed piston heads, requiring fully twice the amount of steam oil, and causing extra wear on the chamber lining.

My construction provides a long, combined stroke between the oppositely running piston heads and a short stroke on the crank shaft, giving added power.

Another advantage, as a consequence of one piston working within the other, is the shortening of the over all length of the engine, requiring less floor space as well as saving in weight and material.

Still another alvantage, due to the shorter stroke and compactness of the engine, as compared with other engines of the same horse power, that it gives no vibration at high speed, from a high pressure boiler. In other words, this is an ideal power unit for driving electric generators in power plants.

It is to be understood that the invention as herein disclosed may be varied from the details described and shown without departure from the spirit of the subjoined claims.

I claim:

1. An expansible chamber engine, comprising a cylindrical casing having a longitudinal channel in the inner wall, said wall further having a guide slot longitudinally therein, a piston cylinder mounted in the casing for reciprocation, a lug carried by the cylinder and extending through and slidably engaging in said slot, a rib formed longitudinally of the outer side of the piston cylinder and slidably engaging in said channel, the piston cylinder having closing end walls and a side wall port adjacent to each end wall and extending through said rib, a steam chest, a pair of ports leading therefrom into said channel,

said cylinder ports being in communication at all times with the last named ports, an exhaust means, a piston in the piston cylinder, a piston rod connected with the piston and slidably extending through an end wall of the piston cylinder and beyond an end of the casing, a piston rod coupled at one end with said lug, a crank shaft having said piston rods in operative connection therewith, valve elements adjacent to the said last mentioned ports and adapted to alternately establish communication between the steam chest and one of the piston cylinder ports and between the other one of the piston cylinder ports and the exhaust means, and means for actuating the valve elements in synchronism with the movements of the piston and cylinder.

2. An expansible chamber engine, comprising a cylindrical casing having a longitudinal channel in the inner wall, said wall further having a guide slot longitudinally therein, a piston cylinder mounted in the casing for reciprocation, a lug carried by the cylinder and extending through and having sliding engagement in said slot, a rib formed upon and longitudinally of the outer side of the piston cylinder and slidably engaging in said channel, the cylinder having closing end walls and a side wall port adjacent to each end wall and extending through said rib, said rib further having in the outer side thereof two longitudinally extending grooves each leading from a port toward and terminating short of the transverse center of the cylinder, a sealing means embedded in said rib and encircling each port and the groove with which the port communicates, said sealing means contacting the surface

of the channel in which the rib lies, a steam chest, a pair of ports leading therefrom into said channel, each of the ports leading from the steam chest being at all times in communication with a cylinder port by way of a groove, an exhaust means, a piston in the piston cylinder, a piston rod connected with the piston and slidably extended through one end wall of the cylinder and an end of the casing, a piston rod connected at one end with said lug, a crank shaft having said rods in operative connection therewith, a pair of slidably supported valve elements in the steam chest and each having a passage which is at all times in communication with said exhaust means, one valve element having its passage in communication with a groove when the other valve element is in a position to uncover an adjacent steam chest port, and means for actuating the valve elements in synchronism with the piston and cylinder movements.

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