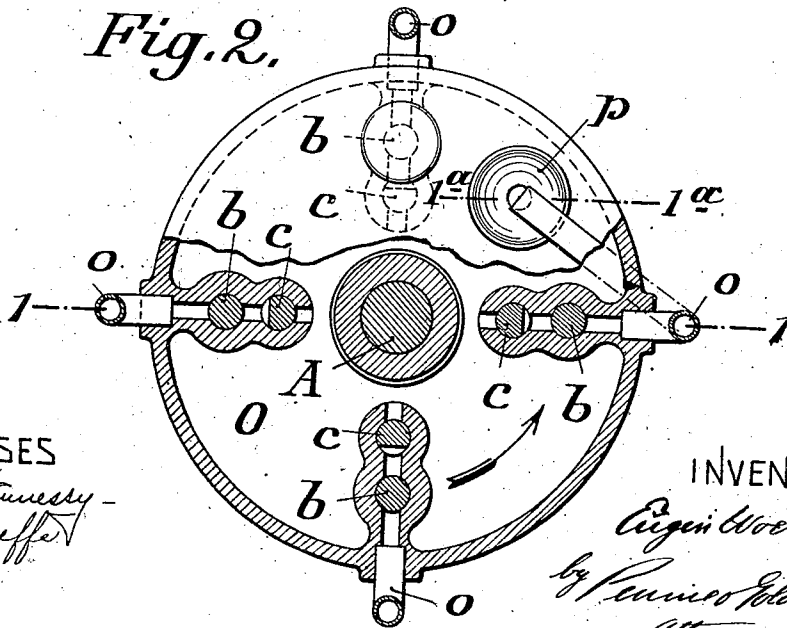
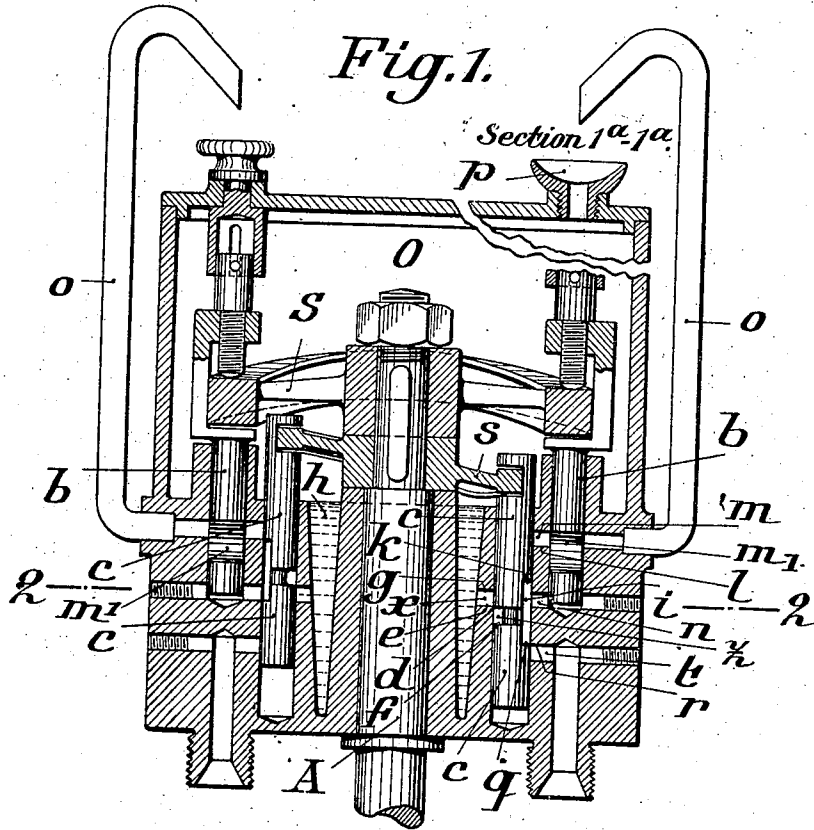


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LUBRICATING SYSTEM.  
APPLICATION FILED AUG. 30, 1910.

1,062,377.

Patented May 20, 1913.

2 SHEETS—SHEET 1.



WITNESSES  
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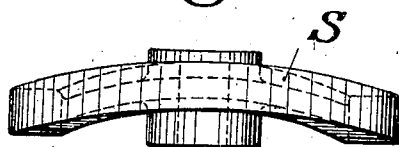
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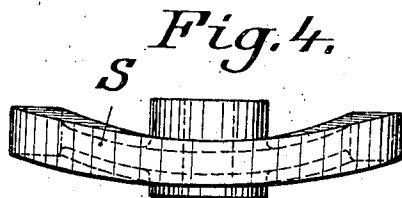
Patented May 20, 1913.

2 SHEETS—SHEET 2.

*Fig. 3.*



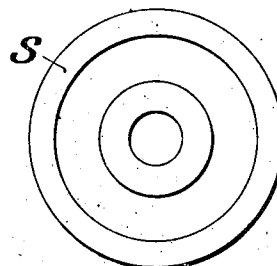
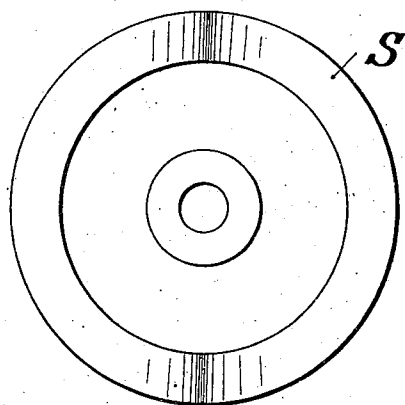
*Fig. 4.*



*Fig. 6.*



*Fig. 5.*



*Fig. 7.*

WITNESSES

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# UNITED STATES PATENT OFFICE.

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

## LUBRICATING SYSTEM.

1,062,377.

Specification of Letters Patent.

Patented May 20, 1913.

Application filed August 30, 1910. Serial No. 579,662.

*To all whom it may concern:*

Be it known that I, EUGEN WOERNER, a subject of the Emperor of Germany, residing at No. 7 Burgstrasse, 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 invention relates to the distribution of lubricating material for steam engines, explosion motors, and the like, wherein a measured quantity of oil is taken from a holder at each stroke of a pressure pump and is delivered to the pipe conduits, which latter have the function of conducting the oil to the machine parts to be lubricated.

The purpose of the invention is to diminish the number of pumps necessary for feeding a given number of lubricating conduits.

The invention consists in connecting each pump with a plurality of separate lubricating conduits, and distributing the individual quantities of oil fed from the pump by successive strokes thereof to the plurality of lubricating conduits in rotation; *i. e.*, if, for instance, there are  $x$   $n$  lubricating places to be supplied, the method of my invention permits this to be effected with but  $x$  pumps, each pump supplying successively  $n$  lubricating conduits.

The method can also be used for making visible the quantities of lubricant fed, so that the working of the pump during the operation can be observed and suitably adjusted. To this end one of the plurality of conduits to which each pump is connected, and which successively receive like quantities of oil, is made accessible to supervision by the introduction of a sight aperture or a free dropping interval. If the conduit so selected to make visible the quantities of oil fed, is to serve exclusively for that purpose, it can be led back into the oil receptacle. The required oil in this conduit can be used, however, directly, by conveying it after it has given its drop indication, to a lubricating place for whose lubrication the oil does not require to be conveyed under pressure.

The exemplification now to be described of a device whereby the method in question can be practised, is based upon a distributor for lubricating material, wherein a plurality of oil pumps are arranged concentrically about a driving shaft and are driven by a cam wheel splined upon the shaft, the rim of the cam-wheel being engaged by the piston rods of the oil pumps after the manner of a crank-slide. A second cam-wheel mounted upon the same shaft drives a distributing valve for each oil pump.

The problem of supplying like quantities of oil in succession to different tubes can be solved by the use of an oil pump positively actuated in such manner, in accordance with the invention, as to cause the piston of the oil pump to be reciprocated  $n$  times in the same time in which the distributing valves perform a complete stroke, if  $n$  tubes are connected to each pump. In this way, the distributing valve for each successive stroke of the piston, during a cycle of operation, will find itself in a different position, and it is thus possible, by corresponding apertures and grooves in the valve, to produce for the  $n$  strokes of the pump piston the desired connections, *i. e.*, during the suction stroke to connect the pump with the oil receptacle and during the force stroke to connect the pump successively with the  $n$  lubricating conduits.

In the particular exemplification shown in the drawing two conduits are provided for each pump. One of the conduits serves as a lubricating conduit and the other for the purpose of making the oil feed visible. In the arrangement shown this latter conduit leads back into the oil receptacle with the interposition of a free dropping interval.

In the drawing, Figure 1 represents a vertical section on the line 1—7 of Fig. 2; Fig. 2 represents a horizontal section on line 2—2 of Fig. 1; Figs. 3 to 5 are various views of the cam wheel which serves for driving the pump pistons; and Figs. 6 and 7 are corresponding views of the cam-wheel which drives the distributing valves.

The rim of the cam wheel *S* which drives the pump pistons *b b* is shaped in such manner that, measured in the direction of

the driving shaft, it passes through (corresponding to the two desired strokes of the piston) two highest and two lowermost points, of which the two former lie at the ends of a diameter and the two latter at the ends of a second diameter at right angles to the first. The rim of the cam-wheel *s* driving the valves *c c* receives, on the other hand, the form of an inclined plane section of a cylinder. Both the disks *S s* are splined fast upon the driving shaft *A*. The oil vessel *O* surrounds the entire pump device and discharges at its lower end into an annular well *h* surrounding the driving shaft *A*, from which well the oil passes out through apertures *x* to the distributing valves *c*. The parts are shown in the position which they assume when the suction stroke of the piston *b* begins.

The shaft *A* revolving clock-wise, the piston *b* moves upwardly and the distributing valve *c*, at the beginning of the upward movement of the piston *b* stands so as to close the suction opening *x* while the surface *d* of the valve lies in register with the surface *e* of the suction opening. As soon as the piston *b*, in consequence of the revolution of the shaft *A*, is moved upwardly, the distributing valve *c* is likewise moved upwardly, and the surface *d* clears the suction channel; so that the oil can enter, through the annular channel *z* of the valve *c*, below the piston *b*. This suction of the oil by the piston *b* lasts until the surface *f* of the valve *c* registers with the surface *g* of the suction channel *x*, so that the oil well *h* is cut off from the space below piston *b*. The valve *c* is provided with a groove *i*, which is so chosen that the upper edge *k* registers with the lower edge *l* of the channel *m* when the valve *c* has just cut off the suction opening *x*. The further revolution of the shaft *A* has the effect that, in consequence of the construction described of the cam-wheels *S s*, the piston *b* now moves downwardly while the valve *c* continues its upward movement and begins its downward movement only after it has passed by the channel *m*. During this part of the upward and downward movement of the valve *c*, the under side of the piston *b* is in connection with the channel *m* through the channel *n* and the recess *i* of the valve *c*. The channel *m* is connected to an oil pipe *o* which leads to that portion of the lubricator distributor where the oil is to be made visible. The oil forced in this manner during the force stroke of the piston *b* into the tube *o* drops into the funnel *p* and flows back into the oil receptacle *h*. As the shaft *A* rotates farther, the piston *b* again begins its upward movement (suction stroke) while the valve *c* is again moved downwardly.

The valve *c* had, at the termination of the force stroke, cut off, by the shoulder *k* the channel *m*, and the surface *f* of the valve registered with the surface *g* of the channel *x*. During its further downward movement it uncovers the channel *x* and the oil may enter through this channel and the annular channel *z* of the valve beneath the working piston *b*, and until the surface *d* of the valve registers with the surface *e* of the channel *x*. At this moment the working piston *b* has completed its suction stroke and begins its downward movement. Now the surface *g* of the lateral recess *i* of the valve *c* registers with the surface *r* of the channel *t* which leads to the lubricating place, so that with the further turning of the shaft *A*, and the accompanying downward movement of the valve *c*, the channel *t* is uncovered and is connected with the channel *n* and the lower side of the piston *b*. The quantity of oil beneath the piston *b* is therefore forced on to the lubricating place. At the termination of this second force stroke of the piston *b* all of the parts of the lubricating pump again assume the position originally described and a new cycle of operation begins.

The recess *m* through which the duct *m* is led has no fundamental signification for the operation of the pump but can be wholly dispensed with if the channel *m* is led around about the piston *b* or is so arranged that it stands in no connection with the piston.

What I claim is:

1. In a lubricating system, a feed pump for the lubricant having a plunger, a plurality of conduits leading from said pump, a reciprocating valve for distributing the oil fed from said pump to the said conduits in succession, driving mechanism for reciprocating said plunger, and driving mechanism for reciprocating said valve, the said driving mechanisms being so timed that for each reciprocation of the valve the pump plunger is reciprocated a number of times equal to the number of conduits, whereby the individual quantities of oil fed from the pump by successive strokes thereof are delivered to the said conduits in rotation, substantially as described.

2. In a lubricating system, an oil receptacle, a plurality of oil pumps arranged concentrically with respect to the receptacle and having suction passages communicating therewith, a plunger for each pump, a plurality of conduits leading from each pump, a reciprocating valve for each pump for distributing the oil fed therefrom to its conduits in succession, said valves being likewise arranged concentrically with respect to said receptacle, a cam-wheel *S* for recip-

rocating said plungers, and a cam-wheel 8  
for reciprocating the valves, the said cam-  
wheels being so shaped that for each recip-  
rocation of a valve its pump plunger is re-  
ciprocated a number of times equal to the  
number of its conduits, substantially as de-  
scribed.

In testimony whereof I affix my signa-  
ture, in presence of two witnesses.

EUGEN WOERNER.

Witnesses:

MAX ANSCHUTZ,  
RICHARD KRUTINA.