

Jan. 31, 1939.

J. P. WEIS ET AL

2,145,825

LUBRICATING MECHANISM FOR SEWING MACHINES

Filed Nov. 30, 1934

4 Sheets-Sheet 1

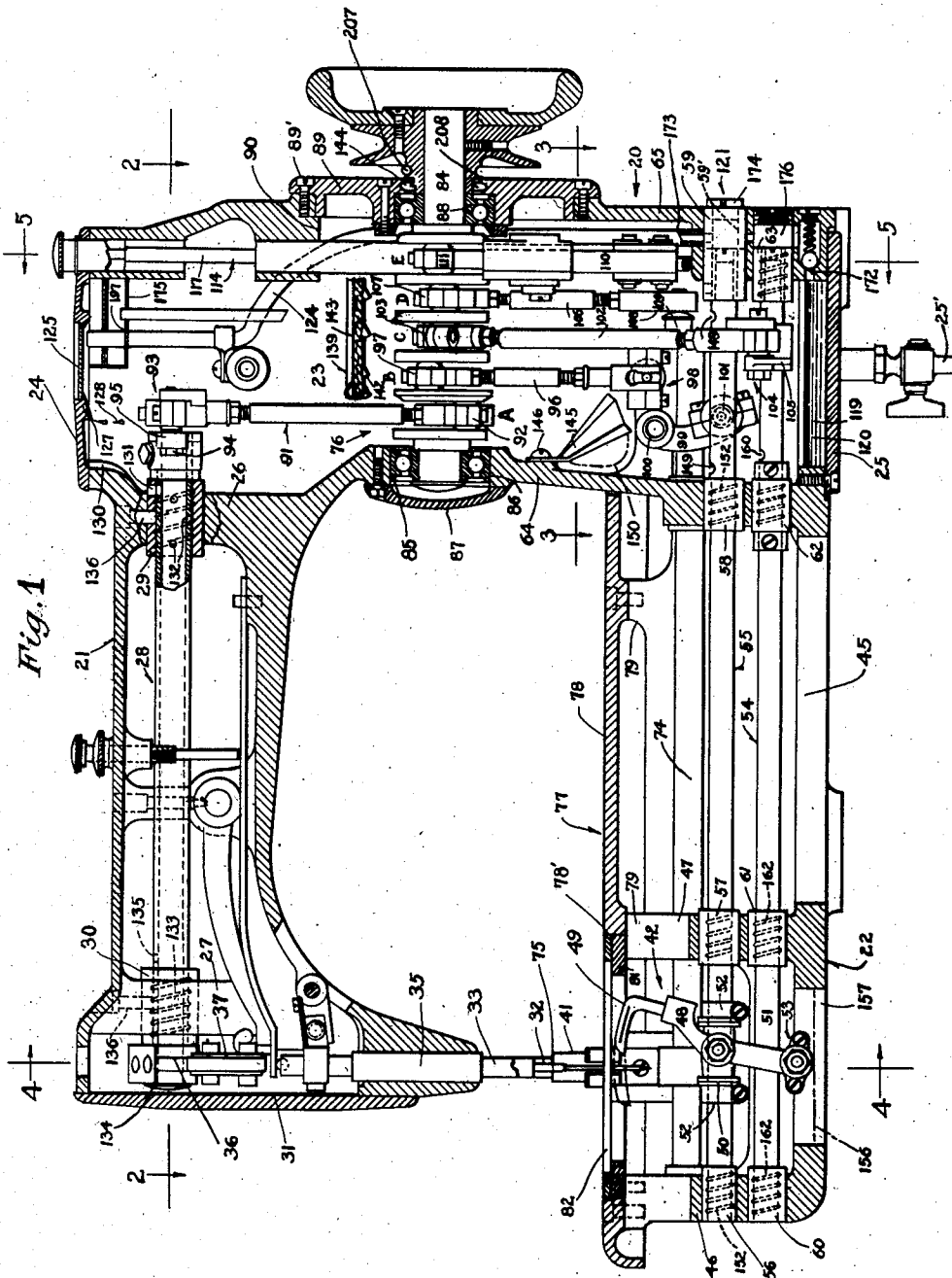


Fig. 1

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4 Sheets-Sheet 2

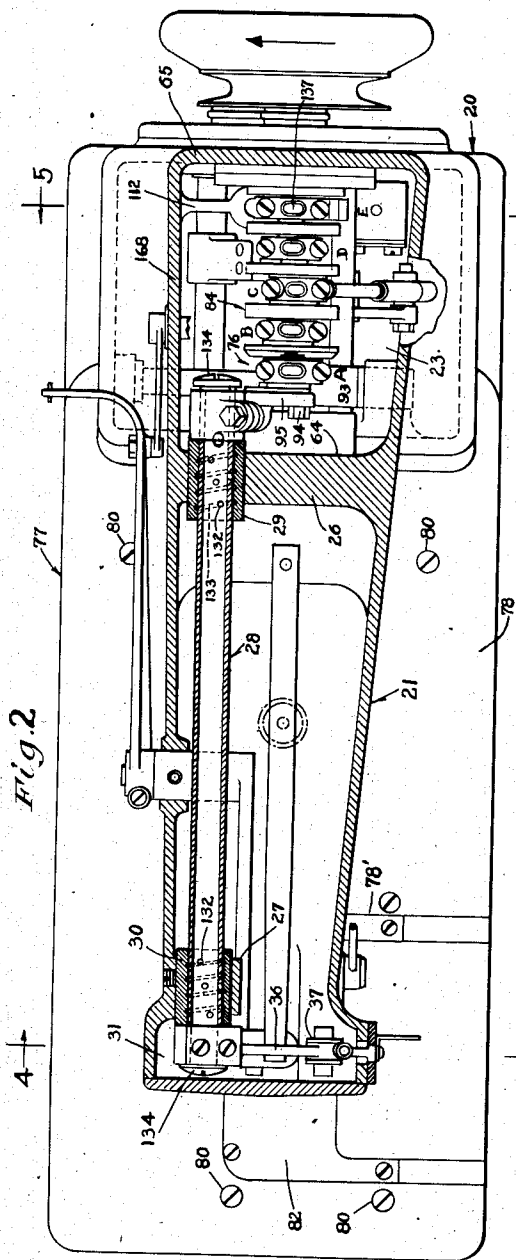


Fig. 2

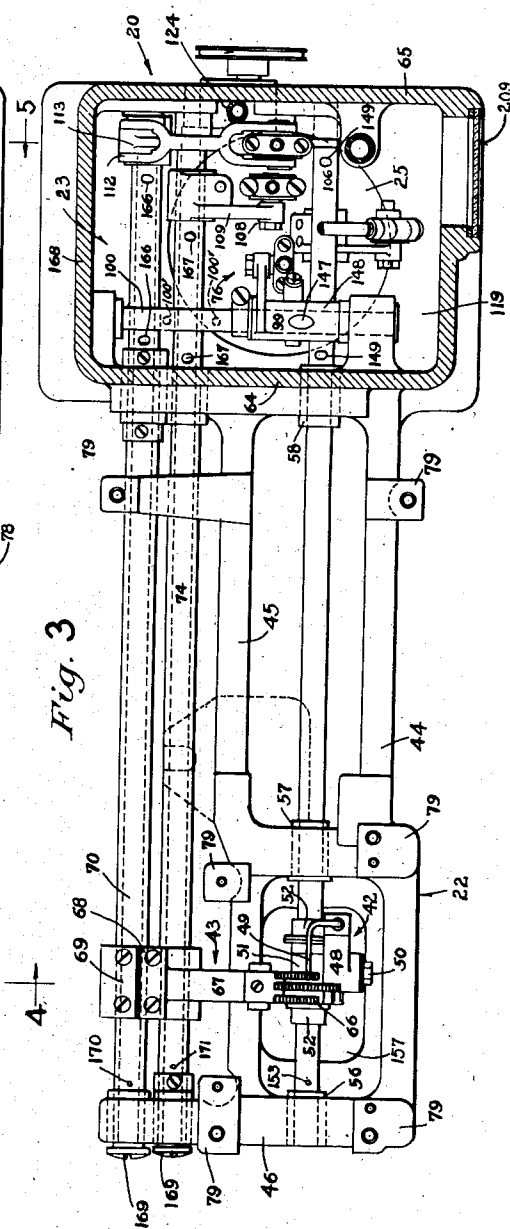


Fig. 3

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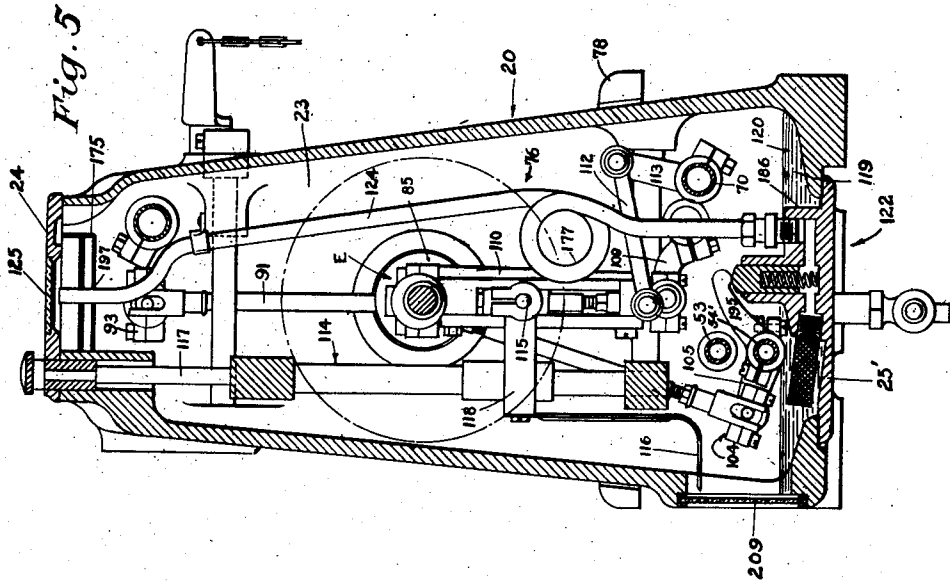
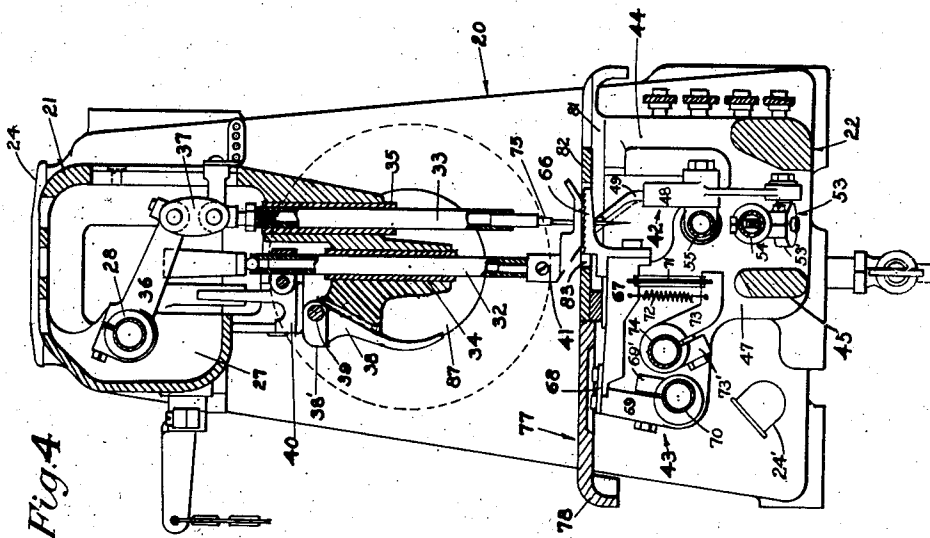
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4 Sheets-Sheet 3



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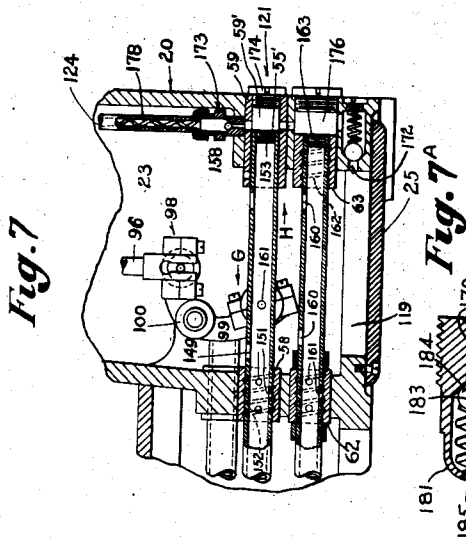
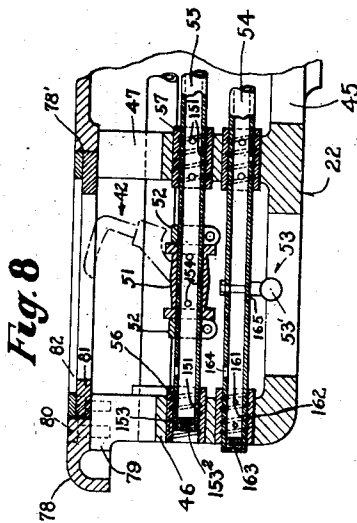
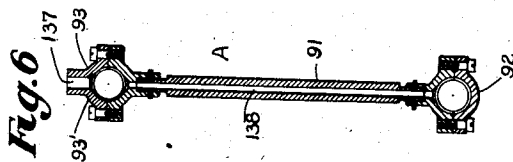
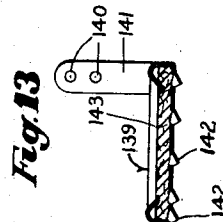
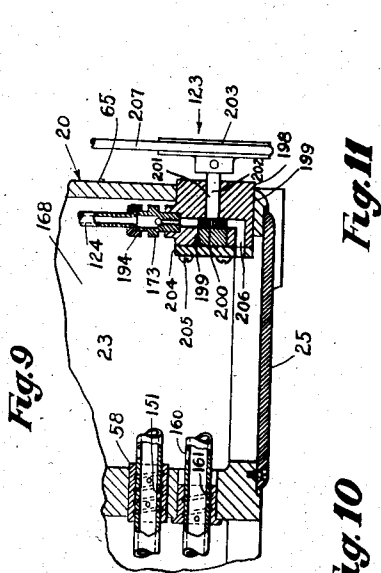
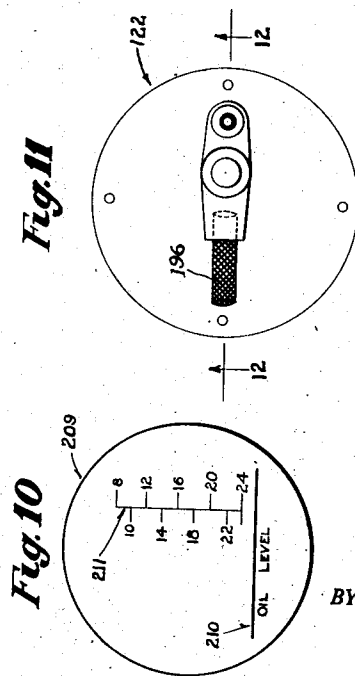
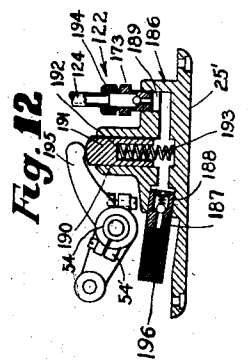
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LUBRICATING MECHANISM FOR SEWING MACHINES

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Application November 20, 1934, Serial No. 755,372

23 Claims. (Cl. 184—6)

This invention relates to improvements in lubricating mechanisms, primarily for sewing machines, and is a continuation in part of our application Serial No. 745,343, filed Sept. 24, 1934.

It is an object of the present invention to provide an improved system and mechanism for automatically lubricating various operating instrumentalities, so that the machine may be made more compact, and whereby the speed, efficiency, and effectiveness of the machine may be enhanced.

It is another object of the present invention to provide improved mechanism for distributing oil to the various operating parts.

Features in connection with this object include the provision of novel inverted or hanging vanes along which the oil may travel and be directed to predetermined locations or bearings, and the provision of a novel distributor pan for regulating and directing the flow of oil to main operating connections. This feature also has the advantage of insuring a feed of oil to various bearings and the like for a considerable period after the machine is stopped, thereby improving the easy starting characteristics of the sewing machine.

Yet another object of the present invention is the provision of improved pumping apparatus for forcing the oil from a low collection point to a high distributing point.

Features in connection with this object are the provision of a novel pump which may be made integral with the bottom plate of the chamber so as to be removed therewith, whereby a worn or broken pump or parts thereof may be easily or quickly replaced without disturbing any other instrumentality in the machine.

A further feature in connection with this object is the provision of an oil pump made in large part from the regular operating instrumentalities in the sewing machine thereby saving the expense of a separate oil pump and particularly in dispensing with separate and intermediate or indirect driving connections for a separate oil pump.

Because it is very important that a high speed sewing machine be properly lubricated at all times, it is an important object of the present invention to provide means so that the operator may be apprised or may check the condition, nature, and extent of lubrication.

Some of the features in connection with this last object include the provision of a glass plate substantially exposed to view for indicating the nature and extent of oil education, located in an accessible and at all times visible location, and also another glass plate for indicating the level of

oil in the oil chamber which, in the present embodiment, also serves both as a wall to the oil chamber and as a gauge plate for indicating the extent of feed or the number of stitches per inch.

It is another object of the present invention to provide a force-feed of lubricant through, preferably without separate pipe lines, to remote bearings.

A feature in this connection is the provision of valves on the ends of operating rods adapted to permit oil to be forced therein at predetermined times, and which may be used either with or without gravity feed of oil.

Heretofore it has been customary to provide so called gear or centrifugal pumps for lifting and forcing oil to the various operating parts and it has been thought impractical to use a plunger type pump for this purpose. However, the present invention provides two very practical reciprocating or plunger type pumps and discloses a novel means to insure a smooth rather than a pulsating flow of oil.

Other objects, features, and advantages will be described or will appear hereinafter.

In the drawings:

Fig. 1 is a longitudinal sectional view of the complete sewing machine.

Fig. 2 is a longitudinal section through the upper arm, taken on line 2—2 in Fig. 1.

Fig. 3 is a longitudinal section taken on line 3—3 in Fig. 1, but shows the cloth plate removed from the lower arm.

Fig. 4 is a vertical section view through the head end of the machine, taken on line 4—4 in Fig. 1.

Fig. 5 is a vertical section view taken on line 5—5 in Fig. 1.

Fig. 6 is a longitudinal section view of a crank arm.

Fig. 7 is a fragmentary view of one form of oil pump provided by the present invention, similar to that shown in Fig. 1, but in section.

Fig. 7A is a sectional detail of a modified plug and valve.

Fig. 8 is a fragmentary view of the looper mechanism at the head end of the machine.

Fig. 9 is a fragmentary view of another form of pump.

Fig. 10 is a view of the oil level indicating plate.

Fig. 11 is a top plan view of the form of pump shown in Fig. 5.

Fig. 12 is a sectional view of the pump shown in Fig. 11 taken on line 12—12.

Fig. 13 is a detached view of the oil distributor pan.

The present invention is not limited to the de-

tails of construction and arrangement of parts illustrated in the accompanying drawings because the principles of the invention are capable of other embodiments, and the phraseology employed is for the purpose of description and not for limitation.

Although the improvements in lubricating mechanisms of the present invention are capable of use in various sewing machines, and in other machines, they are particularly advantageous and useful with the sewing machine illustrated and described in detail in our copending application Serial No. 745,343 filed September 24, 1934, and are therefore illustrated and described in such relation herein.

In the detailed description which follows various main parts or main mechanisms in the sewing machine are described in considerable detail in separate headed sections in order to clearly disclose the purposes of the improved lubricating mechanisms of the present invention and in order to facilitate a quick understanding thereof.

Frame and general structure

Referring now in detail to the drawings, particularly to the general structure shown in Figs. 1 through 5, the present invention provides a frame 20 including an upper arm 21, lower arm 22, and intermediate hollow chamber 23 joining and supporting the upper and lower arms in spaced relation. The hollow chamber is provided with a top 24 which may be made integral therewith or may be in the form of a separate plate, as shown in Figs. 1 and 5 and a bottom plate 25 to facilitate assembly and to close the chamber after assembly.

The upper arm is preferably made hollow and substantially rectangular in cross section with transverse webs 26 and 27 for supporting a needle operating rod 28 in suitable bearings 29 and 30. At its outer end the upper arm 21 is provided with a head 31 for supporting a presser bar 32 and needle bar 33 in suitable bearings 34 and 35 respectively for reciprocation relative to the lower arm 22.

A finger 36 is secured to the outer end of the needle operating rod 28 and is provided with a link connection 37 to the needle bar 33 in order to reciprocate the latter. A hand lever 38, see Fig. 4, pivoted on a stud 39 has a cam 38' for engaging an arm 40 on the presser bar 32 in order to raise a presser foot 41 at the lower end thereof away from the lower arm 22.

The lower arm 22 also houses or supports a looper mechanism 42 and a feeding mechanism 43, but it is substantially open in order to facilitate changing, repairing, and adjusting various parts of these mechanisms as may be seen best in Figs. 1, 3, 4, and 5. Although it may be made as a separate part and secured to the hollow chamber 23 it is preferably made integral therewith as shown with a horizontally extending front wall 44 and rear wall 45 and with a transverse end wall 46, and intermediate wall 47 preferably extending fully between front and rear walls in order to provide a rigid support.

The looper mechanism 42, shown in Figs. 1, 3, and 4 is of the so-called transverse looper (or, looper operating across the line of feed) type and comprises a looper carrier 48 forming an interchangeable mount for various loopers 49, and having needle loop taking travel from the full line to the dot-and-dash line position shown in Fig. 4. The sleeve is capable of rocking movement on an upper rod but is held against axial

or sliding movement thereon by a pair of collars 52, this rocking movement being accomplished automatically through a lower connection 53 to a lower or rocking rod 54, shown in Figs. 1 and 4. Needle loop taking travel is effected through automatic reciprocation of the upper rod 55.

Because the lower and upper looper rods 54 and 55 operate at very high speeds during the normal operation of the sewing machine, it is desirable that they be sturdily supported and well lubricated, and the lower arm 22 provided by the present invention and lubrication mechanism also provided by the present invention are arranged to accomplish this in a marked degree. Support thereof is accomplished through the provision of suitable bearings 56, 57, 58 and 59 for the upper rod 55 and similar bearings 60, 61, 62, and 63 for the lower rod 54 in the wall 46 intermediate wall 47 and in the hollow chamber side walls 64 and 65 respectively. The bearings 57 and 61 in the intermediate wall 47, or bearings 56 and 60 in the outer end wall 46 may be dispensed with; however, because there is considerable inertia transmitted indirectly to the operating rods when the looper carrier 48 is rocked four thousand or more times per minute, it is desirable to steadily support the rods and to this end it is preferable that the disclosed plurality of bearings be used.

The feeding mechanism 43 comprises a feed dog 66 mounted on a feed dog carrier 67 having a spring connection 68 to a finger 69 secured to a feed rocker rod 70 by a yoke connection 69' and having a flat spring 71 and coil spring 72 connection to a finger 73 secured to a feed lift rod by a yoke connection 73'. Four motion travel is imparted to the feed dog 66 when the feed lift and feed rock rods 74 and 70 are operated a predetermined extent, preferably timed in a manner to move materials when the needle 75 is in raised and free position relative to the materials between the presser foot 41 and the feed dog 66.

A main drive mechanism 76 about to be described in considerable detail is provided to impart predetermined and coordinate movement to the rods 28, 54, 55, 70, and 74 in order to reciprocate the needle 75 and to impart four motion operation to the looper 49 and to the feeding mechanism 43 all in timed relation, one relative to the other.

Work support

A work support 77 of the present sewing machine includes a large cloth plate 78, for example, on bosses 79 of the lower arm 22 and secured thereto by suitable screws 80. An adaptor 81 within a U-shaped cut-out 78' in the cloth plate is also adapted to rest upon some of these bosses to support interchangeable throat plates 82 having cut-outs 83 to accommodate variously shaped feed dogs 66. The machine is capable of accommodating a large variety of cloth plates and throat plates so that the machine may be readily converted from a single line to multiple line cloth stitching, and more particularly so that it may be converted from a feed across the arm to a cylindrical or feed around the arm type of machine; the structures and features thereof being more completely disclosed and described in a divisional application Serial No. 750,259 filed October 27, 1934.

Driving mechanism and operating connections

The main driving mechanism 76 of the present invention comprises a main drive shaft 84, hav-

ing a plurality of cranks A, B, C, D, and E, supported in a horizontal plane substantially midway in the vertical height of the hollow chamber 23, at one end by a ball bearing 85 within a suitable bore 86 in the wall 84 and being sealed against oil leakage at this point by a cover plate 87. At its opposite end the main shaft is supported preferably with a ball bearing 88 in a large cover plate 89 as may be seen best in Fig. 1, the latter in turn being supported within a large bore 90 by screws 89'.

Crank arm 91 has a bearing connection 92 with crank A at its lower end and has another bearing connection 93 to a stud 94 at the outer end of an arm 95 carried by the needle operating rod. A short crank arm 96, having a connection 97 to the crank B, and connection 98 to a bell crank 99 pivotally mounted on a cross rod 100 and in turn connected to the upper rod 55 by a connection 101, is provided to reciprocate the upper rod.

Another crank arm 102 is connected to the crank "C" at its upper end through a bearing 103, and at its lower end is, through a connection 104, associated with an arm 105 secured to the lower rod 54 by a suitable yoke in order to impart rocking movement thereto; the crank arms 96 and 102 being adapted to impart elliptical or four way travel or movement to the looper 49.

Crank arm connections are also provided to impart suitable movement to the feeding mechanism 43, viz., a crank arm 106 has a connection 107 with a crank D at its upper end and has a connection 108 to an arm 109 secured to the feed lift rod 74. Another crank arm 110 has a connection 111 to the crank E at its upper end and through a link 112 at its lower end is connected to an arm 113 secured to the feed rocker rod 70. An adjusting mechanism 114 is provided to shift a pivot 115 lengthwise of the crank arm 110 in order to vary the extent of feed rocking movement and thereby to vary the number of stitches per inch. This adjusting mechanism is very completely described in the copending application Serial No. 747,871 filed October 11, 1934. However, it should be particularly noted that the adjusting mechanism includes a pointer 116 adapted to be moved vertically as the pivot stud 115 is moved vertically by a screw 117 connected to a carrier block 118.

The cranks A through E are so proportioned that coordinate movement is imparted through the operating connections just described in detail to the needle 75, looper mechanism 42, and feeding mechanism 43. Various adjustments may be and are provided for the looper mechanism and the needle but detailed description is omitted at this point because such adjustments have no bearing upon the lubricating mechanisms forming the main subject matter of the present application. For similar reasons further description of multiple needle and multiple looper arrangements are not given herein.

Lubricating mechanism

It is a fundamental aim in the development of the oiling mechanism comprising the present invention to lubricate, automatically, substantially all the moving parts in the sewing machine, and especially to lubricate automatically all the main bearings thereof in a very efficient manner. This is accomplished with a combination force, gravity, capillary, and spray feed of oil to the various parts with novel mechanism provided by the present invention.

To this end the hollow trunk 23 forms a substantially enclosed chamber, and forms a lower or main reservoir 119 at the bottom thereof for storing the supply of oil or other lubricant 120. However, in order for the oil to serve its purpose it must be directed to the various operating instrumentalities in an even and unfailing manner. Accordingly, the present invention provides pumps 121, 122, and 123, each hereinafter described in detail, either of which is adapted to draw the oil from the reservoir 119 and force it upwardly through an eduction tube 124 to the very top of the hollow chamber 23, against the under side of a glass plate 125 and of the top plate 24 in such manner that the bulk of the oil will fall back into an upper reservoir 175 and so that some of it will flow by gravity and partly by the force feed of the oil as it is expelled from the top of the eduction tube over the under side of the top plate.

Some of this oil flows along vanes 127 on the underside of the top plate and at the lowest point thereof collects into drops 128 to fall in predetermined locations upon movable parts, or runs through channels or vanes 130 down along the side walls of the chamber to other predetermined locations, for example through aligned holes 131 in the bearing 29 and needle operating rod 28 for passage directly into the latter rod where, by capillary action, the oil flows toward the outer end thereof.

The oil in the hollow rod may pass through suitable openings 132 directly to the bearings 29 and 30, and through the provision of oil grooves 133 in the latter, effect an efficient lubrication of the needle operating rod in both of its main bearings. Plugs 134 are preferably provided at each end of the needle operating rod to form a substantially closed chamber and the rod is preferably provided with an air escape hole 135, see Fig. 1, near the outer end thereof in order to clear the air from the rod and thereby facilitate flow of oil to the outer end. Auxiliary oil holes 136 are provided in the upper arm 21 for manual oiling under special conditions.

Fig. 6 clearly illustrates how oil may be passed directly to one bearing from another or to another operating connection. As may be seen best in Figs. 1, 2, and 6, drops of oil 128 flow from the vane 127 into the entrance port 137 in the top cap 93' of a bearing 93 to thoroughly lubricate the stud 94 within the two upper caps and thence flow down through a channel 138 into the other bearing connection 92 to thoroughly lubricate the crank A of the main shaft 84. The same feature is preferably embodied in the other crank arms 96, 102, 106, and 110 so that oil passing into similar entrance ports 137 of these respective crank arms is directed first to the cranks B, C, D, and E, thence to the connections 98, 104, 108, and 112.

A novel mechanism is provided for passing oil to the cranks B through E and to the associated operating connections. This mechanism comprises a distributor pan 139, see Figs. 1 and 13, preferably secured to the side wall 65 in any suitable manner, as by screws through holes 140 in a side wall 141, and provided with spouts 142 overlying the individual cranks A through E in such manner that a drip feed of oil is established to each crank and so that a substantially equal amount of oil is passed to each of the cranks.

Although not absolutely necessary, the distributor pan is preferably provided with a felt or similar pad 143 adapted to retain the lubri-

cant so that there will be a dripping of oil or further feed thereof to the different cranks after the machine is definitely stopped, thereby forming an accumulation of oil on the various cranks and other connections which facilitates quick starting of the unit after it has been stopped for a time. For example, the cranks have a tendency to thin the oil and to hold the very minimum of oil when the machine has been run for a considerable period of time and the various operating parts and the oil have become heated. However, the felt pad 143 and the distributor pan retain a body of oil sufficiently long to permit the various operating parts and the oil to cool off and to drop the oil onto the cooled operating parts a considerable period of time after the machine is stopped and possibly until it is started again if there is no great lapse of time. Thus, it will be seen that the distributor pan 139 provided by the present invention oils approximately nine main bearings, including cranks A through E and connections 98, 104, 108, and 111, and does this for a considerable period of time after the sewing machine is stopped.

The main bearings 85 and 88 for the main drive shaft 84, because they are ball bearings and the friction very slight, require but very little oil. If preferred, the distributor pan can be lengthened to provide additional spouts 142 directed to these ball bearings. However, it has been found that sufficient spray and gravity feed of oil reaches these bearings to make it unnecessary to provide such specific means to direct the oil thereto. For example, as the main shaft 84 is rotated at a high speed, a supply of oil is thrown from the cranks A through E and a considerable amount thereof reaches the two main bearings.

Also, much of the surplus oil dripping from the top 24 onto the arm 95 of the upper rod is thrown about in the hollow chamber 23 with a portion of it also reaching the main bearings. The end caps 87 and 89 prevent surplus oil from passing outwardly of the hollow chamber. Any conventional oil retainer 144 may also be provided to prevent oil leakage through the chamber.

A director plate 145 secured to the side wall 64 with a screw 146, as shown in Fig. 1, collects oil running down over the side wall 64 or dripping down from crank A, and is preferably provided with notches adapted to direct the oil to the connections 98 and 101 of the bell crank 99. An aperture 147 in the top of the main bearing section 148 of the bell crank 99, see Fig. 3, receives oil both from the plate 145 and from spray or drippings within the chamber 23 in order to lubricate the bell crank thoroughly while it is rocked on the cross rod 100.

The upper or reciprocating rod of the looper mechanism is lubricated in a novel manner by the mechanism of the present invention, and may be seen best in Figs. 1, 3, 4, 7, 8, and 9. In its present preferred form it comprises one or more openings 149 at the top of the hollow rod 55, as shown in Figs. 1, 3, and 7 particularly adapted to receive drippings of oil or oil spray being thrown about in the hollow chamber 23, to receive oil flowing down over the side walls, or to receive oil from the collector plate 145 from a channel 150 thereon as indicated by dot-and-dash lines in Fig. 1. Oil entering these apertures flows by capillary action lengthwise of the rod 55 and through a plurality of oil escape holes 151, see Figs. 7, 8, and 9, to the

main bearings 56, 57, and 58 where full distribution is further effected by the provision of oil grooves 152 in the bearings. Suitable plugs 153 are provided at both ends of the hollow rod 55; the one on the end of the rod within the hollow chamber 23, see Figs. 1 and 7, insures a flow of oil toward the outer end of the rod near the looper mechanism 42, and the plug at the outer end thereof as shown in Fig. 8 prevents adverse escape of the oil outwardly of the machine. An air escape hole 153' near the latter plug facilitates passage of oil lengthwise of the rod and to the various outer bearings.

Lubrication of the looper mechanism 42 is also effected by the upper rod 55. For this purpose, the rod is provided with one or more oil escape holes 154, see Fig. 8, intermediate the transverse walls 46 and 47 so that oil escapes to the sleeve 51 of the looper carrier 48 to lubricate the collar during the rocking movement imparted by the connections 98 and 104 in the manner hereinbefore described. Sufficient oil escapes lengthwise of the sleeve 51 to reach the collars 52 thereby minimizing the friction between the sleeve and collars. If preferred the lower arm 22 may be made in the form of a pocket 156 at this point as shown by dot-and-dash lines in Fig. 1 to collect oil drippings, should there be any. However, the possibility of this is so slight, and the advantage of clearing lint from below the needle and looper is so important, that in the preferred structure an opening 157 is provided.

Oil escape holes 151 similar to those for the bearings 56, 57, and 58 may be provided at the right hand end of the upper rod 55 for the bearing 59, but it is preferably provided with an oil entrance hole 158 at the top of the bearing adapted to pass oil directly to the rod as it is reciprocated.

A very similar oil distributing mechanism is provided for the lower or rocking rod 54 of the looper mechanism 42 for it too is provided with oil entrance holes 160 within the hollow chamber 23 and with oil escape holes 161 to all four bearings 60 through 63. Also, the bearings are preferably provided with grooves 162 to insure thorough distribution of oil, and the ends of the rod are provided with plugs 163 and an air escape aperture 164 to insure proper distribution of oil.

The reservoir 119 may be filled with oil or other lubricant 120 by removing the top plate 24, or through an entrance cup 24' shown in Fig. 4, and may be drained with a petcock 25'. The rod 100 may be open on the ends to provide circulation of air within the chamber 23, or may be sealed on the inside end and be provided with air holes 100' on the bottom, to circulate air and thereby cool oil within the chamber.

As may be seen best in Fig. 4 and particularly Fig. 8, the lower rod is also provided with an oil escape aperture 165 adapted to pass oil to the operating connection 53, as by small drippings to a ball and socket section 53' thereof.

Similar mechanism is also provided for lubricating the main bearings of the feed mechanism 43. Fig. 3 illustrates how the feed rock rod 70 is provided with oil entrance holes 166 and how the feed lifter rod 74 is provided with similar oil entrance holes 167. A plate, similar to the plate 145, may be provided on either the side wall 64 or the rear wall 168 to collect oil running down these walls or dropping within the hollow chamber 23 and to direct such collected oil into the

apertures 166 and 167 into the rods 74 and 76. These hollow rods are sealed at their ends as by cap screws 169, or as by plugs 163 and 163 illustrated in connection with the rods 54 and 55.

Distribution of oil to the main bearings of both the feed lift rod and of the feed rock rod is the same as distribution of oil to the bearings 60 through 63 of the lower rod 54 of the looper mechanism 42 and hence detailed illustration and description thereof seems unnecessary. Air escape holes 170 and 171 are provided near the outer ends of the lift and rock rods 74 and 76 respectively to insure proper capillary flow of oil to the outer ends of the rods for proper lubrication of the bearings at the outer extremities thereof.

If preferred, any or all of the hollow rods 28, 54, 55, 70, and 74 may be provided with wicks to retain and evenly feed oil to the various bearings. Also, the machine may be secured to a bench or table at a slight angle so that the outer end thereof is slightly lower than the chamber end, thereby promoting a flow of oil by gravity to the outer ends. In passing it should be noted too that separate bearings may be dispensed with and properly bored holes in the frame 20 itself for the rods may serve as bearings within the purview of this invention, the different oil escape holes passing oil directly to such bored bearings.

Should any of the oil passing holes, for example the oil entrance port 137 or channel 138 on the crank arm 91 or of any other crank arm become clogged, there will always be sufficient oil supply and oil drippings to lubricate the operating instrumentalities within the hollow chamber, especially since the various parts therein are operated at high speeds, so that there is in effect a double oiling system provided by the present invention, viz., the direct oiling through the various instrumentalities just described in detail, and the indirect oiling effected through the spray system.

Oil pumps

It is highly important that the lubrication of a sewing machine be unflinching, because it is operated at high rates of speed, 4,000 and 5,000 R. P. M. being quite usual. In order to insure a proper supply of lubricant to the various operating mechanisms at all times the present invention provides several novel forms of oil pumps. One form of pump 121, illustrated in Figs. 1 and 7 particularly, is made as a substantially integral part of the sewing machine itself, and from some of the main operating instrumentalities, to the end that definite economies in manufacturing costs may be accomplished and that operating advantages will definitely result, viz., the oil pump absolutely will function when the operating instrumentalities are working and when lubrication is required most. Further, there can be no slipping of belts, breaking of chain, and other inefficiencies as occur when a separate pump with an intermediate driving connection is provided.

Essentially this form of pump comprises a cylinder 55' formed by the main bearing 59 and a plunger 55' formed by the end of the upper rod 55 with an inlet valve 172 and outlet valve 173 adapted to properly control passage of oil. Although the cylinder 55' may be made with an integral head, it is preferably provided with a screw 174 in order to facilitate the grinding or machining of the interior bearing surface. The plug 153 in the right hand end of the upper rod 55, as shown in Fig. 7, serves to close the hollow

end of the rod and to convert this rod into a plunger in order to create a suction capable of drawing oil from the oil reservoir 119 and to create pressure adapted to force the oil upwardly through the eduction tube 124 to an upper oil reservoir 175.

Operation of the pump 121 is as follows: as the upper rod 55 is reciprocated by the crank B, crank arm 96, and bell crank 99 in order to impart needle loop taking travel to the looper 49, the plunger 55' is reciprocated within the cylinder 55'. When the plunger is moved in the direction of the arrow G, shown in Fig. 7, it creates suction within the cylinder which in turn opens the inlet valve 172 and draws oil from the reservoir 119 through the inlet valve 172 and thence upwardly to completely fill a pressure chamber 176. This pressure chamber 176 embraces the section between the pump inlet valve 172 and the pump outlet valve 173 and therefore includes both the cylinder 55' at the end of the upper rod 55 and the chamber at the end of the lower rod 54, which latter chamber is freely connected to the cylinder 55' by aligned apertures in the frame and in the bearing 59. Thence as the rod is reciprocated in the other direction, as in the direction of the arrow H of Fig. 7, oil pressure is initially built up in the pressure chamber to again tightly close the inlet valve and upon further movement opens the outlet valve 173 and forces the oil upwardly through the eduction tube 124 to the upper oil reservoir 175. When the plunger reaches the end of its travel in the right hand direction and initially starts its travel to the left again, the oil pressure in the eduction tube 124 and the initial suction closes the outlet valve 173 to prevent return of the oil into the pump again. Constant reciprocation of the piston in the cylinder 55' insures a substantially constant supply of lubricant to the upper oil reservoir.

In order to equalize the flow of oil to the upper level a coil 177, see Fig. 5, is provided in the eduction tube 124. This tends to change the pulsations or short spouting action of the oil into a substantially even flow. For similar purposes a baffle 178 as shown in Fig. 7 may be provided in the eduction tube 124.

Thus, the present invention provides a very efficient pump adapted to lift the oil from the lower or main reservoir 119 to the top 24 of the hollow chamber 23 for further distribution in the manner hereinbefore described in detail and does this without the expense of a separate additional pump and in a manner to insure constant pumping of the lubricant while the machine is in operation.

It should be particularly noted that this form of pump 121 has the added important advantage of being capable of use for effecting forced feed of oil into and through the operating rods. As illustrated in the accompanying drawings the machine is arranged for this forced feed to the lower and upper looper operating rods 54 and 55 respectively, and this is accomplished by merely using the modified plug 153' illustrated in Fig. 7—A in place of the plain plugs 153 and 163 at the right hand ends of the rods at present shown in Fig. 7. This modified form of plug is provided with a very small inlet port 179 and with a valve 180 including an integral bore 181 supporting a spring 182 adapted to push a ball 183 against a valve seat 184, with the end of the bore spun over to form a flange 185 adapted to hold the spring and ball in place. These valves effectively seat the inlet ports 179 when the rod

55 is reciprocated in the direction of the arrow G in Fig. 7 so that the suction action of the pump is in no way impeded and open automatically by oil pressure in the pressure chamber 176 when the reciprocating rod is given a pressure stroke in the direction of the arrow H.

Because the consumption of oil by the various bearings throughout the rods 54 and 55 is very light and because it is desirable to have a heavy flow of oil to the top of the trunk, the eduction tube 124 and the valve 173 are preferably made of large size to permit the bulk of oil 120, from the pressure stroke of the pump, to pass upwardly for general distribution, and the inlet ports 179 of the modified plug 153' are made extremely small so that there will be just a slight amount of oil passed into the operating rods. The size of the inlet port may be proportioned to obtain any desired amount of lubricant. Preferably, though, it is proportioned to receive but a slight proportion of the oil moved by the pump.

This forced oil feed for the operating rods may be used in conjunction with the gravity feed provided by the entrance ports 150 and 160 in the top of the rods 55 and 54 or these oil entrance holes may be closed so that force feed alone is provided. Further, suitable holes may be drilled through the frame 20 to join the other operating rods, for example the operating rods 70 and 74 for the feeding mechanism 43 so that they in turn may be lubricated by forced feed in like manner.

A modified form of pump 122 of the reciprocating plunger type is illustrated in Figs. 5, 11, and 12, having its main body portion 186 made integral with a modified bottom plate 25' in such manner that the complete pump may be easily and quickly removed from the sewing machine for repairs and adjustments by merely removing the bottom plate.

In detail, this form of pump comprises an inlet valve 187, an outlet valve 173, screwed upon or otherwise secured to the main body portion 186 at inlet and outlet ports 188 and 189 respectively and with an intermediate cylinder 190 supporting a plunger 191. The latter is preferably provided with a bore 192 adapted to receive a coil spring 193 for the purpose of lifting the plunger in the cylinder. An outlet valve 173 is connected to the outlet port 189 by a regular pipe coupling 194. The bottom plate 25', including the pump unit 122, is secured to the hollow chamber 23 by suitable fastening screws.

Operation of this form of the invention is preferably accomplished by the provision of a finger 195 secured to the lower rocking rod 54 as by a yoke 54'. The finger overlies the plunger 191 and pushes the latter downwardly whenever the rod 54 is given a clockwise movement as viewed in Figs. 5 and 12, while the spring 193 lifts the plunger and keeps it in engagement with the finger.

When the pump is operated oil is drawn from the main reservoir 119 through a screen 196 and through the inlet valve 187 and inlet port 188 into the cylinder 190 as the plunger 191 is raised by the spring 193, the suction during this travel of the plunger moving the ball of the inlet valve 187 away from its seating surface and drawing the ball from the outlet valve 173 toward its seating surface. Next, as the plunger is moved downwardly by the finger 195 the pressure built up thereby forces the ball of the inlet valve to its seat, and releases the outlet valve 173 to effect a displacement of lubricant upwardly through the

eduction tube 124 to the upper oil reservoir 175 and to other points for distribution in the manner already described.

The coil 177 and/or baffle 178, already described in detail with pump 121, may be used with this form of pump also, in order to have a comparatively smooth flow of oil to the upper distributing points rather than a pulsating or spouting flow. A sliding connection 197 is provided between the top end of the eduction tube 124 and the upper oil reservoir 175 so that this tube may be simply slid out of the hollow chamber 23 with the pump 122 when the bottom plate 25' is disconnected, and vice versa.

A final form of pump 123 is illustrated in Fig. 9. It comprises a circular body member 198 adapted to be passed into a bore 199 in the side wall 65 of the frame 20. The body member is provided with a pair of bores 199 adapted to receive a pair of gears 200, one being provided with a coextensive bearing 201 for supporting a shaft 202 upon which is secured a driving wheel 203. The pair of gears are held in place by a top plate 204 and screws 205 to form a conventional gear pump. As the gears are rotated, oil is drawn through an inlet port 206 and forced upwardly through an outlet port and outlet valve 173 to the eduction tube 124 for passage to the upper part of the housing. Rotation of the pump 123 and of the gears 200 is provided by any suitable belt 207 or like connection extending to a circular groove 208 section of the main drive pulley.

Although this pump provides a very economical construction it is not as fool proof and positive in its action as the two novel forms of the pump 121 and 122 hereinbefore described, for the belt 207 may break or slip without the operator being aware of it and thereby cause the oil supply to fail.

As illustrated in Figs. 5 and 10 the hollow chamber 23 may be provided with an integral glass wall 209 in the form of a sight and gauge for viewing and checking the condition and the level of the oil, the latter being accomplished by the provision of an oil level line 210 on the glass and the same glass being provided with a graduated scale 211 cooperating with a pointer 116 to indicate the extent of feed and consequently the number of stitches per inch. This glass also, in effect, forms a side wall to the hollow chamber.

It should be noted that the novel pump 121, wherein a bearing is used as a pump cylinder and a main operating rod serves the ancillary purpose of a plunger for the pump, may be used equally well with other machines, and the present description and claims are intended to cover such different use.

Other variations and modifications may be made within the scope of this invention and portions of the invention may be used without others.

Having thus explained the nature of our said invention and described a way of constructing and using the same, although without attempting to set forth all the forms in which it may be made, or all of the modes of its use, we claim:

1. In a sewing machine the combination of a frame; a hollow chamber in said frame; a main drive shaft with cranks; lower operating rods with driving connections; a distributor pan above the main drive shaft; means for lifting oil from the bottom of said chamber to the distributor pan; and crank arms connecting said main drive shaft to the lower operating rods, hollow through their length, adapted to receive oil from the distributor

pan and to direct oil to the main cranks and to the driving connections of the crank arms to the lower operating rods.

2. In a sewing machine the combination of a frame; a hollow chamber in said frame forming a main oil reservoir; a main drive shaft with cranks; lower operating rods; an upper operating rod; an upper oil reservoir; means for lifting oil from said main oil reservoir and directing it to said upper operating rod and said lower operating rods, and to the upper oil reservoir; and a distributor pan overlying said main drive shaft adapted to receive oil from the upper oil reservoir and to direct oil to the cranks on the main drive shaft.

3. In a sewing machine the combination of a frame with a bore in the side wall thereof; a main oil reservoir in said frame; a top plate; a main drive shaft with cranks; lower operating rods; an upper operating rod; an upper oil reservoir; and a gear pump supported in the bore of the frame for lifting oil from said main oil reservoir to said top plate for distributing it to said upper operating rod and said lower operating rods and to said upper oil reservoir; and a distributor pan adapted to receive oil from the upper reservoir and to direct the oil to the cranks on the main drive shaft.

4. In a sewing machine the combination of a frame for supporting operating instrumentalities and driving connections; means for distributing oil to the operating instrumentalities and the driving connections; an oil pump for lifting oil from a low to a high level in the frame for distribution by said means; and a looper operating rod in said instrumentalities forming a plunger for said pump.

5. In a sewing machine the combination of a frame for supporting operating instrumentalities and driving connections; means for distributing oil to the operating instrumentalities and driving connections; an oil pump for lifting oil from a low to a high level in the frame for distribution by said means; a bearing in the frame forming a cylinder for the pump; and a reciprocating rod for performing main operating functions in the sewing machine supported in said bearing and adapted to perform the ancillary function of a plunger for the pump.

6. In a sewing machine the combination of a frame for supporting operating instrumentalities and driving connections; means for distributing oil to the operating instrumentalities and driving connections; an oil pump for lifting oil from a low to a high level in the frame for distribution by said means including a pair of main bearings in said frame adapted to form a pressure chamber for the pump; and a reciprocating main rod in one of said bearings forming a plunger for the pump.

7. In a sewing machine the combination of a frame; connected pressure chambers in said frame, for lubricant; a plurality of hollow rods with outlet holes, respectively extending into said pressure chambers; bearings for said rods; valves in said rods, controlling the flow of lubricant from said pressure chambers; and means for reciprocating one of said rods to create a pressure of lubricant in said pressure chambers and concurrently open said valves and force lubricant therethrough and to the bearings.

8. In a sewing machine the combination of a frame for supporting operating instrumentalities and driving connections; a reservoir for lubricant; a hollow operating rod for operating a

sewing instrumentality, having an oil escape hole; bearings for said rod; means for pumping lubricant from said reservoir; and a valve in said rod associated with said means to effect force feed of lubricant into said rod, through said escape hole and to the bearings.

9. In a sewing machine the combination of a frame for supporting operating connections; a rocking rod supported by said frame adapted to actuate a main operating instrumentality; a hollow chamber in said frame, forming an oil reservoir; a bottom plate for said hollow chamber; means for distributing oil to the operating connections; a pump carried by said bottom plate and having a vertically disposed plunger for lifting oil to said distributing means; and a finger on said rocking rod overlying the plunger and adapted to perform the auxiliary function of operating the pump while the rocking rod performs the main function of actuating a main operating instrumentality.

10. In a sewing machine the combination of a frame; a hollow chamber; a bottom plate for said chamber; a drive shaft; a crank on said drive shaft; an operating rod for a main operating instrumentality; a pump on said plate; means having only one connection to only one crank on the main drive shaft adapted to concurrently operate the rod and main instrumentality and to operate the pump.

11. In a sewing machine the combination of a frame; a hollow chamber in said frame for supporting operating instrumentalities and forming an oil chamber; a top to said hollow chamber; a horizontally disposed glass plate carried by said top; conduit means for directing oil from said oil chamber to the underside of said glass plate; and means for pumping oil from the bottom of said chamber through said conduit means and expelling the same against the underside of said glass plate to diffuse and to distribute the oil to said operating instrumentalities.

12. In a sewing machine the combination of a frame; an oil reservoir; means for distributing oil to operating instrumentalities; an oil pump for moving oil from said reservoir to said means; and a main operating rod for performing a main operating function and cooperating with said pump to perform the ancillary function of a plunger for the pump.

13. In a sewing machine the combination of a frame; an oil reservoir; means for distributing oil to operating instrumentalities; an oil pump for moving oil from said reservoir to said means; a bearing in said frame forming a cylinder for said pump; and a reciprocating rod for performing a main operating function, supported in and cooperating with said bearing to perform the ancillary function of a plunger for the pump.

14. In a sewing machine the combination of a frame; a hollow chamber in said frame forming a main oil reservoir; a top for said chamber; an oil directing vane on said top; a main drive shaft with cranks; means for lifting oil from said reservoir and educting it against the underside of the top for partial distribution by said vane; an upper oil reservoir near the point of eduction adapted to collect oil which drops from the top; a distributor pan overlying said main drive shafts; a plurality of spouts in said distributor pan overlying individual cranks on the main drive shaft; and means for conducting oil from said upper oil reservoir to said distributor pan.

15. In a sewing machine the combination of a frame; a hollow chamber in said frame forming

a main oil reservoir; a top for said chamber, having an opening through which the flow of oil may be observed; a glass insert forming a closure for said opening; an oil directing vane on said top; a main drive shaft with cranks; means for lifting oil from said reservoir and educting it against the underside of the top for partial distribution by said vane; an upper oil reservoir near the point of eduction adapted to collect oil which drops from the top; a distributor pan overlying said main drive shafts; a plurality of spouts in said distributor pan overlying individual cranks on the main drive shaft; and means for conducting oil from said upper oil reservoir to said distributor pan.

16. In a sewing machine the combination of a frame; a hollow chamber in said frame forming a main oil reservoir, having a side wall opening through which the main oil level may be determined; a glass closure member for said opening; a top for said chamber; an oil directing vane on said top; a main drive shaft with cranks; means for lifting oil from said reservoir and educting it against the underside of the top for partial distribution by said vane; an upper oil reservoir near the point of eduction adapted to collect oil which drops from the top; a distributor pan overlying said main drive shafts; a plurality of spouts in said distributor pan overlying individual cranks on the main drive shaft; and means for conducting oil from said upper oil reservoir to said distributor pan.

17. In a sewing machine the combination of a frame; a hollow chamber in said frame forming a main oil reservoir; a top for said chamber; an oil directing vane on said top; a main drive shaft with cranks; lower operating rods having oil entrance apertures; channels in said chamber for conducting oil to said oil entrance apertures; means for lifting oil from said reservoir and educting it against the underside of the top for partial distribution by said vane; an upper oil reservoir near the point of eduction adapted to collect oil which drops from the top; a distributor pan overlying said main drive shaft; a plurality of spouts in said distributor pan overlying individual cranks on the main drive shaft; and means for conducting oil from said upper oil reservoir to said distributor pan.

18. In a sewing machine the combination of a frame; a hollow chamber in said frame forming a main oil reservoir; a top for said chamber; an oil directing vane on said top; a main drive shaft with cranks; lower operating rods having oil entrance apertures; channels in said chamber for conducting oil to said oil entrance apertures; a pump for lifting oil from said reservoir and educting it against the underside of the top for partial distribution by said vane; a reciprocating rod for performing main operating functions in the sewing machine and adapted to perform the ancillary function of a plunger for the pump; an upper oil reservoir near the point of eduction adapted to collect oil which drops from the top; a distributor pan overlying said main drive shaft; a plurality of spouts in said distributor pan overlying individual cranks on the main drive shaft; and means for conducting oil from said upper oil reservoir to said distributor pan.

19. In a sewing machine the combination of a frame; a hollow chamber in said frame forming a main oil reservoir; a top for said chamber; a main drive shaft with cranks; and upper main operating instrumentalities disposed remotely from

and above said main drive shaft; lower main operating instrumentalities disposed below said main drive shaft; means for lifting oil from said main oil reservoir and educting it against the underside of the top; means for conducting a part of said educted oil to said upper operating instrumentality and said lower instrumentality; an upper oil reservoir near the point of eduction adapted to collect oil which drops from the top; a distributor pan overlying said main drive shaft; a plurality of spouts in said distributor pan overlying individual cranks on the main drive shaft; and means for conducting oil from said upper oil reservoir to said distributor pan.

20. In a sewing machine the combination of a frame; a hollow chamber in said frame forming a main oil reservoir; a top for said chamber; an oil conducting vane on said top; a main drive shaft with cranks; an upper operating rod disposed remote from and above said main drive shaft and having an oil entrance aperture; lower operating rods disposed below the main drive shaft and having oil entrance apertures; channels in said chamber for conducting oil to the oil entrance apertures in said upper and lower operating rods; means for lifting oil from said main reservoir and educting it against the underside of said top for partial distribution by said vane to said channels; an upper oil reservoir near the point of eduction adapted to collect oil which drops from the top; a distributor pan overlying said main drive shaft; a plurality of spouts in said distributor pan overlying individual cranks on the main drive shaft; and means for conducting oil from said upper oil reservoir to said distributor pan.

21. In a sewing machine the combination of a frame for supporting operating connections; a rocking rod supported by said frame to actuate a main operating instrumentality; a hollow chamber in said frame, forming an oil reservoir; means for distributing oil to the operating connections; a pump in said hollow chamber having a plunger for lifting oil to said distributing means; and a finger on said rocking rod overlying the plunger and adapted to perform the auxiliary function of operating the pump while the rocking rod performs the main function of actuating a main operating instrumentality.

22. In a sewing machine the combination of a frame; a hollow chamber; a drive shaft; a crank on said drive shaft; an operating rod for a main operating instrumentality; a pump in said hollow chamber; and means having only one connection to only one crank on the main drive shaft adapted to concurrently operate the rod and main instrumentality and to operate the pump.

23. In a sewing machine the combination of a frame for supporting operating instrumentalities and driving connections; a reservoir for lubricant; a pressure chamber in said frame in communication with said reservoir; a hollow operating rod for operating a sewing instrumentality, having an oil escape hole and extending into said pressure chamber; a bearing for said rod; a valve in said rod controlling the flow of lubricant from the pressure chamber; and means for reciprocating said hollow rod to draw lubricant from said reservoir and into said pressure chamber and to force the same into the rod and through the escape hole to the bearing.