Jan. 12, 1954 E. W. PATTERSON 2,665,774

PISTON LUBRICATING MEANS

Filed June 27, 1949

Fig 1

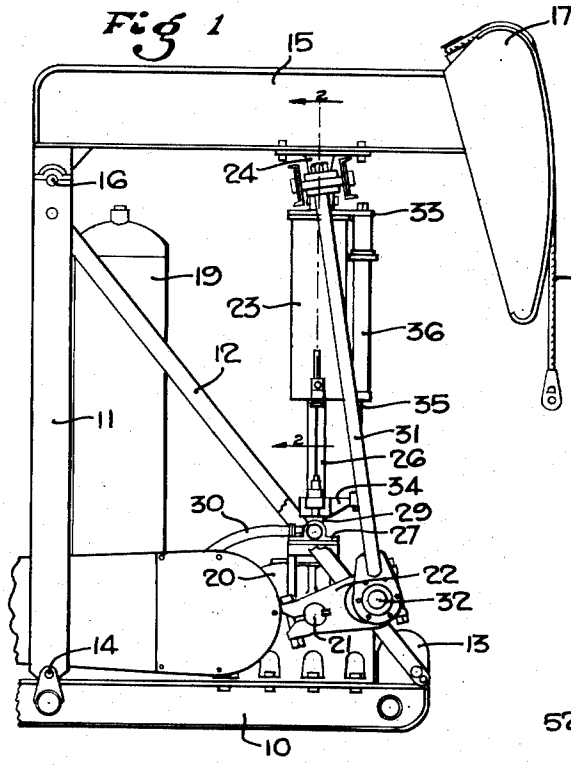


Fig 2

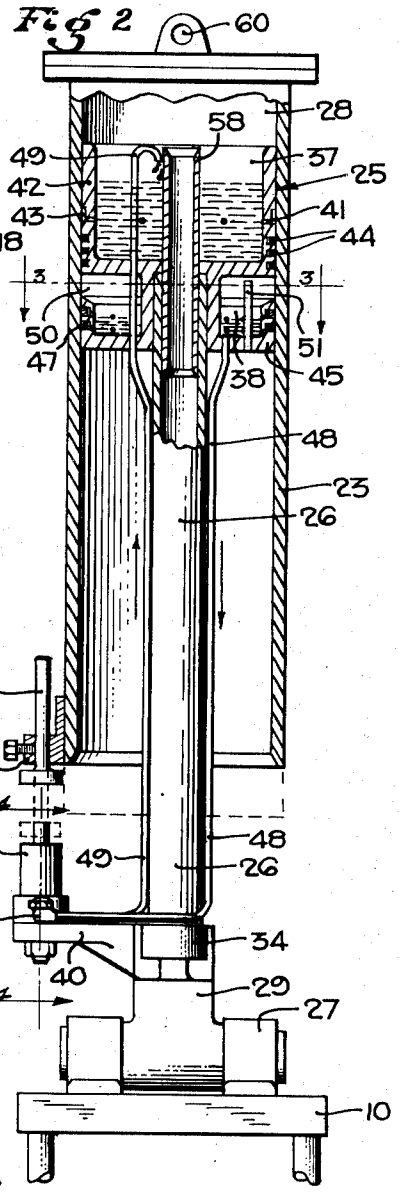


Fig 3

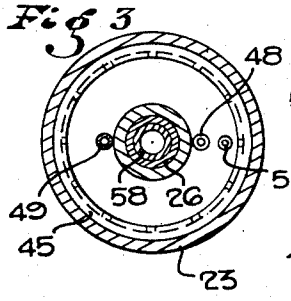


Fig 5

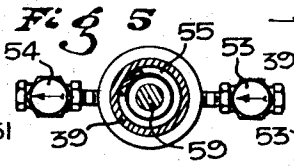


Fig 6

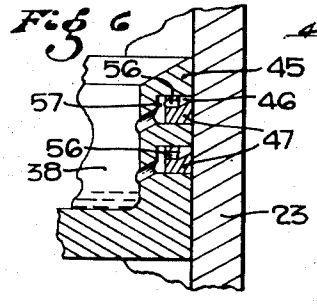
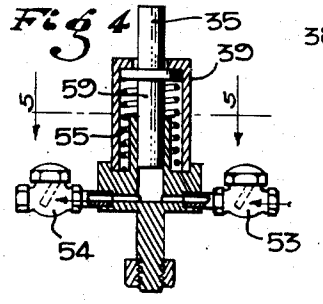


Fig 4



EDGAR W. PATTERSON
INVENTOR.

BY James McAbbett

ATTORNEY.

Patented Jan. 12, 1954 2,665,774

UNITED STATES PATENT OFFICE

2,665,774

PISTON LUBRICATING MEANS

Edgar W. Patterson, Downey, Calif.

Application June 27, 1949, Serial No. 101,619

8 Claims. (Cl. 184—18)

1

This invention relates to pistons within cylinders and means for effectively lubricating and sealing pistons with reference to the cylinder bore, and particularly pertains to piston lubricating means.

This invention is specifically adapted and is of great importance in connection with air-balanced oil well pumping units of the general type as that shown in my recent Patent No. 2,464,710, issued March 15, 1949, and in various other types of air cylinders.

In all arrangements whereby the cylinder is fitted with a partial head or cover at the lower end theerof, there must consequently be a continuous displacement of air both into and out of the lower or atmospheric pressure end of the cylinder. This condition holds true as regards the above mentioned patent and all similar arrangements. The continuous taking in of new air at each stroke of the cylinder will, under certain operating conditions, give trouble and cause unnecessary wear on the piston, rings, and cylinder walls, when the machine is operating in the open oil fields where there is considerable dust and sand present in the atmosphere. As a matter of fact the oil contained in the annulus acts as a trap for dust entering the chamber, and consequently there is a continuous accumulating of dust and foreign matter within the oil supply reservoir at all times. It is therefore the principal object of the present invention to provide a cylinder, piston, and means for lubricating same, wherein there will be no displacement of air below the piston within the cylinder, and to provide an oil reservoir that is not subject to contamination from the atmosphere.

Other objects and advantages of the invention will be apparent from the following description and claims, the novelty consisting of the features of construction, combination of parts, the unique relations of the members and the relative proportioning, disposition, and operation thereof, all more completely outlined herein and particularly pointed out in the appended claims.

The invention is illustrated by way of example in the accompanying drawing in which:

Figure 1 is a view in side elevation, with prime mover broken away, of an air-balanced pumping unit embodying the present invention.

Fig. 2 is an enlarged axial vertical view in elevation taken along the line 2—2 of Fig. 1.

Fig. 3 is a transverse sectional view through the cylinder and piston taken in the plane of line 3—3 of Fig. 2.

Fig. 4 is an enlarged vertical sectional view through the oil pump taken along line 4—4 of Fig. 2.

2

Fig. 5 is a transverse sectional view as seen on the line 5—5 of Fig. 4.

Fig. 6 is an enlarged fragmentary sectional view in detail of one side of the lower part of the piston as shown in Fig. 2, showing more clearly the oil scraper rings.

As seen particularly in Fig. 1, there is provided a pumping unit supported jointly by a generally horizontal base 10, and an identical pair of vertically positioned parallel members 11 disposed at opposite sides thereof. The individual members 11 are joined together by suitable bracing to form what is known as a Samson post, which is maintained in its vertical position by means of a pair of angular struts or braces 12. These braces have their ends secured respectively near the top of the upright members 11 and adjacent to the horizontal base 10, and are affixed at the latter point to a geared "set back" crank mechanism 13. The lower end of the Samson post 11 is in turn attached to the main base 10 by suitable hinge pins 14.

The conventional walking beam 15 is pivotally secured at one end to the top of the Samson post 11 by means of a shaft 16 and carries at its opposite end a horse-head 17 over which the reins 18 attached to a pump rod will operate.

An air receiver or tank 19 is located adjacent the Samson post upon the main base 10. Rotatably journaled in a conventional gear unit 20 is a low speed main drive shaft 21, to each end of which is fixed a crank 22, one at each side of the gear unit. The shaft 21 is suitably connected to a power unit by suitable conventional driving means not shown in detail.

A cylindrical air-balance cylinder 23 is pivotally supported at its top by a universal mounting from a cross-head assembly 24 affixed to the under side of the walking beam 15, the balance cylinder being thus adapted to reciprocate vertically over a stationary piston 25 supported within the cylinder 23 by means of a vertically disposed tubular piston rod member 26, which in turn is pivotally mounted at its lower end in bearings 27 carried upon the base 10. The upper end of the hollow piston rod 26 communicates with the compression space 28 above the piston 25 within the cylinder 23, and the lower end of the hollow piston rod 26 communicates with the air receiver 19 through the pivotal base 29 and the air duct 30.

A pair of vertically swinging pitman rods 31 are pivotally secured to cross-head member 24

at their upper ends, and are attached by a journaled crank pin 32 to the crank arms 22 at their lower ends.

Fixedly secured to the piston tube 26 is a suitable mounting bracket 34 upon which is mounted the piston rod 35 of an air compressor 36, which in turn is attached to the main cylinder head 33 and adapted to reciprocate simultaneously with the main balance cylinder for use as a source of supply for compressed air during normal operation of the pumping unit.

As here illustrated, the main piston 25 is mounted upon the upper end of the hollow piston rod 26, and consists generally of a cylindrical casting, or fabricated member which is divided into an upper reservoir 37 and a lower reservoir 38. The upper reservoir 37 is the oil retaining reservoir which is supplied with oil at regular intervals by means of an oil pump 39 supported upon bracket 40 affixed to piston tube 26. The oil carried in reservoir 37 is adapted to lubricate and seal the piston 25 within the cylder 23 by means of drilled holes 41 through the circumferential walls 42 of the piston 25 leading to an annular groove 43 therearound. The lower reservoir 38 of the piston 25 is adapted to trap any oil that may bypass the upper part, or compression part, of piston 25. The upper part of piston 25 is fitted with suitable piston rings or packing rings 44 for witholding air or oil under pressure above the piston 25. The lower part of the piston 25 is provided with a circumferential side wall 45 having grooves 46 into which are fitted piston rings 47 that are adapted to scrape oil from the cylinder wall 23 and cause such oil to be drained into the lower reservoir 38 from where it will be drained off by means of drain pipe 48 leading to oil pump 39 and thence returned to upper reservoir 37 by way of pressure line 49. There is an annular gap or open space 50 immediately below the upper part of piston 25 and above the lower part thereof. This gap or annulus will permit air under pressure that may bypass the compression ring assembly 44 to expand to atmospheric pressure and escape to the atmosphere by means of vent tube 51 through the lower head of piston 25.

There is a manually adjustable contact member 52 attached to the outer cylinder wall by the bracket 40a for the purpose of predetermining the stroke length of the oil pump 39 as a result of any change being made as regards the pumping stroke of the pumping unit. The oil pump, as illustrated in Fig. 4, is of the simple piston displacement type employing an intake check valve 53, a discharge check valve 54, and a coil spring 55 adapted to return the piston 59 to its uppermost position. It is to be understood, however, that any type pump located at any suitable place about the pumping unit may be effectively employed without departing from the teachings herein.

Fig. 6 shows in detail one method for scraping oil from the wall of the cylinder 23 and causing it to enter reservoir 38 by means of suitable scraper rings 47 and drainage vents 56 communicating with side wall vents 57 leading to reservoir 38.

In order to establish the level of the accumulated lubricant within the upper chamber 37 of the piston 25 a vertically adjustable tube 58 is provided. This telescopes within the main tubular shaft 26 and is held permanently at a desired level.

The cycle of operation of the present piston lubricating and sealing method is predicated upon the assumption that any oil that has been placed in reservoir 37 that may bypass the upper part of piston 25 will be entrapped in the lower reservoir 38, from which it will be directed to a pump 39 and thence returned under pressure to reservoir 37 from where it came without any appreciable escapement of oil externally of the system, or contamination from the atmosphere.

In operation of the present invention it will be understood that the cylinder 23 is held to the cross-head 24 by some suitable pivotal means, such for example as a bolt receiving bore 60 formed in ear means mounted on the closed end of cylinder 23. The cylinder 23 can oscillate as it reciprocates upon the oscillating piston 25. The reservoir 37 of the piston 25 may then be filled to a desired level with lubricating oil, and the limit of this level may be determined by adjusting the tube 58. As the pump operates the piston 25 will reciprocate within the cylinder 23 and at that time lubricating oil will pass out through the ducts 41 and the annular groove 43 to lubricate the cylinder. The piston rings 44 will tend to prevent leakage of lubricating oil. If, however, lubricating oil should move past the piston rings 44 it will flow into the reservoir 38. Attention is directed to the fact that the reservoir 38 is at atmospheric pressure so that the lubricating oil will be free to flow downwardly along the walls of the cylinder. The members 47 in the reservoir 38 will tend to scrape off the excess oil and divert it inwardly through the ducts 56 to the reservoir 38. Any excess of this oil will be drawn through the pipe 48 to the valve 53 of the pump structure, and as the cylinder 23 moves downwardly the member 52 will strike the piston rod head 35 and force oil outwardly through the discharge valve 54 to the pipe 49. The lubricating oil will then flow upwardly in the pipe 49 through the reservoirs 38 and 37 and will be discharged into the reservoir 37, thus completing the cycle.

It will thus be seen that by this means it is possible to automatically replenish the lubricating oil on the piston and cause it to circulate as the pump functions.

While I have shown the preferred form of my invention as now known to me, it will be understood that various changes may be made in combination, construction and arrangement of parts by those skilled in the art, without departing from the spirit of the invention as claimed.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In an air balance for a well pumping unit having a base and a walking beam mounted thereon for vertical movement and from which a sucker rod is suspended in the well, the combination of: a cylinder, one end of which is closed and the other end of which is open, said cylinder having means for pivotally connecting its closed end to said beam, with its other end opening downwardly; a piston slideable in said cylinder and forming a reservoir for oil, there being passage means for oil to flow from said reservoir to the meeting faces of said piston and said cylinder to lubricate said faces; a piston rod united with said piston, said rod extending downwardly out of said cylinder and having means for pivotally mounting said rod on said base; means for admitting air under high pressure to the interior of said cylinder above said piston, oil in said reservoir being subjected to

the pressure of said air; an oil collector carried on said rod below said piston and fitting said cylinder walls closely to scrape from the latter oil escaping downward past said piston when said cylinder reciprocates with respect to said piston and said collector; a pump mounted on a lower portion of said piston rod; an actuator carried by said cylinder and engaging said pump to actuate the same; a suction line connecting said oil collector with the suction side of said pump, and a discharge line leading from the discharge side of said pump and opening into said oil reservoir, whereby actuation of said pump will withdraw oil from said oil collector and discharge the same into said oil reservoir.

2. A combination as in claim 1 in which said oil collector makes a substantially airtight engagement with said cylinder wall; and an air bleeder tube communicating between the space between said piston and said oil collector and the air at atmospheric pressure below said collector.

3. A combination as in claim 1 in which said oil collector comprises a secondary piston providing an oil collecting basin therein and having oil scraping piston rings, said secondary piston being provided with passageways leading from said piston rings to said basin.

4. In an air balance, the combination of a cylinder, one end of which is closed and the other end of which is open; a piston rod; a piston on said piston rod and adapted to slide within said cylinder with the latter in upright position with its open end disposed downwardly, said air balance being adapted to operate with said cylinder and piston thus disposed so as to result in sliding reciprocatory vertical relative movement between said cylinder and said piston; means for admitting air under high pressure to the interior of said cylinder above said piston, said piston forming a reservoir for oil, the latter being subjected to the pressure of said air in said cylinder, there being passage means through which oil may flow from said reservoir to the space between said piston and said cylinder, a certain portion of said oil escaping downwardly from between said piston and said cylinder incidental to said reciprocation and said air pressure; an oil collector carried on said rod below said piston and fitting said cylinder closely to scrape from the latter said escaping oil, said collector providing a basin in which said oil collects; and pump means for returning said escaped oil from said collector basin to said piston reservoir.

5. A combination as in claim 4 in which said collector has a substantially air tight sliding fit with said said cylinder, there being a bleeder passage in said collector communicating between the space between said piston and said collector and the space below said collector.

6. A combination as in claim 4 in which said oil pump is disposed outside said cylinder and is actuated in response to the aforesaid relative vertical movement between said cylinder and said piston.

7. In combination: a cylinder one end of which is closed; a piston rod; a piston on said piston rod closely fitting and slideable reciprocably within said cylinder against a fluid pressure head in said closed end of said cylinder; means in said piston for supplying a lubricant to the space between said piston and said cylinder, certain portions of said lubricant thus supplied leaking past said piston due to the fluid pressure head against which said piston operates; oil recovery means mounted on said piston in spaced relation with the end of said piston from which said lubricant leakage occurs, for recovering from the walls of said cylinder the excess of lubricant leaking past said piston; and means for returning said recovered lubricant to said lubricant supply means in said piston.

8. A combination as in claim 7 in which said lubricant recovery means closely fits said cylinder to scrape said lubricant from said cylinder in recovering the same; and means providing for the escape of fluid from the space between said piston and said lubricant recovery means to maintain a fluid pressure in said space which is not substantially higher than the fluid pressure in said cylinder on the opposite side of said lubricant recovery means from said space.

EDGAR W. PATTERSON.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
414,777	Morison	Nov. 12, 1889
445,110	Graham	Jan. 20, 1891
2,035,450	Barnes	Mar. 31, 1936