E. WOERNER.

LUBRICATING SYSTEM.

APPLICATION FILED MAY 24, 1910.

1,008,401. Patented Nov. 14, 1911.

Fig. 2.

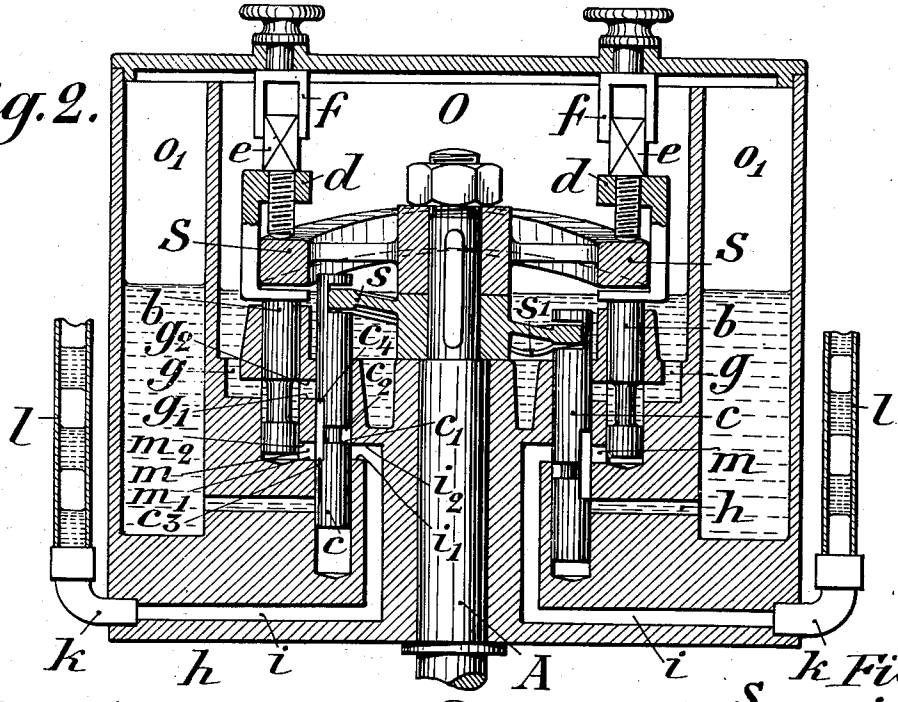

Fig. 3.

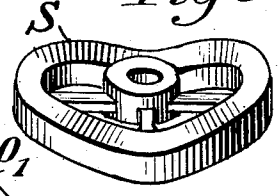

Fig. 4.

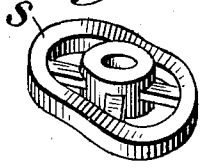

Fig. 1.

WITNESSES

E. M. Leifner

M. L. Owen.

INVENTOR

Eugen Woerner

by Fennie & Goldsborough

atty's

UNITED STATES PATENT OFFICE.

EÜGEN WOERNER, OF CANNSTATT, GERMANY, ASSIGNOR TO THE FIRM OF ROBERT BOSCH, OF STUTTGART, GERMANY.

LUBRICATING SYSTEM.

1,008,401. Specification of Letters Patent. Patented Nov. 14, 1911.

Application filed May 24, 1910. Serial No. 563,061.

To all whom it may concern:

Be it known that I, EÜGEN WOERNER, a subject of the Emperor of Germany, residing at Cannstatt, Germany, have invented certain new and useful Improvements in Lubricating Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to means for making visible the quantities of oil fed from a lubricator, so that the action of the lubricator may be supervised during the operation. To this end, it has been heretofore proposed to feed, alternately, measured quantities of oil and of compressed air into the lubricator conduit, so as to divide up the thread of oil flowing toward the place of lubrication into short sections, whose travel in the lubricator conduit can be observed by means of a sight tube interposed in the conduit for that purpose. This expedient has the disadvantage that only every second stroke of the oil pump can be made available for the feed, and that the air, arriving under pressure at the place to be lubricated, clears it of oil; so that this method is doubly expensive. Moreover, the scope of use for this method is very restricted, for the reason that on the occurrence of high pressures in the lubricator conduit, the air pumped in is compressed to such an extent that it fails to form sharp dividing partitions between the successive oil subdivisions, so that viewed through the sight tube they seem to constitute an uninterrupted oil thread.

The present invention consists in using, instead of air bubbles, lubricating oil or some other suitable fluid, which is so chosen, however, that the quantities of oil fed by successive piston strokes of the pump manifest themselves differently, in an optical sense. In this manner, we produce, as with an ordinary oil pump, a continuous oil thread, but one whose progress through the lubricator pipe is nevertheless perceptible to the eye.

The device hereinafter described for carrying the invention into effect includes an oil pumping device wherein a series of pressure pumps are arranged concentrically about an operating shaft preferably in the interior of a cylindrical oil receptacle. In addition to the oil receptacle containing the pumps, another oil receptacle is provided, containing for instance, oil of a different or contrasting color. A lubricating pipe or conduit is connected to each pump and the actuating mechanism is so chosen that the pump takes oil alternately from the two oil receptacles and feeds successively to the lubricating pipe, the quantities of contrasting color thus taken. Accordingly each pump is provided with a distributing slide valve positively driven from the pump-actuating shaft, and the number of strokes of the distributing slide valves is made half as great as that of the pump pistons. For successive strokes of the pump pistons the distributing slide valves find themselves in different positions, and this makes it feasible, by suitably disposed ports and passages, to establish the desired connections between the two oil receptacles of the pumps and the lubricator pipes; *i. e.* during each two successive suction strokes the pumps are to connect alternately with the one and with the other of the two oil receptacles, and during the two pressure strokes the pumps are to connect with the lubricating pipes.

In the drawings, Figure 1 represents a top plan view of the apparatus; Fig. 2 represents a vertical section and partial elevation on a plane indicated by the line 2—2 of Fig. 1. Fig. 3 is a perspective view of cam S. Fig. 4 is a perspective view of cam *s*.

Similar letters of reference indicate similar parts in the several views.

Upon the driving shaft A is splined a cam disk S whose rim is so formed that, measured in the direction of the axis, it passes through two highest and two lowest points, of which the former lie at the terminals of one diameter and the latter at the terminals of a second diameter at right angles to the first. The pump pistons *b*, constituting plunger pistons, play within bored out recesses in the bottom of the oil receptacle. Their upper ends are provided with stirrups *d*, which overlie the rim of the cam S. In the projecting screw threaded overhangs of the stirrups are set screws *e*, whose heads enter stirrups *f*, so that the feed action of the working pistons *b* can be adjusted, and by turning the thumb knobs which project outside the oil cylinder there-

by turning the stirrups f, to accord with the particular requirements of use, even during the working of the oil pump.

Below the disk S, a second disk s is splined upon the driving shaft A, whose rim constitutes an oblique section of a cylinder, and is overhung similarly to S by the upper ends of distributing slide valves c. Therefore, with each revolution of the driving shaft, each of the pump pistons makes two strokes and each of the distributing slide valves c one stroke. The oil receptacle O is surrounded by a second annular oil receptacle O_1. The oil receptacle O is connected with the pump by means of the passages g, and the oil receptacle O_1, by means of the passages h, when the distributing slide valves c are in the corresponding position, through the ports of the said slide valves. Passages i lead to the lubricating pipes k, which are provided with glass sight tubes l.

In the position illustrated, the plane of the paper passes through the two lowermost points of the rim of the disk S, so that the pump pistons are at the beginning of the suction stroke. The disk s is so adjusted that the diametrical plane intersecting the lowermost and the highest point of its rim is inclined 45° to the plane of the paper. The lowermost point of the rim of s appears, therefore, in the drawings, at s', and the highest point falls in front of the plane of the paper, and is, therefore, not shown.

In the position shown, the lower edge c^1, of the recess in the slide valve appearing at the left in Fig. 1 is in line with the upper edge i_2 of the passage i leading to the lubricator pipe. Furthermore, the lower edge c_3 of a port in the slide valve is in line with the lower edge m_1 of a passage m connecting the valve casing with the pump cylinder; and, finally, the upper edge c^4, of the port of the slide valve is in line with the lower edge g_1 of the passage g. In this position, however, the slide valve cuts the pump off from both oil receptacles O and O_1, as well as from the outlet passage i. Where the passage g intersects the pump cylinder, the piston b is turned down to a lesser diameter. This manner of completing the passage g is shown in the drawing merely for the sake of clearness of illustration. The passage g could be carried around the pump, with the same effect.

If the driving shaft is rotated in the direction of the hands of a watch, the two pistons b shown begin their suction stroke. Simultaneously, the slide valve c, shown at the left, continues its upward movement already begun and connects the passages g and m by means of the port in the slide valve. The oil can, therefore, following the suction of the piston, enter below the piston, from the receptacle O. After the driving shaft has rotated 45°, the upper edge c_4 of the slide valve port and the upper edge g_2 of the passage g register and at that time the slide valve itself has reached its highest position. If the rotation of the driving shaft is continued, the slide valve begins to descend, whereas the piston still moves upwardly, until the shaft has rotated 90°. The piston then attains its highest position and all the ports are momentarily closed. At the beginning of the now following pressure stroke, the slide valve continues its downward movement, and, as soon as the lower edge c_1 has passed the upper edge i_2 the space below the piston is in communication with the outlet passage i and the sucked-in oil is delivered thereinto. While the shaft is rotating 90° farther, and while accordingly the piston is completing its first pressure stroke, the slide valve moves continuously downward without altering the connections then established. At the instant in which the piston completes its first pressure stroke, the left hand slide valve attains the position of the slide valve shown at the right hand side of Fig. 1. For an instant, all ports are then again closed. Now follows the second suction stroke of the piston. During the first 45° of the rotation of the shaft, the slide valve continues its downward movement and begins its upward movement, so that, after completion of the second suction stroke it again takes the position in which the right hand slide valve is illustrated. During this time period, the space beneath the piston is connected with the port h and the piston sucks oil from the receptacle O_1. During the following second pressure stroke, the slide valve again moves continuously upward, and the edges c_1 and c_2 successively pass the edges i_1 and i_2 of the passage i, so that the oil sucked in is delivered into the said oil outlet passage i. All of the parts have now returned to their original position and the same operation begins anew.

As coloring media, all substances are suitable which permit the oil taken from the one receptacle to appear differently to the eye than that taken from the other receptacle, and which do not prejudice the lubricating function of the oil, nor exert an injurious effect upon the machine parts with which the oil comes in contact. For instance, in one of the receptacles we could mix a little ground or crushed graphite with the oil. It suffices, however, to supply one of the receptacles with oil which is by nature or origin of somewhat darker color than that of the other receptacle. Even water may be used in one of the receptacles, under certain circumstances.

What I claim is:

1. An arrangement for making visible the quantities of oil fed in a lubricating system, comprising a plurality of reservoirs of optically contrasted oil, in combination with a

sight-tube through which quantities of oil are fed from one reservoir in successive alternation with quantities of oil from another reservoir, whereby the oil passes through the sight-tube in the form of successive optically contrasted liquid sections.

2. In a lubricating system, a feed pump, a plurality of reservoirs for the lubricant, a feed pipe connected to the delivery orifice of the pump and containing a sight tube, conduits connecting the suction side of the pump to the different reservoirs, and a valve controlling the conduits to put the pump into communication with the different reservoirs in succession, whereby when the reservoirs are supplied with optically contrasted liquids there will be fed through the sight tube a lubricant made up of individual optically contrasted sections.

3. In a lubricating system, a plurality of feed pumps, a corresponding number of feed pipes containing sight tubes and connected to the delivery orifices of the several pumps, a plurality of reservoirs for the lubricant, conduits connecting at least two of the reservoirs to the suction side of each pump, and valves controlling the conduits to put the pumps into communication with their associated reservoirs in succession, whereby when the reservoirs connected to each pump are supplied with optically contrasted liquids there will be fed through the sight tube a lubricant made up of individual optically contrasted sections.

4. In a lubricating system, a feed pump, two reservoirs for the lubricant, a feed pipe connected to the delivery orifice of the pump and containing a sight tube, conduits connecting the suction side of the pump to the two reservoirs, a slide valve controlling the conduits to put them alternately into communication with the pump, and mechanism for so driving the pump and slide valve that for every stroke of the slide valve there are two strokes of the pump, whereby, when the reservoirs are supplied with optically contrasted liquids there will be fed through the sight tube a lubricant made up of optically contrasted sections.

In testimony whereof I affix my signature, in presence of two witnesses.

EUGEN WOERNER.

Witnesses:
MAX ANSCHUTZ,
REINHOLD ELWERT.