

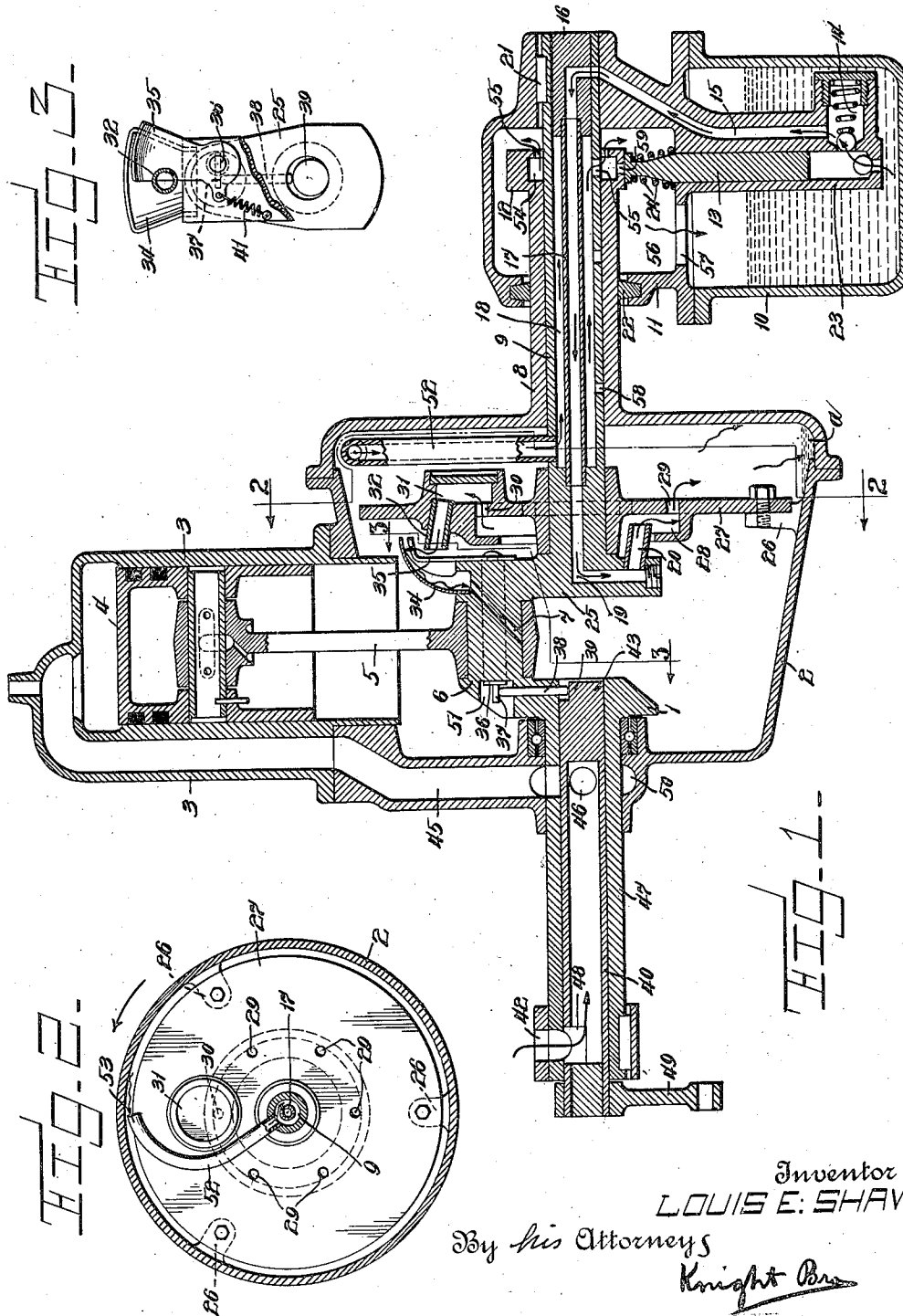
Oct. 16, 1923.

1,470,769

L. E. SHAW

OIL CIRCULATING SYSTEM

Filed Oct. 26, 1920



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Patented Oct. 16, 1923.

1,470,769

UNITED STATES PATENT OFFICE.

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OIL-CIRCULATING SYSTEM.

Application filed October 26, 1920. Serial No. 419,607.

To all whom it may concern:

Be it known that I, LOUIS E. SHAW, a citizen of the United States, and residing at East Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Oil-Circulating Systems, of which the following is a specification illustrated in the accompanying drawings, the particular novel features of the invention being more fully pointed out in the annexed claims.

My invention relates to oil circulating systems, for any kind of machinery in which comparatively small but carefully proportioned quantities of oil should be supplied at any one time to the point or points of consumption from a storage supply not located directly adjacent to this point. The difficulty arising in such cases of small oil supply is, that the small quantities of oil required are considerably diminished on their comparatively long way to the point of consumption by unavoidable leakages, so that an insufficient amount of oil will eventually reach this point. In many cases it is not feasible to counteract such losses by simply increasing the amount of oil delivered from the storage supply, because leakage losses are uncertain quantities, are hard to determine and are variable.

In order to overcome these difficulties, I propose to feed from the storage supply oil in bulk, i. e., in quantities, many times in excess of the amount actually required at the point of consumption and to separate from this excess amount at one or several points, closely adjacent to the point of consumption, quantities of oil, sufficient to cover the exact requirements at that point, whereby the excess amount of oil is permitted to escape and to gather at suitable portions of the engine, whence it is returned by suitable means to the storage supply.

This method of oil supply becomes of particular value in case of so-called rotary cylinder internal combustion engines, which are usually of very compact construction and in which it is otherwise difficult to reach points, requiring lubrication, located inside of the rotary crank casing.

I have therefore illustrated my invention as applied to that class of machinery without thereby limiting the scope of the use to which my novel construction may be put in other classes of machinery.

In the accompanying drawings:

Fig. 1 is a longitudinal vertical section through a rotary cylinder engine,

Fig. 2 is a detail face view of a portion of the oiling device partly in section on the line 2—2 in Fig. 1,

Fig. 3 is a detail end view of a crank portion, the section appearing therein, being taken on the line 3—3 in Fig. 1.

Referring to Fig. 1, the stationary crank-shaft is shown at 1 and the rotary crank-casing, disposed thereon is shown at 2. 3 is one of the cylinders (the others not visible in this sectional view), containing the piston 4, connected to the crank-pin 6 by connecting rod 5. The illustration of this type of engine is purely conventional and merely for the purpose of illustrating how my oiling system may be applied, for instance for the purpose of oiling the crank-pin 6. Crank-casing 2 has a tubular extension 8 at its right hand end, which serves as a bearing on the shaft end 9 for that side of the casing. Extension 8 terminates in an eccentric 12 for the purpose stated below. At 21, is keyed to the end of shaft portion 9 a pump casing 11, which rests with a running fit, by means of ring 22, on tubular extension 8 of the crank case, and which contains the pump cylinder 23 with its two ball check valves, denoted jointly with 14. In pump cylinder 23 is disposed plunger 13, whose upper end is held in contact with eccentric 12 by means of spring 24. Thus, when the crank casing 2 with its tubular extension 8 rotates, the eccentric 12 operates the plunger 13 up and down. The plunger pump cylinder is disposed in the oil reservoir 10 attached to the lower portion of pump casing 11. From the check valves 14 the oil, pumped from reservoir 10 is delivered into passage 15 provided in casing 11, whence it passes through plug 16 which closes the outer end of cylindrical boring 18 provided in crank shaft portion 9. Crank arm 25 is provided with a boring 19 which connects by means of a tube 17, located in shaft boring 18, with the oil passage through plug 16, so that the total amount of oil delivered by the pump is directly conducted to oil discharge stud 20 attached to the inner end of crank arm boring 19.

At the inner periphery of crank casing 2 are provided a number of lugs 26 (three in this case as shown in Fig. 2), to which is

bolted a disk 27, having on the side, facing the crank shaft, an annular chamber 28 within which discharge stud 20 terminates. The oil discharged from the latter into this rotary chamber tends to collect at the inner periphery thereof, due to centrifugal force, but is permitted to escape therefrom through discharge holes 29, provided in disk 27 near the bottom of chamber 28. From these discharge holes the oil is splashed into crank case 2, where it collects at the point of largest diameter, indicated by *a*.

Disk 27 in the present example is provided with six oil discharge holes, five of which are denoted with 29 and one with 30 (see Figs. 1 and 2). While holes 29, as previously stated, all discharge the oil from chamber 28 directly into crank case 2, hole 30 discharges the oil passing through it into a trap 31 provided on disk 27 and surrounding hole 30. A trap discharge tube 32 is arranged on disk 27 at a suitable point, so that the oil collecting in trap 32 is discharged therefrom by centrifugal force at the side of disk 27, facing crank pin 6. The oil passage in crank pin 6, thru which a definite amount of oil is to be supplied to the crank pin bearing, is shown at 7. Now in order to deliver some of the oil discharged from tube 32 into passage 7, I arrange on pin 6 a catcher plate 34, which rises from the crank pin closely adjacent to passage 7 and curves over the circular path in which discharge tube 32 revolves, and extends into the tangential plane in which the oil is discharged from tube 32.

From the description of my oiling system so far given, it will be noted that of the total amount of oil delivered by plunger pump 13, 23 into annular chamber 28, five-sixths is returned unused to crank case 2 through the five discharge tubes 29, while the remaining one sixth is delivered through tube 30 into trap 31, whence it is discharged at the left hand side of disk 27 through tube 32. The peripheral extension of catcher plate 34 is dimensioned so that of the oil discharge from tube 32, say for instance, one tenth splashes against plate 34, the remaining nine tenths being discharged into casing 2 where it collects at *a* with the remainder of the oil discharged directly into it as described before. Thus of the total amount of oil delivered by the pump one sixtieth is delivered to catcher plate 34, on which it may run down, as shown by the corrugated arrow, into oil hole 7 to the bearing for which it is intended.

In order to further control the amount of oil delivered to catcher plate 34, and thus to the bearing, in accordance with the load of the engine, I have provided a shield 35, disposed between the circular path of discharge tube 32 and catcher plate 34. This shield is pivotally arranged on crank pin

6 by means of a small shaft 36 longitudinally extending through the crank pin as shown in Figs. 1 and 3. When this shaft is rocked through a suitable angle, shield 35 will cover a greater or smaller portion of catcher plate 34 and thus deflect more or less of the oil discharged against plate 34, so that the oil so deflected cannot reach oil hole 7 of the crank pin. The deflected oil may run down on shield 35 into crank case 2 and collect at *a* with the rest of the unused oil.

In order to render the deflection of oil from plate 34 dependent upon the engine load, I connect the rocking shaft 36 with the throttle of the engine for instance as follows: The left hand shank 47 of crank shaft 1 is hollowed similar to the right hand shank 9. Into this boring is snugly but revolvably fitted the throttle tube 40, which may be rocked through a suitable angle by means of throttle lever 49 (Fig. 1). The carbureting device (not shown) delivers combustible mixture through port 42, provided on crank shaft end 47, into the throttle tube 40, which for this purpose has a port 48, permanently registering with port 42 throughout the entire angular motion which the tube is permitted to perform. Another port 44 is provided in that portion of the crank shaft nearer the crank arms, which permanently connects with an annular chamber 50 of crank case 2, which completely surrounds the shaft at that point and connects with intake passage 45 leading to the engine cylinder 3. Throttle tube 40 is provided adjacent to port 44 with a port 46, which may be brought to register with port 44 more or less, according to the angular position of the throttle lever 49, and by these means the gas supply and thus the speed of the engine may be controlled.

Throttle tube 40 is closed at its inner end by a solid portion 43, which terminates substantially flush with the inner face of the crank arm, but is formed at this end into an eccentric 39 (Figs. 1 and 3) against which rests one end of a pin 38 slidingly disposed in the crank arm and protruding at its other end into a recess 51 in the end of crank pin 6. Rocking shaft 36, to which shield 35 is attached as described, also protrudes into this recess and is provided at its free end with a cross bar 37, which bears against the outer end of pin 38, being held in engagement therewith by a spring 41 shown in Fig. 3. This spring is arranged at the rocking shaft end near the shield and is not shown in Fig. 1. Thus when the throttle tube is operated to control the engine speed, eccentric 39 rocks with it and lifts or lowers pin 38, so that by the mechanism just described shield 35 is correspondingly operated to cover a greater or smaller portion of catcher plate 34 in accordance with the throttle position.

In order to return the unused oil collecting at *a* in the crank case 2, to the storage supply vessel 10, I use the following expedient: To the inner end of the hollow crank shaft portion 9 is fastened a curved tube 52, which rises along the end wall of crank case 2, as shown in Figs. 1 and 2, and is curved against the direction of rotation of case 2 as indicated by the arrow in Fig. 2. The outer end of tube 52 dips into the oil, which collects in annular fashion at the largest inner peripheral portion *a* of the crank case, due to the action of centrifugal force, and thus gradually scoops up this oil and conveys it by gravity to the hollow portion 18 of crank shaft end 9, but outside of tube 17. It is discharged near the outer end of the crank shaft through port 55 into an annular space 54 of eccentric 12, whence it is permitted to flow through annular passage 55 provided between the shaft and the eccentric 12 into chamber 56 of the pump casing, from which it can flow freely through opening 57 into the reservoir 10. On its return from case 2 to the reservoir, the oil may easily lubricate the bearing surfaces between shaft end 9 and tubular extension 8 of the crank case, by means of oil holes 58, and also the operating surface of pump eccentric 12 by means of oil hole 59. The amount of oil supplied to these last mentioned portions of the engine need not be carefully apportioned and may be far in excess of the amount required, since any excess of oil will either flow into crank case 2 or directly into reservoir 10, without leaking to the outside or into portions of the engine where it may be detrimental.

The path of the oil from the pump to the points of subdivision and of consumption and return to the reservoir is indicated throughout by arrows in Fig. 1.

I claim:—

1. In a rotary cylinder engine, having a stationary hollow crank shaft and a crank case rotatable thereon, an oil circulating system comprising a stationary oil reservoir, means for supplying oil therefrom in bulk thru said hollow shaft into said crank case, an annular chamber, rotatable with said case and adapted to receive the oil so supplied, said chamber having a plurality of discharge openings, permitting the oil to escape into the crank case, a trap attached to said annular chamber, adapted to receive the oil escaping from some of said openings, a discharge tube in said trap for discharging by centrifugal force the oil contained in said trap, and a catcher plate mounted on said crank shaft adjacent to the point of oil consumption and extending for a suitable peripheral length into the tangential plane, in which the oil is discharged from said tube, to receive a predetermined amount of the oil discharged from the tube in accordance

with the peripheral extent of the plate, and adapted to lead the oil to the point of consumption, and means for collecting the oil discharged into the crank case and returning it to said stationary reservoir.

2. In a rotary cylinder engine, having a stationary hollow crank shaft and a crank case rotatable thereon, an oil circulating system comprising a stationary oil reservoir, means for supplying oil therefrom in bulk thru said hollow shaft into said crank case, an annular chamber, rotatable with said case and adapted to receive the oil so supplied, said chamber having a plurality of discharge openings, permitting the oil to escape into the crank case, a trap attached to said annular chamber, adapted to receive the oil escaping from some of said openings, a discharge tube in said trap for discharging by centrifugal force the oil contained in said trap, and a catcher plate mounted on said crank shaft adjacent to the point of oil consumption and extending for a suitable peripheral length into the tangential plane, in which the oil is discharged from said tube, to receive a predetermined amount of the oil discharged from the tube in accordance with the peripheral extent of the plate, and adapted to lead the oil to the point of consumption, a shield also mounted on the crank shaft adjacent to the point of oil consumption and being located between said catcher plate and the path of the discharge tube, said shield being angularly operatable in front of said catcher plate to deflect a desired amount of oil otherwise caught by said plate, and means for collecting the oil discharged into the crank case and returning it to said stationary reservoir.

3. In a rotary cylinder engine, having a stationary hollow crank shaft and a crank case rotatable thereon, an oil circulating system comprising a stationary oil reservoir, means for supplying oil therefrom in bulk thru said hollow shaft into said crank case, an annular chamber, rotatable with said case and adapted to receive the oil so supplied, said chamber having a plurality of discharge openings, permitting the oil to escape into the crank case, a trap attached to said annular chamber, adapted to receive the oil escaping from some of said openings, a discharge tube in said trap for discharging by centrifugal force the oil contained in said trap, and a catcher plate mounted on said crank shaft adjacent to the point of oil consumption and extending for a suitable peripheral length into the tangential plane, in which the oil is discharged from said tube, to receive a predetermined amount of the oil discharged from the tube in accordance with the peripheral extent of the plate, and adapted to lead the oil to the point of consumption, a shield also mounted on said crank shaft adjacent to the point of

oil consumption between said catcher plate and the path of the discharge tube, said shield being angularly operatable in front of said catcher plate to deflect the desired amount of oil otherwise caught by said plate, a throttle for controlling the speed of the engine and operative connection between said throttle and said shield for operating said shield to deflect oil from the catcher plate in accordance with the position of the throttle and means for collecting the oil discharged into the crank case and returning it to said stationary reservoir.

LOUIS E. SHAW.