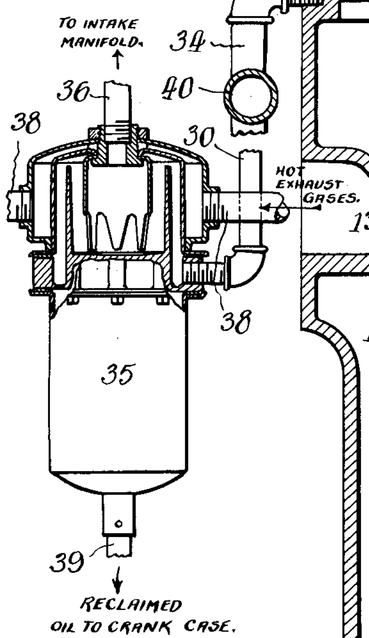
Sept. 8, 1931. R. L. SKINNER 1,821,991

OIL APPLIANCE FOR SLEEVE TYPE OF INTERNAL COMBUSTION ENGINES

Filed April 17, 1926

Fig. 1.



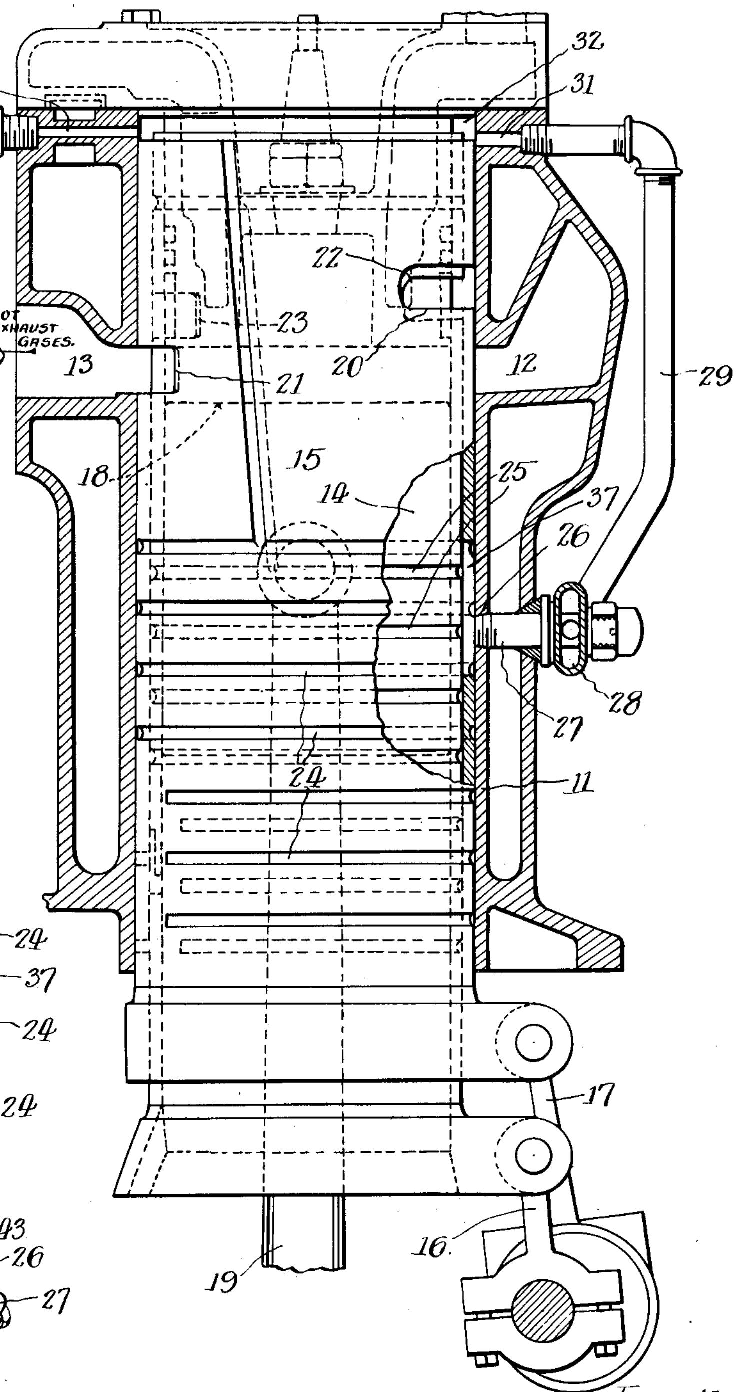


Fig. 2.

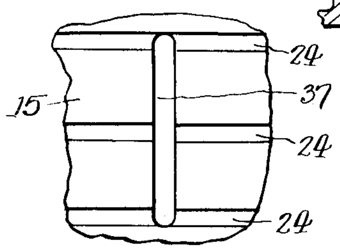
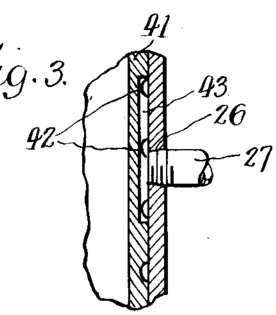


Fig. 3.



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UNITED STATES PATENT OFFICE

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OIL APPLIANCE FOR SLEEVE-TYPE OF INTERNAL-COMBUSTION ENGINES

Application filed April 17, 1926. Serial No. 102,696.

My current invention pertains to internal-combustion engines or motors, and deals more particularly with the lubrication thereof, and especially with the withdrawal of some of the lubricating oil to improve the operating conditions and efficiency of the engine, and, in some cases, with the use of such oil to lubricate other portions of the engine.

In some internal-combustion motors, particularly those of the Knight or sliding-sleeve and sliding valve types, having one or more reciprocatory sleeves or valves between the sliding pistons and the cylinder walls, there is a tendency for an undue quantity of the lubricating oil to pass or flow up about the valves and/or between the sleeves, and/or between the outer sleeves and the cylinder walls, and to be drawn into the intake-manifold or admission-ports or combustion-chamber of the cylinder by reason of the suction thereat and to be consumed or burned in the cylinders without resulting advantage and with a substantial loss of oil.

This travel of the oil is seemingly occasioned in part by the slight sidewise or lateral movements of the sleeves due to the operating angularity or obliquity of the eccentric-rods which actuate them, and in part by the sub-atmospheric pressure condition at the intake-ports of the engine and in the intake-manifold and combustion-chamber of the cylinder.

To overcome or eliminate this undue and needless consumption of oil is one of the primary objects and leading purposes of the present invention, the cause of such excessive use of oil heretofore having been much of a mystery, so that this invention may be said to reside partly in the discovery of the source of the oil loss, and in some measure in the means for removing the difficulty.

To assist those skilled and trained in this art in understanding the structural features and the operating benefits to be derived from the employment of this invention, in the accompanying drawings, forming a part of this specification, and throughout the views of which like reference characters have been employed to designate the same structural elements, present desirable embodiments of the invention have been illustrated.

In these drawings,—

Fig. 1 shows, partly in elevation, partially in section, somewhat diagrammatically, and also on different scales, an embodiment of the invention as applied to a sleeve-type of internal-combustion engine having a pair of reciprocatory sleeves for each cylinder;

Fig. 2 is a fragmentary elevation of a portion of the outer sleeve shown in Fig. 1; and

Fig. 3 illustrates fragmentarily a similar embodiment as applied to an engine having only one sleeve between the piston and the cylinder.

Referring first to the structure depicted in Figs. 1 and 2, it will be observed that each cylinder 11 of the multi-cylinder engine, equipped with the inlet and exhaust ports 12 and 13, respectively, has the usual, telescoping, reciprocatory, inner and outer sleeves 14 and 15 operated in the customary manner by suitable eccentrics and their connecting-rods 16 and 17.

Inside of the sleeves is the common, sliding piston 18 connected to the engine crank-shaft (not shown) by a connecting-rod 19, as is usual in mechanisms of this type.

The outer sleeve 15 has the customary intake and discharge ports 20 and 21, and the companion, inner sleeve has similar co-operating ports 22 and 23, both sets of such openings, by the sliding movements of the sleeves, being brought at the proper moments into coactive register with one another and with the corresponding ports of the cylinder.

On its exterior surface, the outer sleeve 15 has a plurality of longitudinally-spaced, shallow, circumferential, horizontal, oil grooves 24, 24, the upper ones of which extend all the way around the sleeve, the lower ones, for a reason unnecessary to explain here, reaching almost, but not quite, around the whole circumference; the inner sleeve 14 being similarly supplied with external oil grooves or channels 25.

Such outer sleeve 15 of each engine-cylinder is longitudinally slotted or cut through, for a short portion of its length, at 37, thereby providing a cavity which is in communication with a plurality of the surface oil grooves or channels 24 of the outer sleeve and 25 of the inner sleeve.

As is clearly shown, the engine-cylinder wall, below and longitudinally in substantial register with the cylinder-admission port of the intake-manifold 12, has an opening or port 26 extended therethrough in register with the slot or recess 37, and connected by a short pipe 27 to a horizontal, tubular manifold 28 located alongside of the several cylinders of the multi-cylinder engine, and, in like manner, operatively connected to corresponding ports in the side-walls of all of them.

Conduit 28 is connected by a pipe 29 and a communicating passage 31 through the side-wall of the engine to the annular sealing-head compartment 32 above the top ends of the sleeves at a point practically in lengthwise register with the port 26 and the inlet-port of the cylinder, the diametrically opposite side of such ring-shaped space or chamber being connected by a passage 33 through the engine-wall, an associated pipe 34, and a manifold 40, to the single intake-pipe 30 of an oil-rectifier 35 of known construction, similar to, or like, that of United States Patents Nos. 1,435,561 and 1,502,921, and the top part of such oil-separator or refining-appliance is joined by a pipe 36 to the intake-manifold of the engine, whereby the suction of such manifold is exerted in and through the rectifier, the sealing-head compartment and the various connections to the cylinder-port 26 of each cylinder.

The manifold 40 is connected to all the several pipes 34 of the plurality of engine-cylinders and is in communication with the single rectifier inlet-pipe 30, so that a single oil-refining appliance is used for the whole engine.

Owing to the length of the slot or cavity 37, it is constantly subjected to the specified suction action at the port 26, and consequently the oil is withdrawn in large measure from the upper oil-grooves of both sleeves and is delivered into the rectifier after passing through the sealing-head compartment, thus preventing such excess oil from reaching the cylinder-port of the intake-manifold 12, or the latter, the suction in which would otherwise abstract the oil traveling up the sleeves and cause its entrance into and combustion in the cylinders.

Owing to the fact that the connecting-rods actuating the sleeves operate at an angle thereto, there is a tendency to rock or tilt the sleeves slightly sidewise, thereby causing a pumping action tending to feed the oil upwardly of the sleeves in undue or unnecessary amount, and by the simple means provided, such surplus oil is drawn off or removed before it reaches the influence of the suction existing at the admission or entrance ports of the cylinders and in the intake-manifold.

It was the discovery of this peculiar operation which led to the development of this novel and approved means for overcoming or remedying the difficulty.

This oil thus abstracted from the several engine-cylinders is discharged into their sealing-head compartments above the points where it was removed from the sleeves, and here it lubricates those portions of the sleeves above the cylinder intake-ports which may possibly be deprived of adequate lubrication by reason of this oil removal from below.

In some instances an excessive amount of oil may find its way along other sections of the sleeves into these sealing-head compartments, and by withdrawing the oil therefrom this surplus, as well as that withdrawn from the sleeves below the cylinder intake-ports, is delivered into the rectifier 35, the upper portion of which may be heated by at least a portion of the hot exhaust-gases from the manifold 13 passing through the pipes 38, 38 provided for that purpose, and which connect with a casing enclosing the upper section of the rectifier.

The oil thus abstracted from the engine and fed to the rectifier or separator, is ordinarily mixed with other oil requiring reclaiming, taken from other parts of the engine, and the oil purified in the refining-appliance under the action of the sub-atmospheric pressure therein, and also under the heat, if that is desired, is delivered from the rectifier, either continuously or intermittently, to the lubricating system of the engine, as, for instance, through a return pipe 39 from the lower portion of the rectifier to the engine crank-case.

The oil drawn off from around the sleeves need not indispensably be reclaimed or purified, but where other impure oil taken from the engine requires reclaiming, it is convenient to withdraw all of such oil by the suction specified and to return it to the engine crank-case or other portion of the engine lubrication-system after reclamation.

It is to be understood that the lubricating oil may be fed to the pistons, sleeves and cylinder-walls in any approved manner, as by being splashed thereon through the action of the piston connecting-rods, or by a force-feed system, or by the two combined if preferred.

From the foregoing it will be apparent that the excess oil which heretofore has been consumed in the engine by reason of being drawn into the inlet-ports or intake-manifold or combustion-chamber of the cylinder, due to the suction present therein, is taken off or withdrawn before it can reach such ports or chamber and is returned to the engine for further use, rather than being uselessly burned in the engine, and all of this is accomplished without permitting any portions of the sleeves to receive insufficient oil for proper lubrication purposes.

In some cases it is possible to construct an engine of the general Knight type and employ only one reciprocatory sleeve between each piston and its cylinder wall, and the manner in which my invention may be incorporated conveniently in such a structure is illustrated in Fig. 3.

In this instance the sleeve 41 has the external grooves or channels 42, and a plurality of the upper ones are connected together by a longitudinal groove or channel 43 in register with the cylinder-port 26.

It is to be noted, however, that such lengthwise groove or channel 43 in this case does not extend through the sleeve, but is merely present on its outer surface connecting the circumferential channels.

Inasmuch as this appliance operates practically the same as the one already described, no further statement with respect to the same is needed.

This invention is susceptible of a variety of embodiments in satisfactory form, and those set forth are presented merely by way of example.

For instance, if preferred, the means for causing the abstracted oil to traverse the sealing-head compartment may be omitted and the oil may be drawn directly into the rectifier; and, if desired, even the latter may be omitted so long as suitable means are provided for drawing off the oil from the sleeves in the general manner indicated.

It should be remembered that the structures illustrated and described may be otherwise modified in mechanical details more or less radically without departure from the heart and essence of the invention as defined by the appended claims and without the sacrifice of any of its material benefits and advantages.

Although I have indicated the length of the longitudinal slot or groove in the sliding sleeve as sufficient to communicate with the cylinder-port at all times during the reciprocation of the sleeve, it should be borne in mind that the dimensions of such groove or slot may be varied, or, in fact, such slot or groove may be entirely omitted, and the withdrawal of the oil may be continuous or intermittent as may be required or preferred.

I claim:

1. In an internal-combustion engine, the combination of an engine-cylinder having inlet and exhaust ports, movable means in said cylinder controlling said ports, means to move said controlling means, a movable piston in said cylinder, means to supply lubricating oil to said controlling means and cylinder, and suction means acting substantially in longitudinal register with said inlet-port to withdraw the excess of said lubricating oil to prevent such excess oil from being drawn into and by the suction in the combustion-chamber of the cylinder and said inlet-port.

2. In an internal-combustion engine, the combination of an engine-cylinder having inlet and exhaust ports, a reciprocatory member in said cylinder controlling at least one of said ports, means to supply lubricating oil to said member and cylinder, a movable piston in said cylinder, said cylinder having a port through its wall in approximate longitudinal register with said inlet-port and spaced from the latter in the direction of oil supply to said member and cylinder, and suction means to withdraw the excess oil through said cylinder-port, thereby preventing its being withdrawn into and by the suction at said inlet-port and the combustion-chamber of said cylinder.

3. In an internal-combustion engine, the combination of an engine-cylinder having inlet and exhaust ports, a channeled movable member in said cylinder controlling said inlet-port, means to move said member, a movable piston in said cylinder, means to supply lubricating oil to said member and cylinder, said cylinder having a port through its wall in approximate longitudinal register with said inlet-port, means to withdraw the excess oil through said cylinder-port from the channel of said member, thereby preventing its being withdrawn into and by the suction at said inlet-port and in the combustion-chamber of said cylinder.

4. In an internal-combustion engine, the combination of an engine-cylinder having inlet and exhaust ports, a transversely, externally channeled reciprocatory member in said cylinder controlling said inlet-port and having a longitudinal recess communicating with said channel and in substantial longitudinal register with said inlet-port, means to reciprocate said member, means to supply lubricating oil to said member and cylinder, the latter having a port through its wall in approximate longitudinal register with said inlet-port and said recess, a piston in said cylinder, and means to remove the excess oil through said cylinder-port from the recess and channel of said member thereby preventing its being withdrawn into and by the suction at said inlet-port and in the combustion-chamber of said cylinder.

5. In an internal-combustion engine, the combination of an engine-cylinder having inlet and exhaust ports, a sliding piston in said cylinder, ported movable sleeve means in said cylinder controlling said inlet and exhaust ports, means to move said sleeve means, means to supply lubricating oil to

said sleeve means and cylinder-wall, and means to withdraw the excess lubricating oil to prevent the same from being withdrawn into and by the suction at said inlet-port and in the combustion-chamber of said cylinder.

6. In an internal-combustion engine, the combination of an engine-cylinder having inlet and exhaust ports, a sliding piston in said cylinder, ported reciprocatory sleeve means between said piston and the wall of said cylinder, means to reciprocate said sleeve means, means to supply lubricating oil to said sleeve-means and cylinder wall, the latter having a port therethrough in approximate longitudinal register with said inlet-port, and suction means to withdraw the excess oil through said cylinder-wall port, thereby preventing its being withdrawn into and by the suction at said inlet-port and in the combustion-chamber of said cylinder.

7. In an internal-combustion engine, the combination of an engine-cylinder having inlet and exhaust ports, a sliding piston in said cylinder, ported reciprocatory sleeve means between said piston and the wall of said cylinder, means to reciprocate said sleeve-means, means to supply lubricating oil to said sleeve-means and cylinder-wall, the latter having a port therethrough in approximate longitudinal register with said inlet-port in the direction of oil feed thereto, and suction means to withdraw the excess oil from said sleeve means through said cylinder-wall port, thereby preventing it being abstracted into and by the suction in said inlet-port and in the combustion-chamber of said cylinder.

8. In an internal-combustion engine, the combination of an engine-cylinder having inlet and exhaust ports, a sliding piston in said cylinder, ported reciprocatory channeled sleeve-means between said piston and the wall of said cylinder, means to reciprocate said sleeve-means, means to supply lubricating oil to said sleeve-means and cylinder-wall, the latter having a port therethrough in approximate longitudinal register with said inlet-port, and suction means to withdraw the excess oil from the sleeve-means channel through said cylinder-wall port, thereby preventing its being abstracted into and by the suction at said inlet-port and in the combustion-chamber of said cylinder.

9. In an internal-combustion engine, the combination of an engine-cylinder having inlet and exhaust ports, a sliding piston in said cylinder, a ported reciprocatory sleeve between said piston and the wall of said cylinder, said sleeve having a transverse oil-channel and a longitudinal recess communicating therewith, means to reciprocate said sleeve, means to supply lubricating oil to said sleeve and cylinder-wall, the latter having a port therethrough in approximate longitudinal register with said inlet-port and in communication with said sleeve recess, and means to withdraw the excess oil from said sleeve channel through said sleeve recess and said cylinder wall port, thereby preventing its being abstracted into and by the suction at said inlet-port and in the combustion-chamber of the engine.

10. In an internal-combustion engine, the combination of an engine-cylinder having inlet and exhaust ports, a sliding piston in said cylinder, ported telescoping reciprocatory inner and outer sleeves between said piston and the wall of said cylinder controlling said engine ports, means to reciprocate said sleeves, means to supply lubricating oil to said sleeves and cylinder-wall, the latter having a port therethrough in approximate longitudinal register with said inlet-port, a slot through said outer sleeve in register with said cylinder-wall port, said outer sleeve having an external transverse surface channel communicating with said slot, one at least of said sleeves having a transverse channel in its surface in contact with the companion sleeve and connecting with said slot, and means to withdraw the excess oil from said channels through said slot and cylinder-wall port, thereby preventing its being abstracted by the suction at said inlet-port and in the combustion-chamber of said cylinder.

11. An internal-combustion engine having, in combination, a cylinder with inlet and exhaust ports, a sliding piston in said cylinder, a reciprocatory valve between said piston and cylinder-wall controlling at least one of said cylinder ports, means to reciprocate said valve, means to supply lubricant to said cylinder, piston and valve, and means to by-pass some of said lubricant traveling along said valve around said fuel-inlet port.

12. An internal-combustion engine having, in combination, a cylinder with inlet and exhaust ports, a sliding piston in said cylinder, a reciprocatory valve between said piston and cylinder-wall controlling at least one of said cylinder ports, means to reciprocate said valve, means to supply lubricant to said cylinder, piston and valve, and means to withdraw lubricant from around said valve and deliver it into the upper portion of said cylinder.

13. An internal-combustion engine having, in combination, a cylinder with inlet and exhaust ports, a sliding piston in said cylinder, a reciprocatory valve between said piston and cylinder-wall controlling said ports, means to reciprocate said valve, means to supply lubricant to said cylinder, piston and valve, and means to withdraw lubricant from around said valve through the sealing-head compartment of the engine.

14. An internal-combustion engine having, in combination, a cylinder having inlet and exhaust ports, a sliding piston in said cylinder, a channeled reciprocatory engine-port-controlling sleeve between said piston and cylinder-wall, means to reciprocate said sleeve, means to supply lubricant to said cylinder, piston and sleeve, and suction means to withdraw lubricant from said sleeve-channel during at least a portion of the stroke of the sleeve and deliver it into the sealing-head compartment of the engine.

15. An internal-combustion engine having, in combination, a cylinder with inlet and exhaust ports, a sliding piston in said cylinder, a channeled reciprocatory engine-port-controlling-sleeve between said piston and cylinder-wall, means to reciprocate said sleeve, means to supply lubricant to said cylinder and sleeve, and means substantially in longitudinal register with said inlet-port to withdraw excess lubricant from said sleeve-channel to prevent such excess lubricant from being abstracted into and by the suction at said inlet-port and in the combustion-chamber of said cylinder and to deliver the withdrawn lubricant into the sealing-head compartment of the engine.

16. An internal-combustion engine having, in combination, a cylinder with inlet and exhaust ports, a sliding piston in said cylinder, a channeled reciprocatory engine-port-controlling sleeve between said piston and cylinder-wall and having a longitudinal recess communicating with its channel, means to reciprocate said sleeve, means to supply lubricant to said cylinder and sleeve, means substantially in longitudinal register with said inlet-port to withdraw excess lubricant from said sleeve-channel during at least a portion of the stroke of the sleeve to prevent such excess lubricant from being abstracted into and by the suction at said inlet-port and in the combustion-chamber of said cylinder and to deliver it into the sealing-head compartment of the engine at a point substantially in longitudinal register with its point of withdrawal, and means to withdraw lubricant from said sealing-head compartment.

17. In an internal-combustion engine, the combination of an engine-cylinder having inlet and exhaust ports, movable means in said cylinder controlling said ports, means to move said controlling means, a movable piston in said cylinder, means to supply lubricating oil to said controlling means and cylinder, and means to prevent the excess of said lubricating oil from being drawn into the combustion-chamber of said cylinder by the suction therein and into said inlet-port by the suction thereat.

18. In an internal-combustion engine, the combination of an engine-cylinder having inlet and exhaust ports, movable means in said cylinder controlling said ports, means to move said controlling means, a movable piston in said cylinder, means to supply lubricating oil to said controlling means and cylinder, and means to apply suction to said controlling means in opposition to the action thereon of the suction in the combustion-chamber of said cylinder and at said inlet-port to prevent the excess of said lubricating oil from being drawn into said chamber or into said inlet-port.

19. In an internal-combustion engine, the combination of an engine-cylinder having inlet and exhaust ports, movable means in said cylinder controlling said ports, means to move said controlling means, a movable piston in said cylinder, means to supply lubricating oil to said controlling means and cylinder, and means to apply suction to said controlling means in opposition to the action thereon of the suction in the combustion-chamber of said cylinder and at said inlet-port to withdraw the excess of said lubricating oil from between said controlling means and said cylinder to prevent such excess from being drawn into said chamber or into said inlet-port.

In witness whereof I have hereunto set my hand.

RALPH L. SKINNER.