

(No Model.)

J. I. THORNYCROFT.
LUBRICATOR.

3 Sheets—Sheet 1.

No. 554,801.

Patented Feb. 18, 1896.

Fig. 1.

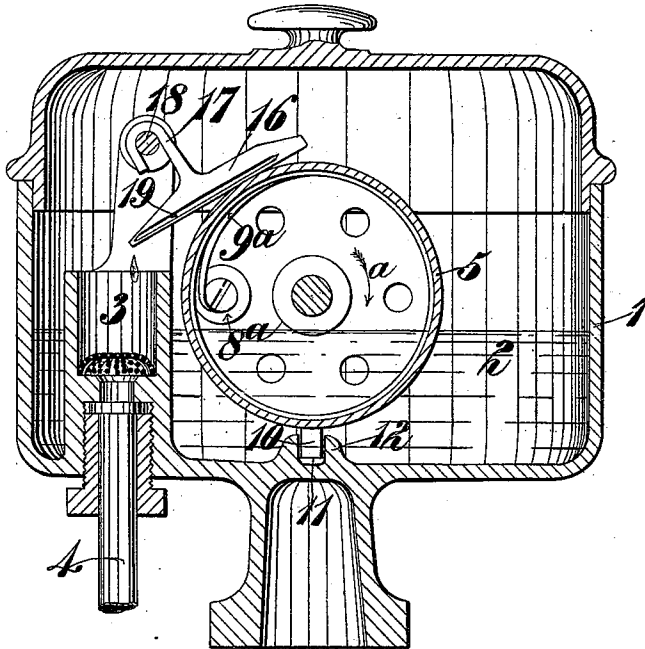
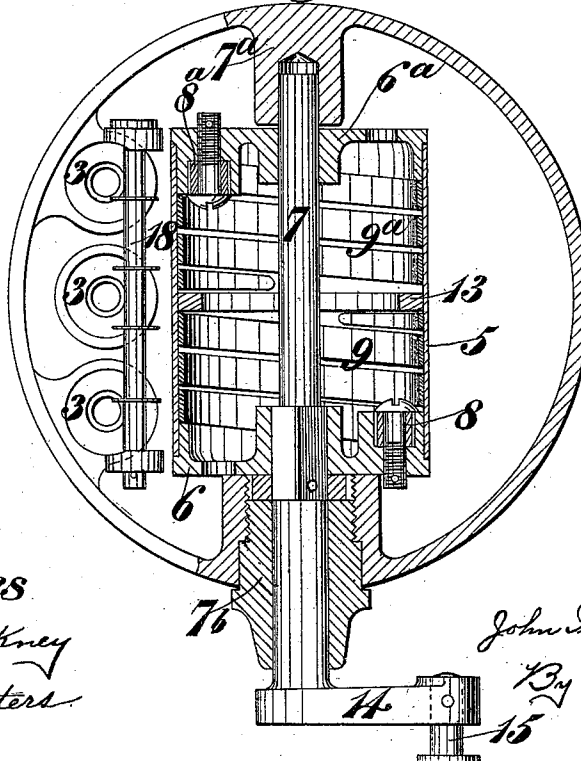


Fig. 2.



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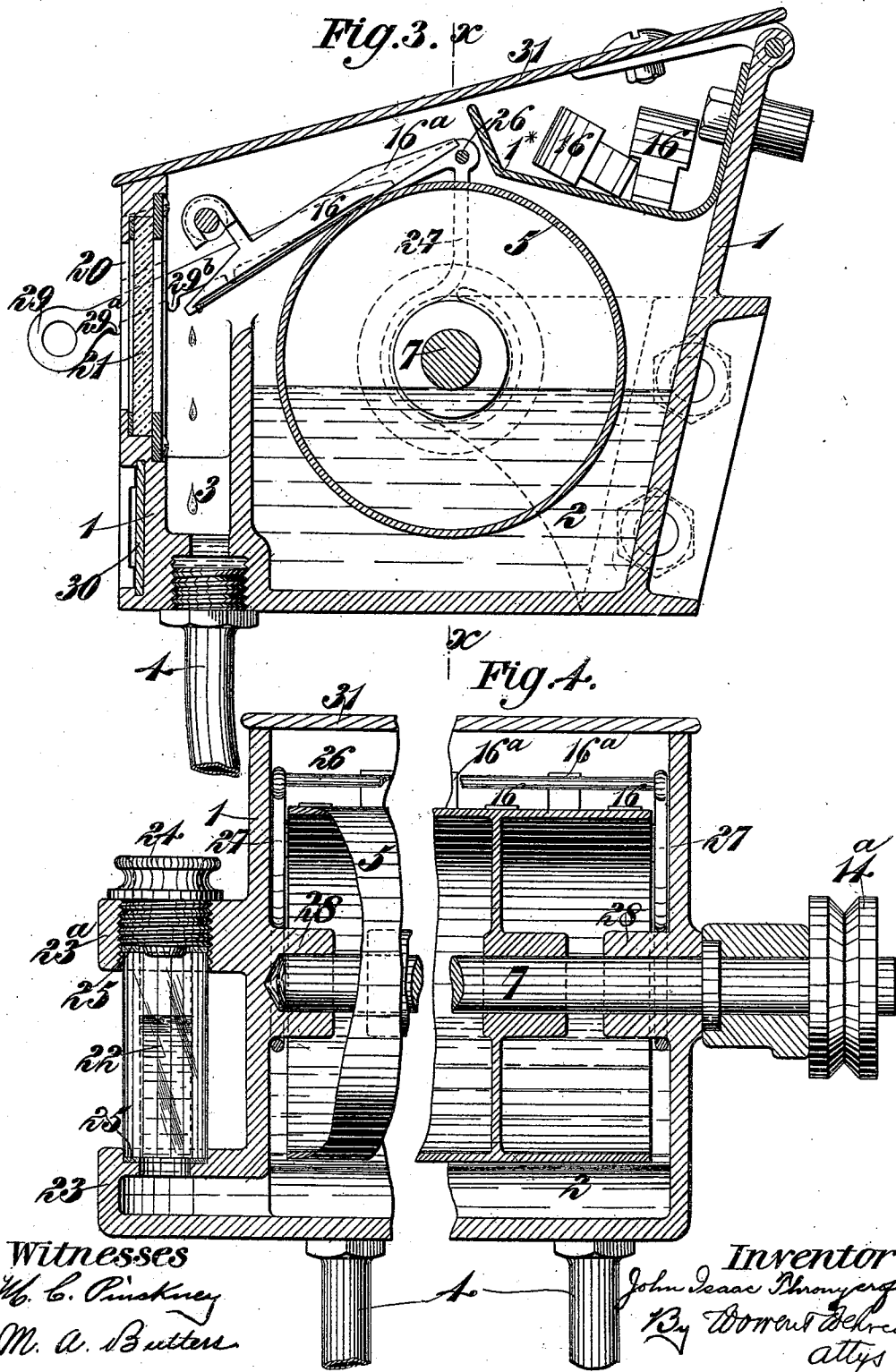
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J. I. THORNYCROFT.
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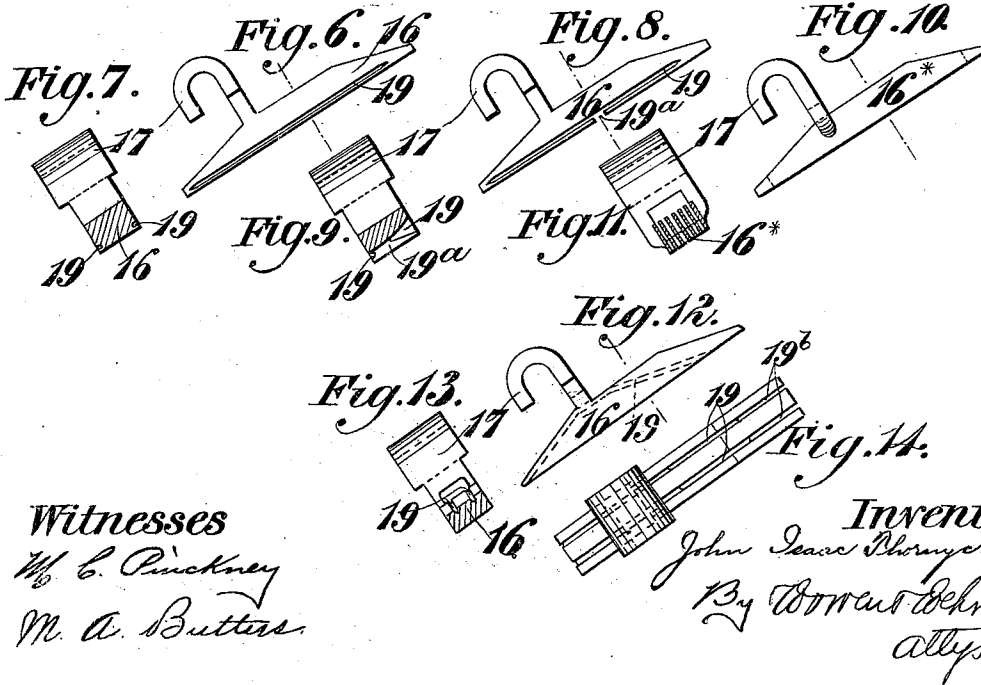
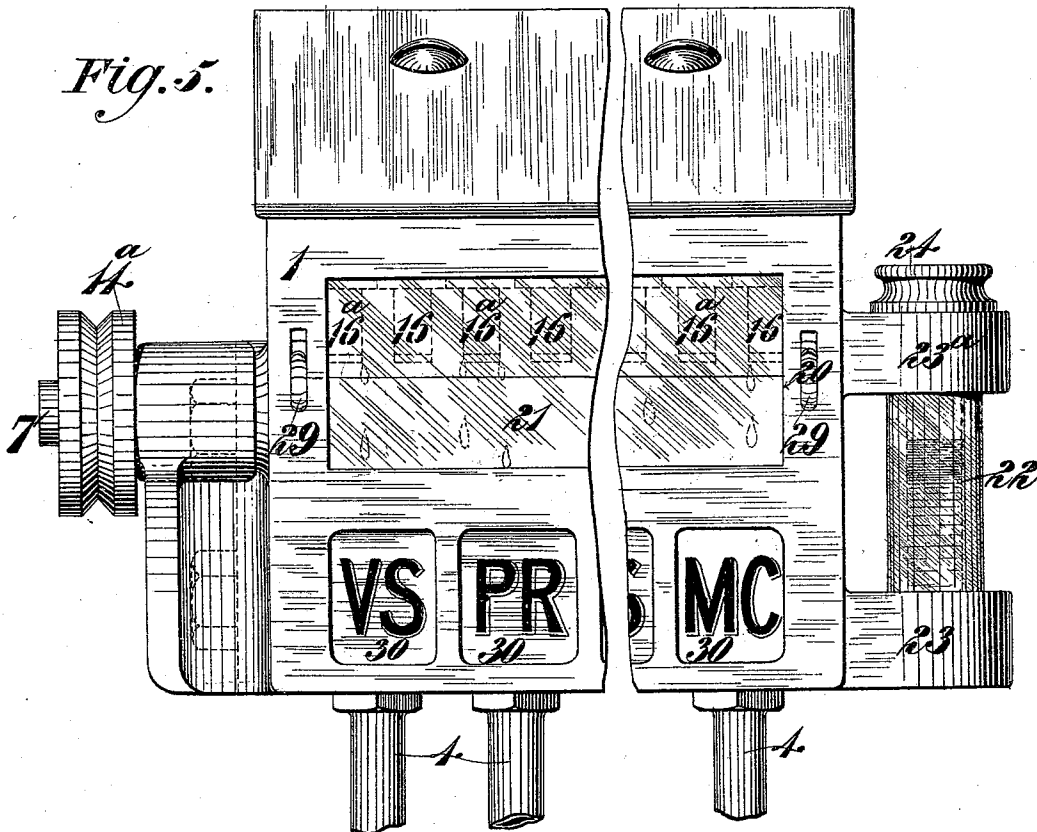
3 Sheets—Sheet 3.

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Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN ISAAC THORNYCROFT, OF LONDON, ENGLAND.

LUBRICATOR.

SPECIFICATION forming part of Letters Patent No. 554,801, dated February 18, 1896.

Application filed June 13, 1893. Serial No. 477,439. (No model.) Patented in England November 25, 1892, No. 21,532; in France May 24, 1893, No. 230,295, and in Germany May 27, 1893, No. 77,755.

To all whom it may concern:

Be it known that I, JOHN ISAAC THORNYCROFT, a subject of the Queen of Great Britain and Ireland, residing at Chiswick, London, in the county of Middlesex, England, have invented Improvements in Oil-Feeders or Apparatus for Supplying Lubricant to Steam-Engines and other Machines, (for which I have obtained Letters Patent in Great Britain, dated November 25, 1892, No. 21,532; in France, dated May 24, 1893, No. 230,295, and in Germany, dated May 27, 1893, No. 77,755,) of which the following is a specification.

The object of this invention of improvements in oil-feeders or apparatus for feeding lubricant to steam-engines and other machines is to produce an efficient oil-feeder adapted for lubricating working parts of marine and other steam-engines and other machines, and which will stop and start with the engine or machine to which it is applied, will vary its rate of feed with that of such engine or machine when a change in velocity occurs, and which shall be simple in construction and operation.

In an apparatus for this purpose, according to my invention, oil contained in a vessel is lifted by a moving surface to a point above the oil-delivery outlet. From this point it flows into a small groove or grooves in an inclined piece (hereinafter called for distinction an "oil-conveyer") extending over the oil-delivery outlet. Into such a groove oil will flow so long as the surface of the oil in the groove is concave, even against the force of gravity, because the surface-tension of the liquid in this case reduces the pressure in the groove or grooves and, with such an arrangement as indicated, the groove or grooves being so inclined as to deliver the oil over the oil-delivery outlet, it will be evident that by adjusting the size and number of grooves used any particular rate of feed can be assured because the grooves can be cleaned without danger of changing their capacity to convey oil; but although the maximum amount of oil that can be fed is naturally determined by the size and number of grooves employed it will be evident that the rate at which the lifting-surface moves may be so ad-

justed as to reduce the flow by only bringing up the oil at a rate less than that necessary to fill the groove or grooves, and in this way a feeder may be made to vary the supply given with the speed of the engine or machine and to stop at once with the motion of the engine or machine. I prefer to use a cylinder, partly immersed in the oil to be fed, as the moving surface. On this a number of grooved oil-feeders may partly rest and serve for as many separate feeders for different parts of an engine or machine, as I will now proceed to explain by reference to the accompanying drawings, in which—

Figure 1 is a vertical section, and Fig. 2 a sectional plan, of one construction of oil-feeding apparatus according to this invention. Figs. 3, 4, and 5 are respectively a cross-section, a longitudinal section, partly in elevation, and a front view, illustrating a modified construction of such apparatus. Figs. 6 to 14, inclusive, are detail views illustrating modified forms of oil-conveyers.

Referring to Figs. 1 and 2, 1 is a casing of circular form in plan, and the interior of which serves as a receptacle 2 for the oil to be fed. This casing is formed internally with a number of tubular extensions 3, that serve as oil-delivery outlets into which oil is fed by the oil-conveyers, as hereinafter described, and to the lower end of each of which is secured a pipe 4 for conveying the oil to the place where it is to be used.

5 is a cylinder mounted to rotate partly within the oil in the receptacle 2 so as to raise oil therefrom upon its cylindrical surface to a point above the top of the outlets 3. This cylinder may be driven in various ways. In the example now being described it is loosely mounted at its ends upon two disks 6 and 6^a, carried by a driving-shaft 7, supported in bearings 7^a 7^b in the casing 1. The disk 6 is fixed to the said shaft so as to rotate therewith, and to it is fixed at 8 one end of a coiled metal strip or spring 9, adapted to fit the interior of the cylinder. The other disk 6^a is loosely mounted upon the shaft 7, and is prevented from rotating therewith by a projection 10, that is carried by the said disk and enters a recess 11 in a fixed part 12 of the cas-

ing. This disk 6^a has also fixed to it at 8^a a coiled metal strip or spring arranged to fit the interior of the said cylinder.

13 is a ring or annular flange fixed to the interior of the cylinder between the inner ends of the two coiled strips 9 9^a. The outer end of the driving-shaft 7 is provided with an arm 14 with pin 15, by means of which a rocking motion can be imparted to the shaft by means of an eccentric and rod. (Not shown.) By this arrangement, when the driving-shaft is rocked in the direction of the arrow *a*, the coiled metal strip 9 will be caused to expand and grip the interior of the cylinder 5 so as to partly rotate the cylinder, which then slides in contact with the coiled strip 9^a in a direction to contract such strip. When the shaft is rocked in the opposite direction, the coiled strip 9 will be slightly contracted so as to release the cylinder, which will then be prevented from rotating backward with the disk 6 and shaft by the coiled strip 9^a, which will expand and tightly fit the interior of the cylinder when the cylinder tends to move backward with the disk 6. Thus an intermittent rotary movement will be imparted to the cylinder.

16 is an oil-conveyer formed with a hook 17, by which it can be partly supported by a rod 18, so as to rest in an inclined position upon the outer surface of the cylinder 5, as shown in Fig. 1. In the arrangement of apparatus now being described there would be three such oil-conveyers, one for each oil-delivery outlet 3. Each oil-conveyer, which may consist of a short metal bar, is according to this invention formed at one or at each of its flat sides with an oil-groove 19, that extends lengthwise of the conveyer and is in proximity to the surface of the cylinder, so that when the conveyer is in the position shown in Fig. 1 and the cylinder 5 is rotated in the direction of the arrow *a*—that is to say, in a direction toward the upper end of the oil-conveyer—oil will pass from the part of the surface of the cylinder upon which the conveyer rests to the groove or grooves, even against the force of gravity, so long as the surface of the oil in the groove is concave, as seen in cross-section, because the surface-tension of the liquid in this case reduces the pressure in the groove or grooves, as hereinbefore stated and as will be readily understood. The groove or grooves being downwardly inclined, the oil entering it or them will flow to the lower end of the conveyer in an opposite direction to that in which it is lifted by the cylinder and drop into the oil-delivery outlet 3 below, whence it will pass by the corresponding pipe 4 to the part to be lubricated. By the construction and arrangement described the required rate of feed of oil can be obtained in a very accurate manner.

Oil-conveyers adapted to operate as de-

scribed may have the oil groove or grooves formed and arranged in various ways.

In the example shown in side elevation in Fig. 6 and in cross-section in Fig. 7 the oil-conveyer is formed with two small separate and similar oil-grooves 19, one at each side of the piece of metal of which the conveyer is made.

In the example shown in Figs. 8 and 9 the oil-groove at one side is made wider and deeper than the one at the other side, with which it may be connected, as shown, by a transverse groove 19^a.

In the example shown in Figs. 10 and 11 the oil-conveyer consists of a number of thin plates 16^x secured together at the ends and arranged a short distance apart so as to form a number of oil-channels 19 open at the top. The grooves instead of being formed at the sides or on the top of the oil-conveyer may be formed at the under side thereof; but I do not consider this so advantageous a position as the others as the flow of oil is liable to be interfered with by air-bubbles that might enter the grooves, and which in such a construction could not readily escape; also, the oil-conveyer instead of being made in one piece of metal or other non-absorbent material or of a number of thin plates arranged side by side might be otherwise constructed. Thus it may consist of two or more wires arranged sidewise in relation to each other and either in contact or at a short distance apart.

In the example shown in Figs. 12, 13, and 14, which are respectively a side elevation, a cross-section, and a plan, the oil-grooves are formed upon the upper side of the metal bar forming the oil-conveyer, which is slotted at its upper end, as shown at 19^b, to permit the oil to pass to the said grooves from the surface of the cylinder 5 on which it rests, and which revolves in a direction away from the said grooves. The quantity of oil fed in a given time, by the means described, will vary with the speed of the cylinder 5 and the cross-sectional area of the groove or grooves 19 in the oil-conveyer 16, the quantity increasing with an increase of speed of the cylinder and with an increase in cross-sectional area of the groove or grooves. By providing a number of oil-conveyers with grooves of different cross-sectional areas, any one or more of which can be used at will, different rates of delivery of oil can be provided for without changing the speed of the cylinder 5.

In the modified construction of oil-feeding apparatus shown in Figs. 3, 4, and 5 the casing 1 is provided at its front side with an opening 20, fitted with a plate of glass 21, through which the rate at which oil is fed by the oil-conveyers to the oil-delivery outlets 3 can be readily observed. The cylinder 5 is shown in this example as fixed upon its shaft 7, to the outer end of which is fixed a pulley 14^a, by which it and the cylinder 5 can be

driven in a continuous manner, if desired, and at any required rate of speed, from a suitable moving part of the engine or machine to which the oil-feeding apparatus is applied.

22 is a glass tube, which serves as a gage-glass to indicate the height of the oil in the said receptacle. This tube is carried by two extensions 23 23^a, the lower of which is in communication with the interior of the casing and the upper of which is fitted with a screw 24, that serves to hold the glass tube 22 in place and has an air-hole extending through it. Washers 25, of suitable material, such as leather or asbestos, may be inserted between the ends of the glass tube and the parts between which they are held in order to obtain a tight joint and prevent fracture of the glass tube.

1^x is a holder for spare-oil conveyers.

Two or more oil-conveyers 16 of the kind described may be employed to feed oil to each delivery-outlet 3, these conveyers being so constructed and operated that one or more of them can be placed in or out of action according to the rate at which it is desired to feed oil to the part to be lubricated. In the example shown in Figs. 3, 4 and 5 there are two oil-conveyers 16 16^a to each oil-delivery outlet 3. To enable one, 16^a, of each pair to be placed out of action, it is made longer than the other, 16, and below the upper projecting ends of the longer ones is arranged a movable wire rod 26, carried by wire supports 27, that are capable of turning about the fixed bosses 28 within the casing 1, and one of which has connected to it a handle 29, that passes through a slot in the front side of the casing.

As will be seen the arrangement is such that by moving the wire rod 26 forward by the handle 29 it will raise the longer oil-conveyers 16^a out of contact with the cylinder and so place them out of action, and by moving the wire rod back again the said oil-conveyers will be permitted to fall back onto the cylinder in position for use. The handle 29 may be provided with projections 29^a 29^b, adapted to engage with the outer front end of the slot through which the handle passes and hold the wire rod 26 in its operative or inoperative positions, as may be required.

When the apparatus is constructed to supply oil to a number of bearings or other parts, there may be provided in connection with each supply-pipe 4 a plate or tablet bearing the name or initials of the name of the bearing or part to which oil is supplied by the pipe. Plates or tablets for this purpose are indicated at 30 in Figs. 3 and 5. By this means the conveyers supplying oil to any bearing or part can be readily determined for the purpose of enabling the supply of oil to such bearing or part to be regulated.

What I claim is—

1. In oil-feeding apparatus, the combination with a movable device to the upper and

outer surface of which oil is supplied, of an inclined oil-conveyer arranged in contact with and so as to project at each end beyond said surface and having one or more inclined oil-grooves arranged below its upper surface and in proximity to the part of the surface against which the said conveyer bears and which or each of which is adapted to act as a capillary conduit to siphon off oil from said surface, substantially as herein described.

2. In oil-feeding apparatus, the combination with a movable body to the outer surface of which oil is supplied in a direction opposed to the direction of gravity, of an oil-conveyer consisting of a strip of material arranged to rest in an inclined position against and project at each end beyond the said surface and provided with one or more inclined grooves adapted to act as a capillary conduit or conduits for oil on the surface of said movable body, substantially as herein described.

3. In oil-feeding apparatus, the combination with a rotary body having an outer curved surface to which oil is supplied, of an oil-conveyer consisting of a strip of material arranged tangentially to and so as to project at each end beyond said surface and formed with one or more inclined oil-grooves arranged in proximity to and extending in each direction from and beyond the point of contact of said oil-conveyer with said surface, and means for imparting ascending movement to the surface of the rotary body in contact with said conveyer, substantially as herein described, for the purpose specified.

4. In oil-feeding apparatus, the combination of a movable surface to which oil is supplied, oil-conveyers each formed with one or more oil-grooves and capable of resting against said movable surface so that the groove or grooves therein will be inclined, and means for throwing some of said oil-conveyers in and out of action, substantially as herein described for the purpose specified.

5. Oil-feeding apparatus comprising a casing serving as an oil-receptacle and provided with one or more oil-delivery outlets, one or more stationary oil-conveyers 16 inclined to the horizontal and each formed with one or more grooves 19 also inclined to the horizontal, a cylinder 5 against which said oil-conveyer or conveyers rest, and means for rotating said cylinder in a direction to lift oil from said receptacle and supply it to said conveyer or conveyers in a direction opposite to that in which a portion of it will be subsequently conveyed by said oil-grooves substantially as herein described.

6. Oil-feeding apparatus comprising an oil-receptacle, one or more oil-delivery outlets the lower ends of which are adapted to be placed in communication with the parts of an engine or machine to be lubricated, a cylinder mounted to rotate in said receptacle, one or more oil-conveyers arranged to rest in an inclined attitude upon said cylinder and each formed with one or more grooves adapted to

receive oil from the surface of said cylinder and lead it away therefrom, and means for imparting an intermittent rotary motion to said cylinder in such a direction that the
5 part of the surface thereof against which the oil conveyer or conveyers rest or rests will move in an opposite direction to that in which the oil will be conveyed by said oil groove or grooves, substantially as herein described.
10 7. Oil-feeding apparatus comprising a casing provided with an internal oil-receptacle and with one or more oil-delivery outlets the lower ends of which are adapted to be placed in communication with the part or parts of
15 an engine or machine to be lubricated, a cylinder mounted to rotate in said oil-receptacle, disks whereon said drum is loosely mounted, a rock-shaft to which one of said

disks is fixed and whereon the other is loosely fitted, coiled strips connected each at one end 20 to one of said disks and arranged to fit the interior of said cylinder, and one or more oil-conveyers arranged to rest against said cylinder and each formed with an oil groove or grooves inclined to the horizontal and having 25 its delivery end terminating above an oil-delivery outlet, substantially as herein described.

In testimony whereof I have signed my name to this specification in the presence of 30 two subscribing witnesses.

JOHN ISAAC THORNYCROFT.

Witnesses:

EDMUND S. SNEWIN,
PERCY E. WATTOCKS.