

Oct. 15, 1963

E. L. DUNHAM
OIL WELL TUBING CLEANER

3,106,962

Filed Aug. 28, 1958

4 Sheets-Sheet 1

FIG. I

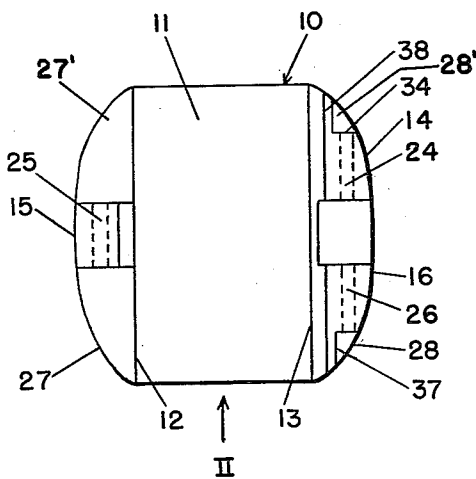


FIG. II

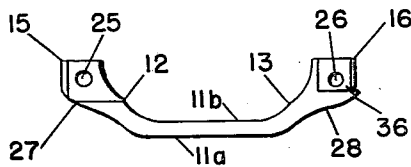


FIG. III

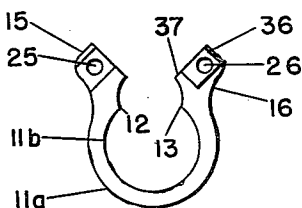


FIG. IV

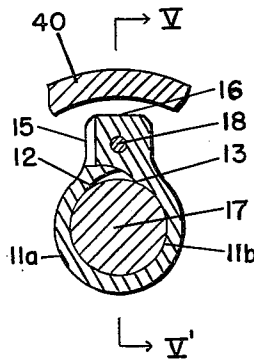
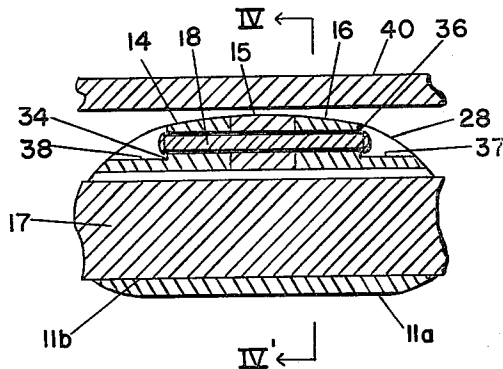


FIG. V



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4 Sheets-Sheet 2

FIG. VI

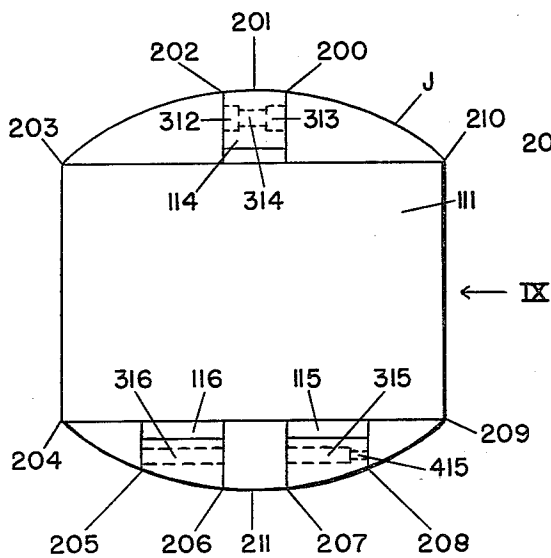


FIG. IX

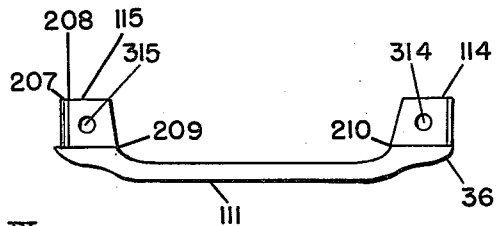


FIG. VII

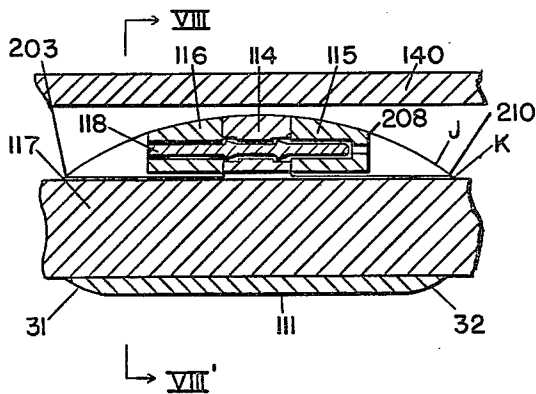
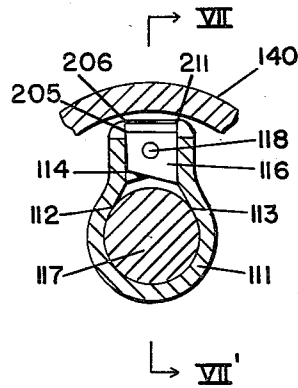


FIG. VIII



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4 Sheets-Sheet 3

FIG. X

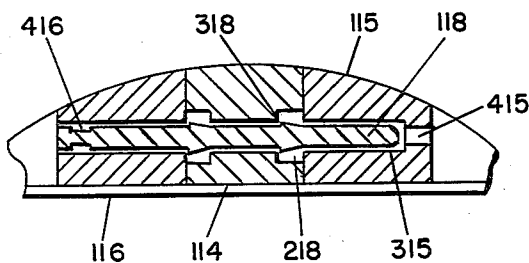


FIG. XI

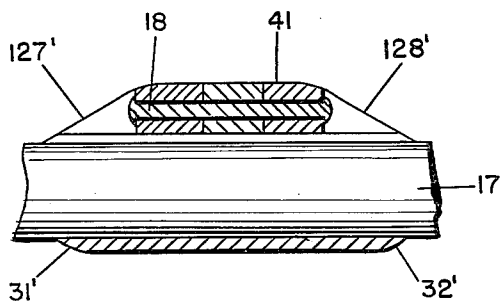


FIG. XVIII

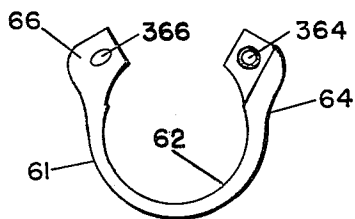
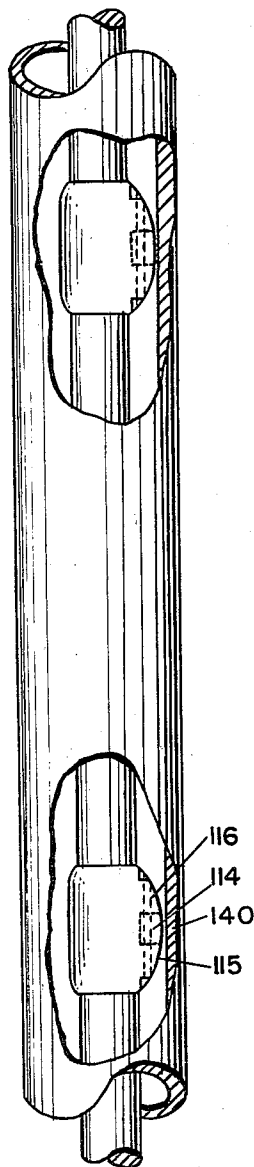


FIG. XII



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3,106,962

Filed Aug. 28, 1958

4 Sheets-Sheet 4

FIG. XIII

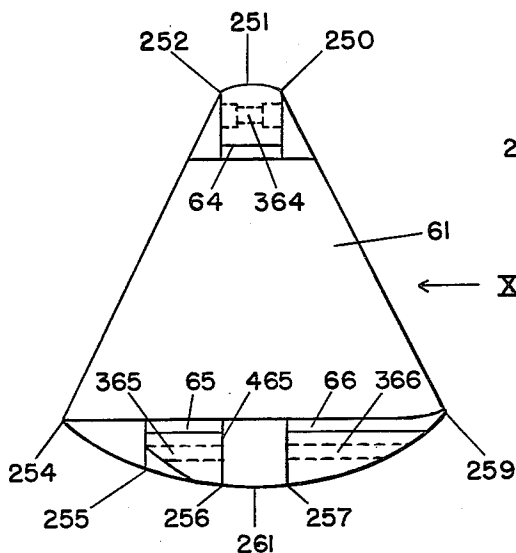


FIG. XIV

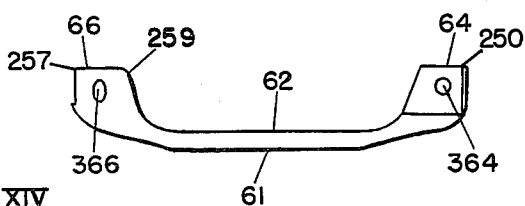


FIG. XVII

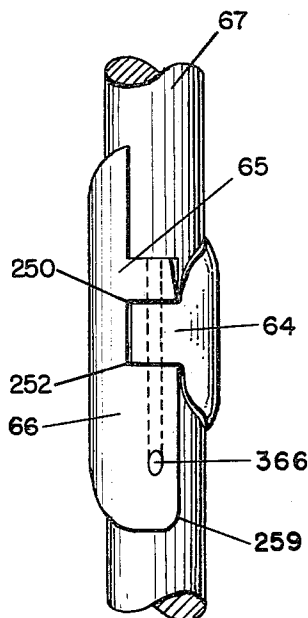


FIG. XVI

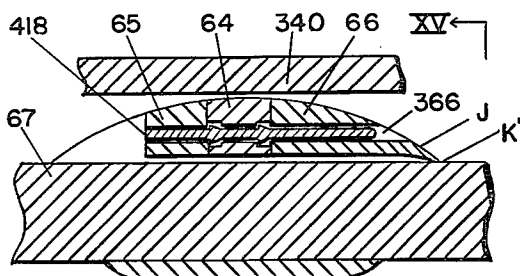
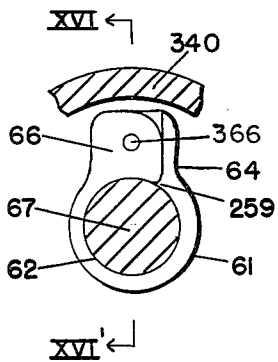


FIG. XV



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1

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4 Claims. (Cl. 166-176)

This invention is related to a device commonly known as a paraffin scraper or paraffin remover, for removing what are known as paraffin accumulations from the interior of oil well tubing during the operation of such wells.

It is an object of my invention to make an improved paraffin remover for attachment to a sucker rod for use in an oil well.

It is a further object of my invention to make a paraffin remover that is durable, reliable, light in weight, inexpensive to manufacture, simple to use, and provides a minimum of interference with the flexibility and strength of the sucker rod to which it is attached in an oil well.

Other objects and advantages will be apparent during the course of the following description. Devices of the prior art for removing accumulations from oil well tubings suffer from the disadvantage of either requiring welding in the assembly of the clamp and the scraper blade or requiring special tools for their assembly, which tools are not readily available in the field and so require shipping the sucker rods and the to-be-attached scraper to and from such points as such assembly can be accomplished. Further, similar prior art devices, which provide scraper blade lengths from 2 to 5 feet, require long clamps or a plurality of clamps to support each scraper sufficiently firmly on the sucker rod to prevent dislodging thereof during use. Long clamps or a plurality of clamps for each scraper blade reduce the flexibility of the rod and scraper combination, put strains on the sucker rod to which attached, and concentrate the stress of reciprocation and flexing in the portion of the rod between the scraper blades. Also, such large scrapers provide unnecessary weight, and are more expensive to manufacture than the scrapers provided by my invention; such large scrapers also limit the number of scrapers that can be put on a given length of sucker rod and thus require a large minimum length of stroke to provide satisfactory paraffin removal. Further still, sucker rods are made of forged alloy steels in order to have tensile strengths of upwards of 80,000 p.s.i.; the heating usually concomitant on welding operation for the connection of scraper blade to a scraper clamp or to a sucker rod by means of welding reduces the strength of the sucker rods.

I have found that these disadvantages may be overcome by providing a relatively small, light, inexpensive unitary clamp and paraffin remover which is durable, reliable, readily attached in the field, and may be reused.

According to my invention, I provide a simple, light, rugged, unitary and relatively small structure—commonly known as a paraffin scraper or paraffin remover—adapted to be firmly attached to the sucker rod so as to present to a paraffin accumulation in an oil well tube a sufficiently large surface normal to the axis of the sucker rod and peripheral to the surface of the rod with an area adequate in size to clear—on vertical reciprocatory motion of said scraper in said paraffin accumulation and especially when used with the conventional rod rotators—a sufficiently large pathway through the paraffin mass to allow a substantial and economic flow of oil therethrough, preferably without said scraper structure making contact with the wall of the tubing. According to my invention this structure need only be long enough, about four times the diameter of the sucker rod, to firmly attach said surface to the sucker rod; the structure is, thus, preferably short to reduce the length of contact of such surface-support-

2

ing structure with the rod and thereby provide the minimum amount of interference with the flexibility of the sucker rod. Further still, such scraper presents an outline, when viewed in or against in a plane parallel to the axis of the rod, that is free of acute or right angles so as to be free of structures on which the string of rod with such scrapers attached thereto may catch on the oil well tubing when inserted into the oil well tubing.

Generally, this paraffin scraper comprises a plate with a set of lugs on one side thereof, at least one lug on one end of said one side and at least two lugs on the other end of said one side, said plate being adapted to wrap tightly around and firmly attach to a sucker rod. The plate wraps around the sucker rod and contacts a substantial proportion, preferably at least 180°, of the circumference of the rod in the zone thereof bounded by the lines—straight in a flattened position of the plate and correspondingly curved in its operative position—between the most peripheral points of the lugs on both ends of the plate. The lugs at one end of the plate each have a hole therethrough, which hole is in line with the hole in the lug adjacent thereto; the lug at the other end of the plate has a hole therethrough which is in alignment with the aforesaid holes in the aforesaid lugs on the other end of said plate when said plate is in its operating position about and attached to the sucker rod. Said lugs may be held in operative position by means, as a pin, which may be removable. This convenient, light and inexpensive device does not seriously reduce the strength of the sucker rod or the flexibility of the sucker-rod scraper combination. The shorter length of the blades of paraffin removers made according to my invention also allows closer spacing between scrapers and, thus, shorter strokes to be used than are practical with paraffin removing devices or scrapers having longer blades. This, in turn, allows the use of less powerful and less expensive pumping equipment than are required with such longer scraper blades. Further still, the efficiency of paraffin removal, which is believed to depend upon the action of the paraffin scraper in tearing loose or forcing a path through the paraffin on the walls of the tubing, is facilitated by the shape of the device which is presented to the paraffin accumulation during the vertical reciprocation of the scraper.

In the accompanying drawings, which form a part of this application and in which like numerals are employed to designate like parts throughout the same,

FIG. I is a top view of one embodiment of my invention as manufactured;

FIG. II is an end view of the device of FIG. I as seen in the direction of arrow II of FIG. I;

FIG. III is an end view of the device of FIG. I in a partly bent form preparatory to being placed in its operative position on a sucker rod;

FIG. IV is a sectional view of the device of FIG. I in its operative position tightly clamped to a sucker rod, and adjacent to the inner wall of a well tubing, this sectional view being taken along the plane indicated by line IV—IV' of FIG. V;

FIG. V is a longitudinal section of the device of FIG. I in its operative position tightly clamped to a sucker rod in a well tubing and adjacent to a wall thereof, this sectional view being taken along the plane indicated by line V—V' of FIG. IV;

FIG. VI is a top view of another embodiment of my invention as manufactured;

FIG. VII is a longitudinal sectional view of the device of FIG. VI in its operative position, tightly clamped to a sucker rod in a well tubing and adjacent to the wall thereof, this section being taken along the line VII—VII' of FIG. VIII;

FIG. VIII is a cross-sectional view of the device of FIG. VI in its operative position tightly clamped to a

sucker rod, this section being taken along the plane indicated by line VIII—VIII' of FIG. VII;

FIG. IX is an end view of the embodiment shown in FIG. VI as seen in the direction of the arrow IX of FIG. VI;

FIG. X is a detailed view of the pin-locking means shown in FIG. VII;

FIG. XI is a longitudinal sectional view of another embodiment of my invention;

FIG. XII is an overall view, partly broken away, of a plurality of scrapers as shown in FIGS. VI—X, on a sucker rod within a tubing;

FIG. XIII is a top view of the preferred embodiment of my invention as manufactured;

FIG. XIV is an end view of the device of FIG. XIII as seen in the direction of the arrow XIV of FIG. XIII;

FIG. XV is an end view of the device of FIG. XIII in its operative position tightly clamped to a sucker rod in a well tubing, this end view being taken along the plane indicated by line XV—XV' of FIG. XVI;

FIG. XVI is a longitudinal sectional view of the device of FIG. XIII in its operative position tightly clamped to a sucker rod in a well tubing, this sectional view being taken along the plane indicated by line XVI—XVI' of FIG. XV;

FIG. XVII is a top view of the device of FIG. XIII in its operative position tightly clamped to a sucker rod;

FIG. XVIII is an end view of the device of FIG. XIII in a partly bent form preparatory to being placed in its operative position on a sucker rod.

The device of FIGS. I—V comprises principally a unitary piece, indicated generally as 10, readily formed by casting or forging and a locking pin, 18. Piece 10 comprises a central thin portion, 11, with slightly elevated ridges, 12 and 13—whose function is explained below—and interfitting locking assembly lug elements, 14, 15, and 16. The central thin portion, 11, is chosen of sufficient width—measured perpendicularly to the direction of arrow II and in the plane on which FIGURE I is drawn—as to allow the device to tightly wrap around and firmly grip a sucker rod, as item 17, shown in FIGS. IV and V.

To bring this device to its operative position, piece 10 is bent around a rod, 17, from the flat shape shown in FIGS. I and II and clamped firmly in place in the operative position shown in FIGS. IV and V by use of the locking pin, 18, which pin is passed through holes, 24, 25, 26, in lug elements, 14, 15 and 16, respectively.

The piece, 10, passes through the bent form shown in FIG. III in passing from the flat shape of FIGS. I and II to its rounded form in the operative position. As described below, this embodiment may be made and distributed to the user in such curved form, in which case the process of assembly on the rod starts from such curved form instead of from the flattened form.

A machinist's vise, common to the petroleum industry and its operating areas, may be used to tighten the device on the rod. Each ridge, 12 and 13, in FIGS. I—IV provides a fulcrum or pivot point about which the adjacent attached lug portion (14, 15 and 16) may elastically rotate. The elastic reaction of such rotated elements against pin 18 causes ridges 12 and 13 to bear against rod 17. Additionally, the rotation of lugs 14 and 16 around ridge 13, and the rotation of lug 15 around ridge 12 elastically stretches the peripheral portion of the flat portion 11 (shown as surface 11a in FIGS. III, IV and V); the elastic reaction of such stretched element against the pin 18 also firmly yet elastically urges the inner surface of portion 11 (surface 11b) against the sucker rod and so tightens the device firmly yet elastically on the sucker rod. The device may be made of any metal that has sufficient spring or resiliency to be firmly yet elastically held by the above described action against the sucker rod, sufficient strength to maintain its shape for protracted usage as in an oil

well, and sufficient corrosion resistance to keep its strength, such as 1020 steel.

In the example of a device according to one embodiment of my invention shown in FIGS. I—V, the thickness of wall 11 is $\frac{1}{8}$ inch, the length of the portion 11 (along direction of arrow II) is 3 inches, the holes, 24, 25 and 26, are $\frac{3}{16}$ to $\frac{7}{32}$ inch diameter and pin 18 is preferably made of high carbon steel with a press fit into said holes. The pin 18 may be upset at either end to help fix it in position, as shown in FIG. V, although the spring action of lugs 14, 15, and 16 alone tends to satisfactorily hold the pin in operating position. With a width of $3\frac{1}{8}$ " between the left side of lug 15 and the right side of lug 16, as shown in FIGS. I and II, there is from $\frac{1}{8}$ " to $\frac{1}{16}$ " space between the top of lug 15 and the wall, 40 of the 2 inch I.D. tubing (shown in FIGS. IV and V) when the $3\frac{1}{2}$ " diameter sucker rod 17 is in the center of that 2 inch I.D. tubing in the operative position of the device.

A feature of my invention is that the method of removal of the accumulation known as paraffin accumulations appears to be by a tearing action, much like that of a steam shovel. This action is believed to tear away lumps of paraffin accumulations rather than depending for the removal of such paraffin by a shaving action.

The position and shape of the edges 27 and 28 and 27' and 28' of plate 10 are such as to form grooves in the paraffin accumulation within the pipe 40 on vertical reciprocation of the paraffin scraper within said pipe or tubing and thereby make it easier for the portion of the paraffin accumulation between the thus-formed grooves to be broken off on upward as well as downward travel of my device by contact with the faces 34 and 36 of the elements 14 and 16. These faces each present a surface that is peripheral to the sucker rod and that is normal to the length of the sucker rod and that extends to a position close to but out of contact with the oil well tubing when said rod is in the center of said tubing.

The device of FIGS. VI—IX is another embodiment of my invention. The device of FIGS. VI—IX consists essentially of a single unitary element readily formed by casting or forging, and comprising a central thin portion, 111, with interfitting lock assembly lug elements 114, 115, and 116 and a pin therefor. A machinist's vise, common to the petroleum industry and its operating areas, may be used to fasten this device to a sucker rod. In the embodiment shown in FIGS. VI—IX elements 37 and 38 shown in FIGS. I, II, III and V are removed and the element 111 is formed with its edge distinctly feathered at 31 and 32. The overall dimensions herein and the method of bringing this device from its flat form shown in FIGS. VI and IX to its operative position and form correspond, respectively, to the overall dimensions and method mentioned above for the embodiment of FIGS. I—V. The embodiment may also be made and distributed in a rounded form, similar to that shown in FIGS. III and XVIII.

In this embodiment the ridges 12 and 13 of FIGS. I—V are absent, and instead, there is utilized the elastic spring action of elements 114, 115 and 116 about the line of contact 112 and 113 of plate 111 with rod 117 (rather than the spring action about a contact line as at ridges 12 and 13 of FIGS. I—V) to develop a gripping action on the sucker rod that is free of the stress concentration effected by ridges 12 and 13 in the embodiment of FIGS. I—V. Also, the rotation of lug 114 around line of contact 112 and the rotation of lugs 115 and 116 around the line of contact 113 elastically stretches the peripheral portion of flat portion 111; the elastic reaction of such stretched element urges the inner portion thereof into a snug tight fit against the sucker rod.

In the embodiment of FIGS. VI—IX, passageway 314 of lug 114 has, at both ends thereof, counter-sunk zones 312 and 313. Lug 115 is only partly bored through at 315 with a hole of the same diameter as passageway 314

5

and 316; a smaller hole, 415, completes passage through lug 115. A barbed pin 118 is held in place by countersunk zone 312 and 313 when lugs 115 and 116 are in operative position. The barbs of the pin 118 are sufficiently small to pass through passage 314 and 316. The barbs need only present an outer diameter of 0.005 to 0.010 inch larger than the remainder of the pin when such pin has a diameter of about 0.20 inch. Once the pin 118 is in place as shown in FIG. X, the movement of the previously tensioned lugs 114, 115, and 116 prevents the pin from moving (leftwards in FIG. X) past the point at which the barbs catch on the adjacent shoulders of the lugs, while the narrowing of the passage 315 to form the passage 415 limits the movement of the pin in the other direction. However, when removal of the scraper from the sucker rod is desired such pin—which is tightly fitted (even press-fitted) into passages 314, 315 and 316, when they are aligned—may be removed by a driving pin applied to the end of pin 118 through passage 415 when lugs 114, 115 and 116 are pressed sufficiently out of their operating position to fully align passageways 314, 315 and 316.

As an alternative to the barbed pin above described, a smooth surfaced pin that is similarly tightly fitted into passages 314, 315 and 316 may be used; when removal or reuse of the scraper is desired, such a pin may also be driven out by a driving pin through passage 415. Such pins may also have a ridge 416 formed therein, as shown in FIG. X, to form a collar which facilitates removal of such pins. It is also advantageous to bevel the front end of the pin, as is shown in detail in FIG. X.

As shown in FIGS. VII and VIII, the embodiment of FIGS. VI-IX also provides, on the faces on which points 208 and 205 lie, surfaces normal to the length of the sucker rod and peripheral to the sucker rod, which surfaces each extend to a position close to but out of contact with the oil well tubing when said sucker rod is in the center of said tubing. Such surfaces, on vertical reciprocation of such scrapers when attached to said sucker rod in an oil well, serve to provide the above-described shovel action for paraffin removal. The softly curved edge J of the embodiment of FIGS. VI-IX, as well as the softly curved edge 28 of the embodiment of FIGS. I-V, avoids a shaving action on the walls of the adjacent tubing, as 40 or 140. The beveling at 31 and 32 and the smooth edge at J or 28 allows sucker rods with scrapers, made according to invention attached thereto, to be easily inserted into the well tubing because these scrapers, by presenting only soft obtuse angles as the profile of the junctions of the rod and scraper, as at K, minimize the possibility of the rod string "hanging up" on the scraper during its insertion into the well tubing.

In yet another embodiment of my invention, shown in FIG. XI, straight edges 41 are provided across the surface of the device nearest to the oil well tubing interior surfaces and the feature edges 127' and 128' are made straight. This embodiment has some economies in manufacture over the other embodiments.

The preferred embodiment of my invention is shown in FIGS. XIII-XVIII. The device of FIGS. XII-XVIII comprises a unitary element readily formed by casting or forging and comprising a central thin portion, 61, and interfitting locking assembly lug elements 64, 65 and 66, and a pin therefor. To bring this device to its operative position the unitary piece is bent from the flat shape shown in FIGS. XIII and XIV and clamped firmly in place in the rounded form of its operative position shown in FIGS. XV, XVI, and XVII by the use of the locking pin 418, which pin is passed through holes 364, 365 and 366. The plate 61 passes through the curved form shown in FIG. XVIII during this process. As described below, this embodiment may be made and distributed in such curved form, in which case the process of assembly starts from such curved form instead of from the flattened form. A machinist's vise, common to the petroleum in-

6

dustry and its operating areas, may be used to tighten the device on the rod. This embodiment is generally similar to that shown in FIGS. VI-X, with the change that corners 202-203-204 and 200-210-209 are removed from the embodiment of FIG. VI so that a substantially straight line passes from each longitudinal peripheral edge of lug 64 (points indicated as 250 and 252) to the periphery of the opposite side (points 254 and 259) in the flattened position of this embodiment. A correspondingly curved line forms the outline for the embodiment in its curved form shown in FIGS. XVIII and in the rounded form of its operative position shown in FIGS. XVI and XVII. The end view of this embodiment in its flat form (FIG. XIV) and the cross section through points 251 and 261 of the embodiment of FIG. XIII are, respectively, the same in outline as the end view of the embodiment shown in FIG. IX and as the cross section through FIG. VI at points 201 and 211. Also, the distances between similar points in these two embodiments (FIGS. VI and XIII) are the same except for the toe at 259. However, shaping the lug in such manner as shown in FIGS. XIII-XVII and attaching the scraper on the sucker rod with lug 66 below lug 65 facilitates insertion of a rod string with such scraper attached thereto into the oil well tubing because lug 66 tightly and snugly contacts the sucker rod, especially due to the toe at 259.

The surface on lug 65 on which point 255 lies is normal to the length or axis of the sucker rod and is peripheral to the sucker rod. This face or surface extends, as shown in FIGS. XVII and XVI, to a position close to, but out of contact with, the oil well tubing when said rod is in the center of such tubing. The surface provides the shovel or tearing action above described on the upward portion of the reciprocatory motion of the rod string to which such scraper is attached. The scraper of FIGS. XIII-XVIII is held to the sucker rod by bending of plate 61 about the sucker rod and by passing a pin, 418, through passageways 364, 365, and 366 to hold the lugs 64, 65 and 66 in position as described for the embodiment of FIG. I. The passage 364 through lug 64 may be countersunk and a barbed pin 418, similar to 118 above described, passed therethrough. Alternatively, a smooth pin may be tightly passed through passages 364, 365, and 366 to hold the scraper in position as discussed for the embodiment of FIG. VI.

As in the embodiment of FIG. VI, the spring action of the lugs (64, 65, and 66 in this embodiment) about the line of contact of inner surface 62 of plate 61 with sucker rod 67 develops a strong yet elastic gripping action on the sucker rod—as in the embodiment shown in FIG. VIII—without providing localized stress concentrations on the sucker rod.

It is to be noted that the downward concave shape in the lateral portion of plate 111 shown in FIG. IX and of plate 61 shown in FIG. XIV are such that, in the operative position of these embodiments, the restraining or holding of lugs 114, 115 and 116 effected by pin 118 and the similar restraining or holding of lugs 64, 65 and 66 effected by pin 418 and the resiliency of the material used serves to urge together the points 112 and 113 on plate 111 and the corresponding points on plate 61 to form a close fit on rod 117 and on rod 67 with the compressive stress relatively evenly distributed over the sucker rod surface contacted. Also, due to the resiliency or elasticity of the circumferential squeezing grip of these devices on the sucker rod, these devices are extremely resistant to any displacement due to vibration of the sucker rod.

The above-described circumferential squeezing action obtained by the curvature of the elastic plate is aided by the shape and size of the lugs, by the fit of the lugs against the opposing plate, and by the cooperation of the lug shape and fit with the locking pin. Thus, in the embodiment shown in FIGURE VI, as seen in operative position in FIGURE VIII, the holes for the pin are ar-

7

ranged so as to pass the pin substantially through the center of the center lug, 114. The lugs are so shaped as to keep the surface 204—211—209 parallel to the corresponding surface on which points 203 and 210 lie and to keep the surfaces spaced apart from each other by a distance less than the diameter of the sucker rod but greater than the radius thereof. The edge corresponding to points 205—206 of lug 116 bears on the flat surface adjacent to lug 114 (to the left thereof as seen in FIG. VI) when held in operative position by pin 118. Edge 207—208 similarly bears against the flat surface on the other side of lug 114 (right side as seen in FIG. VI) and edge 200—202 bears on the surface 211 between and adjacent edges 206—207. This fit and this restraint serves to keep relatively flat and parallel the portions of the elastic plate 111 immediately adjacent to lug 114, 115 and 116. This action of the lugs, supplemented by the elasticity of the material used, thus serves to aid in forming a firm contact of the thus-rounded plate 111 against the rod 117. This elasticity compensates for any minor variations in sucker rod diameter, such as may occur due to variation in manufacture or in operation of the rod string. This elastic fit maintains continued strong gripping contact of the scraper with the rod even on axial and/or radial vibration of the rod.

A similar action of the lugs and plate occurs in the embodiment of FIGS. XIII—XVIII, which embodiment, as above described, has a similar cross section (through points 251 and 261) and a similar outline (as shown in FIG. XIV) to the cross section (through points 210 and 211) and outline (as shown in FIG. IX) of the embodiment of FIG. VI. Thus, in the operative position of the embodiment of FIG. XIII (shown in FIGS. XVI and XVII) the edge 250—252 bears against the surface 256 and adjacent the surface on which points 256 and 257 lie and the similar fit and size and cross-section shape of the lugs here also serves to tend to maintain the portion of plate 61 adjacent to lug 64 relatively flat, parallel to the portion of the plate adjacent to the opposing lugs, and at a distance therefrom less than the diameter of the sucker rod but more than the radius thereof, whereby there is developed a tensioning action that urges the rounded plate 61 into a tight elastic contact with rod 64 with a minimum of compressive stress concentration on the surface of the sucker rod contacted.

The embodiment shown in FIG. XIII as well as in FIGS. I, VI and XI may be made by casting in sand or by forging with subsequent machining; the procedure of forging with staging dies is preferred. These scrapers may be most economically made of mild (1010—1025) steel—1020 steel is preferred—although other materials of the appropriate strength and elasticity are included within the scope of my invention. The scrapers may be distributed in the flat form shown in FIGS. I, VI and XIII. It is somewhat more convenient for the user, however, to deliver the scraper body in the rounded form shown in FIGS. III and XVIII, which is preferably tempered after bending to such form.

To facilitate appreciation of the detail of my invention FIGS. VI, VIII, IX, XIII, XIV, and XV have been drawn to scale except for a slight (5—15°) central and downward slope on top of lugs 114 and 115 not shown in FIG. IX and a similar slight (5—15°) slope on top of lugs 64 and 66 not shown in FIG. XIV. The effect of the slope to space apart part of the top of lug 116 from face 203—201—210 is illustrated in FIG. VIII. In FIG. VI, the distance between points 201 and 211 (the maximum width of this embodiment) is 3½ inches, the distance between points 203 and 210 is 3 inches and corresponding and other dimensions can be picked off those drawings. The distance in FIG. XIII between points 254 and 259 is 3 inches and the distance between points 251

8

and 261 (the maximum width of this embodiment) is 3½ inches. All the above are for scrapers intended for attachment to a ¾ inch diameter sucker rod and are presented as exemplary; similar scrapers for smaller rod diameter will obviously have correspondingly smaller dimensions and larger scrapers for larger rods will have correspondingly larger dimensions.

The paraffin removers made according to my invention have provided great resistance to displacement; for example, it requires a force of about 2800 lbs. to budge a scraper such as that of FIG. XIII of size and dimensions as above described from its position on an appropriate sucker rod in the direction of the sucker rod length when attached as above described.

A further feature of my invention stems from the fact that the scrapers made according to the preferred embodiments of my invention, while gripping an associated sucker rod firmly, also grip it elastically as above described and, also, from the fact that these scrapers are short, sturdy, and attached without appreciable stress concentration to the rod and without mechanical weakening of such rod. Accordingly, such rod breaks as occur with use of the preferred embodiments of my scrapers are more likely to be peripheral to the scraper and the recovery of such rod by conventional fishing tools is simplified. Further, even if the rod used with my scrapers should break intermediate the ends of a scraper made according to my invention, because such scrapers are held by elastic action and to preselected strengths dependent upon the thickness and strength of the material used, such scrapers can be moved along the length of the rod by application to such scrapers of a force no more than sufficiently great either to overcome the frictional force of attachment or to deform the device enough to move it rather than requiring a force sufficiently large to rupture components thereof in order to so move the scraper as to permit a fishing tool to attach to the rod and recover same. Such forces needed to displace the scrapers made according to my invention are readily obtained by the tamping action usually effected during conventional "fishing" or recovery operations. In this regard it is also to be noted that the scrapers of my invention not only grip the rod with sufficient firmness for paraffin removal yet with sufficient elasticity that they can be moved along the rod but, further, my scrapers are sufficiently sturdily built so that they can absorb the energy imparted thereto on tamping by a fishing tool and thus be moved longitudinally of said rod without being bent over the end of the rod and thus hinder the attachment of a fishing tool to the rod for recovery thereof. Contrariwise, scrapers so firmly held to a rod string that they cannot be moved longitudinally of the rod string—aside from the reduction of the strength of the rod string caused by such tight attachment and possible metallurgical damage thereto—require removal of the well tubing, a very expensive and time consuming procedure, to put a well back in operation after break in the rod string intermediate the ends of such scrapers. Similarly, scrapers attached to a rod string by two or more widely spaced zones or points, and especially those of less sturdy construction than the devices of my invention, do not provide structures to which sufficient force may be applied to move such scrapers longitudinally of the rod in the event of a rod break between the end of such scrapers without the probability that such scraper will bend over the end of the rod whose recovery is the object of the fishing operation and prevent the fishing tool from attaching to such rod and effecting recovery thereof. Such disadvantages are overcome by my invention.

It will, accordingly, be seen that I have developed simple, inexpensive, paraffin scrapers that may be applied in the field. Because these scrapers contact the sucker rod only over distinct and separate zones which each are short, they do not interfere with the flexibility of the

sucker rod to which attached. Also, these short scrapers permit a large number thereof to be put on a single sucker rod and, therefore, permit of shorter effective pump strokes where paraffin accumulation is met than are effective with longer scrapers. Further still, while these mechanically held scrapers develop adequately great attachment strengths to the sucker rod for scraping purposes yet they do not deleteriously affect the metallurgical characteristics of the sucker rod to which attached, as does the usual attachment by welding wherein the welding heat is directed toward or into the rod. Further still, the scrapers of my invention do not interfere with the passage of a rod string to which such scrapers are attached into the well hole, and such scrapers may be readily removed as for reuse, without damage or expense, and permit fishing or recovery operations not possible with different structures.

It is to be understood that the forms of my invention herewith shown and described are to be taken as particular examples of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of my invention or the scope of the subjoined claims.

I claim:

1. A paraffin scraper of the type adapted for attachment to a sucker rod within a well tubing comprising a plate formed of relatively thin bendable elastic material, a pair of spaced apart lugs integrally formed on one edge of said plate, a single lug integrally formed on a second edge of said plate parallel to said one edge, said single

lug being adapted to engage between said pair of lugs with said scraper encompassing a sucker rod, said pair of lugs and said single lug each having a bore adapted to respectively align with said single lug engaged between said pair of lugs, and a lock pin extending through said bores for securing said scraper to said sucker rod, said scraper being attached to said sucker rod with said plate engaging the outer surface of said sucker rod, said lugs extending radially outwardly from said sucker rod a substantial distance greater than said plate to form a scraping portion on said scraper.

2. A device as claimed in claim 1 wherein said relatively thin plate is substantially rectangular.

3. A device as claimed in claim 1 wherein said one edge and said second edge of said plate are connected by a pair of edges converging from said one edge toward said second edge.

4. A device as claimed in claim 1 wherein said lugs have the surface thereof remote from said sucker rod lying in an arc of a circle the axis of which is perpendicular to the axis of said sucker rod.

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