March 17, 1953 F. L. CARSON 2,631,674

PARAFFIN SCRAPER

Filed April 5, 1950 2 SHEETS—SHEET 1

Fig. 1.

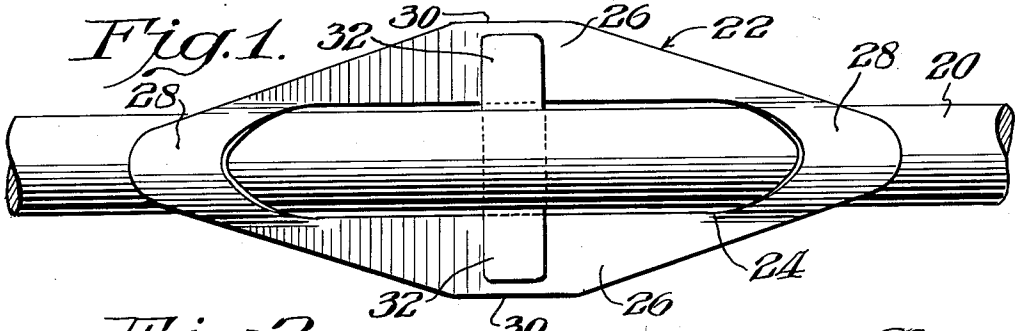


Fig. 2.

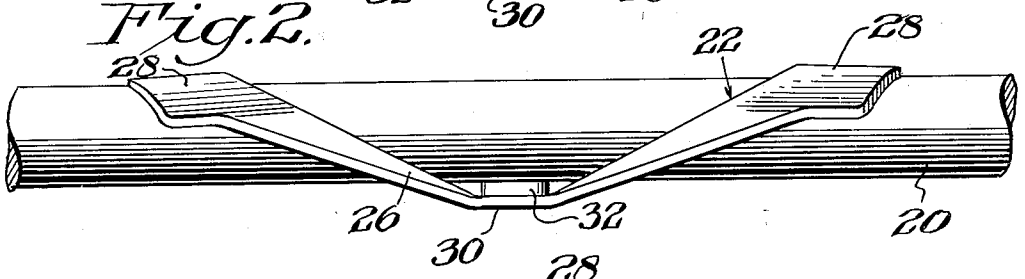


Fig. 3.

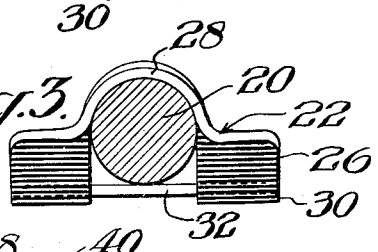


Fig. 4.

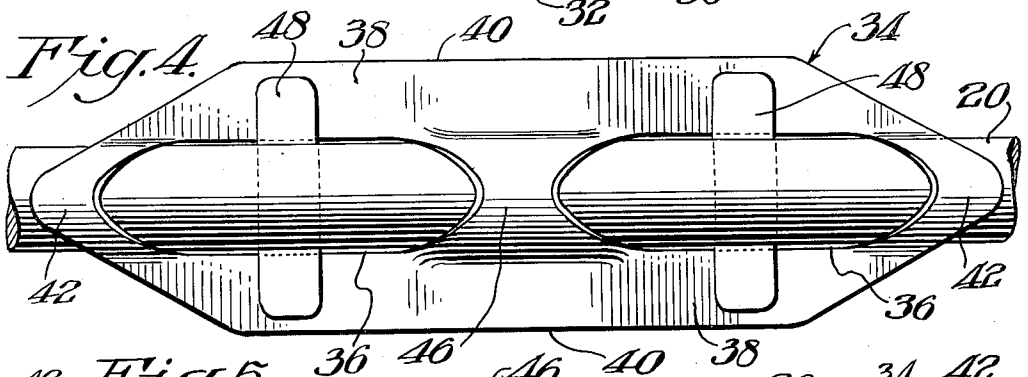


Fig. 5

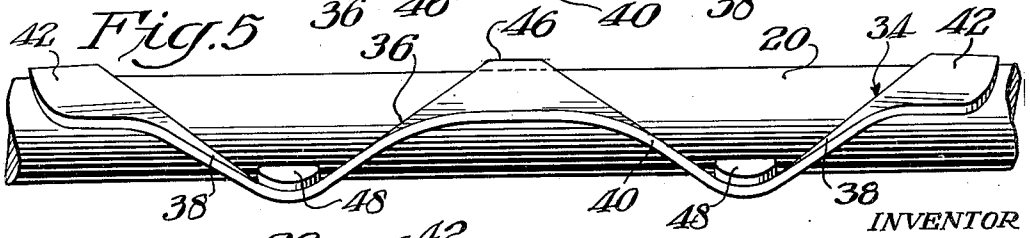
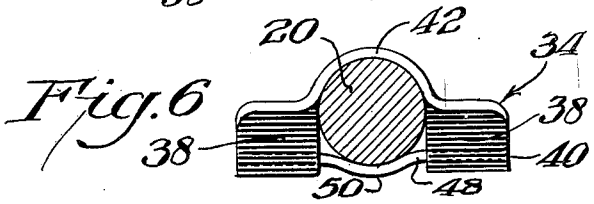


Fig. 6



INVENTOR

Forrest Leon Carson

BY

Edwin C. Woodhouse

ATTORNEY

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Filed April 5, 1950 2 SHEETS—SHEET 2

Fig. 7.

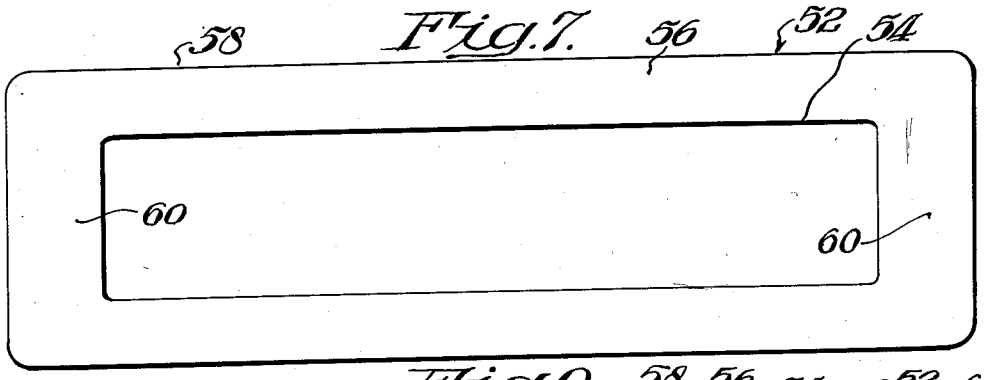


Fig. 9.

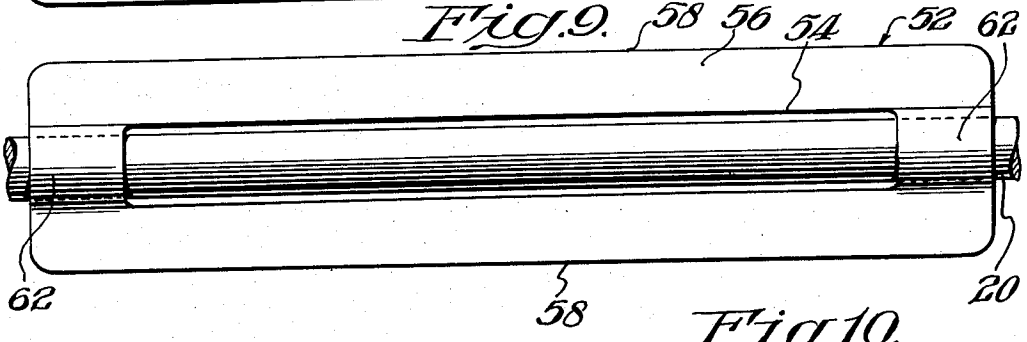


Fig. 8.

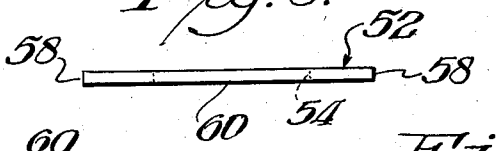


Fig. 10.

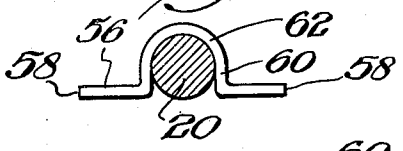


Fig. 11.



Fig. 12.

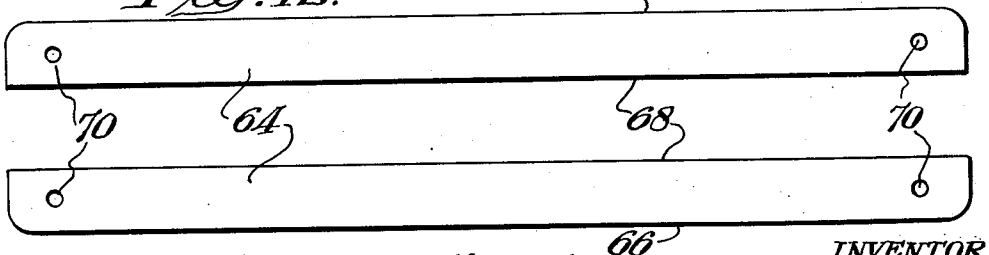
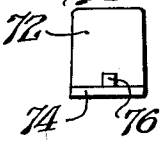


Fig. 13.



Fig. 14.



INVENTOR

Forrest Leon Carson

BY

Edwin C. Woodhouse

ATTORNEY

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UNITED STATES PATENT OFFICE

2,631,674

PARAFFIN SCRAPER

Forrest Leon Carson, Borger, Tex., assignor to J. M. Huber Corporation, Locust, N. J., a corporation of New Jersey

Application April 5, 1950, Serial No. 154,165

9 Claims. (Cl. 166—18)

1

This invention relates to paraffin scrapers for oil wells and particularly to a novel type of paraffin scraper blade and mode of detachably securing it to a sucker rod.

An oil well generally comprises a casing, a string of smaller steel pipe inside the casing and generally known as the tubing, a pump at the bottom of the well, and a string of steel rods, commonly referred to as sucker rods, within the tubing and extending down into the pump for operating the pump. Means are provided at the top of the well for reciprocating the sucker rods to operate the pump. In many cases, the means for reciprocating the sucker rods include means for rotating the rods through a predetermined angle during each stroke of the sucker rods. Suitable apparatus of this character are shown by Sargent in Patent 1,653,510, Poulsen in Patent 2,180,880 and T. De Witte McConahey et al. in Patent 2,444,842.

The crude oil generally contains paraffin and other substances which tend to congeal and precipitate out of the oil and deposit upon the walls of the tubing during the passage of the oil through the tubing. Such deposits are quite objectionable and tend to restrict the flow of oil through the tubing. Various means and methods have been proposed for preventing the formation of such deposits and for removing deposits so formed. Such means and methods comprise the use of chemicals, electrical heating, and various mechanical scraping devices. In general, such means and methods are expensive and have other objectionable features.

A common mode, of preventing the formation of deposits on the tubing and removing such deposits as they are formed, comprises attaching mechanical paraffin scrapers to the sucker rods. Such scrapers remove the deposits from the oil well tubing as it is formed so that it is flushed out of the well with the oil passing therethrough. In most cases, the scrapers and the modes of attaching the same to the sucker rods are such that it is necessary to transport the sucker rods to a plant which is specially equipped for the attachment of the scrapers. This is an expensive process and requires the wells to be shut down for considerable periods of time. C. E. Blackburn, in Patent 2,321,275, has disclosed a simple and inexpensive detachable scraping blade for sucker rods which are simultaneously reciprocated and rotated. While such scraper blades of Blackburn have been commercially successful, it is difficult to fasten the blades to the sucker rod sufficiently firmly and there is

2

a tendency for the blades to become loose in operations extending over long periods of time. R. C. Lister, in Patent 2,468,503, has disclosed an improved method for attaching scraper blades of the type disclosed by Blackburn to the sucker rods. While such method of Lister results in firmly securing the blades to the rods, it has the disadvantage that the sucker rods must be transported to a plant which is specially equipped for the attachment and replacement of the scraper blades.

It is an object of my invention to provide a novel type of paraffin scraper blade which is adapted to be detachably attached to sucker rods that are simultaneously reciprocated and rotated. Another object is to provide a novel type of paraffin scraper blade which can be securely attached to the sucker rods or removed therefrom at the oil well and without requiring transportation of the sucker rods to a separate plant for attachment or replacement of the scraper blades. A further object is to provide a sucker rod having paraffin scraper blades detachably secured thereto in a firm manner and which can be quickly and easily removed from the sucker rod or replaced at the oil well. Further objects are to advance the art. Still further objects will appear hereinafter.

The above and other objects may be accomplished in accordance with my invention which comprises providing an elongated paraffin scraper blade composed of steel at least 4 inches long and provided with an elongated opening having a width slightly greater than the diameter of the sucker rod and a length of from about 3 to about 7.5 times its width extending coaxially of the blade, the end portions of the blade being about $\frac{1}{16}$ to about $\frac{1}{2}$ inch thick and extending beyond the ends of the opening for at least $\frac{1}{2}$ inch, and the side portions of the blade opposite the opening being composed of spring steel about $\frac{1}{16}$ to about $\frac{1}{4}$ inch thick.

Such paraffin scraper blade is adapted to be attached to the sucker rod by placing the blade so that the end portions bear against one side of the sucker rod and the opening is opposite the sucker rod, pressing the side portions of the blade midway their length to a position beyond the opposite side of the sucker rod, then inserting a key between such opposite side of the sucker rod and the side portions of the scraper blade, and then releasing the sides of the blade so that they spring partway back to bear against the key with a spring tension of from about 100 to about 500 pounds. Such spring tension is suffi-

cient to maintain the scraper blade and key firmly in position by the friction of the surfaces of the end portions of the blade and the surface of the key on the surfaces of the sucker rod, and it is unnecessary to otherwise secure the key to the scraper blade. Such scraper blade can be easily removed for repair or replacement by reversing such operation.

It will be apparent that such scraper blades are simple and economical and may be quickly and easily applied to the sucker rods or detached therefrom at the oil well without transporting the sucker rods to a special plant and without shutting down the well for any considerable periods of time.

Each sucker rod will be provided with one or more of such scraper blades extending for substantially its length. Usually, each blade is from 4 inches to about 3 feet in length, and each sucker rod will carry a plurality of such blades spaced longitudinally of the rod at distances less than the length of the stroke of the rod. However, a sucker rod may carry a single scraper blade having a length substantially equal to the length of the sucker rod.

Preferably, when a scraper blade is sufficiently long, it will be provided with a plurality of such elongated openings spaced longitudinally of the blade. Also, preferably, such a blade will be attached to the sucker rod at each opening in the manner heretofore described. A blade having a plurality of such openings will have "an elongated opening" and also may be considered to be a series of connected scraper blades each having an elongated opening.

The scraper blade, when attached to the sucker rod, should be under a spring tension of from about 100 to about 500 pounds, that is, should exert a total force of from about 100 to about 500 pounds on the surface of the sucker rod. Usually, a total force of about 100 pounds is sufficient for a scraper blade up to 1 foot in length. The maximum force will depend upon the size and strength of the sucker rod and should be insufficient to bend the rod. A force of 400 to 500 pounds, exerted over not more than 1 foot of the length of the sucker rod, is permissible for the usual sucker rod of ⅝ inch diameter. The selection of the spring steel for each scraper blade is within the skill of the art.

In order that my invention may be more readily understood, reference will be made to the following detailed description and claims taken in connection with the accompanying drawings wherein like reference characters designate like parts.

Fig. 1 is a front view of one form of the paraffin scraper blades of my invention, showing it attached to a sucker rod;

Fig. 2 is a side view of the structure of Fig. 1;

Fig. 3 is an end view of the structure of Fig. 2, with the sucker rod shown in cross section;

Fig. 4 is a view similar to Fig. 1, showing a different form of scraper blade of my invention;

Fig. 5 is a side view of the structure of Fig. 4;

Fig. 6 is an end view of the structure of Fig. 5, with the sucker rod shown in cross section;

Fig. 7 is a plan view of a blank for forming into a third form of scraper blade of my invention;

Fig. 8 is an end view of the structure of Fig. 7;

Fig. 9 is a view similar to Fig. 7, showing the scraper blade formed for attachment to the sucker rod and with the blade placed on the sucker rod ready for attachment thereto;

Fig. 10 is an end view of the structure of Fig. 9;

Fig. 11 is a side view of the structure of Fig. 9, with the blade secured to the sucker rod;

Fig. 12 is a plan view of the side parts of a fourth form of scraper blade of my invention;

Fig. 13 is an end view of one of the connecting end parts for connecting the side parts of Fig. 12; and

Fig. 14 is a side view of the structure of Fig. 13.

Referring more particularly to the structure of Figs. 1 to 3, a sucker rod **20** about ⅝ inch in diameter has attached thereto a scraper blade **22** about 6 inches long provided with an elongated opening **24** about ¾ inch wide and about 4½ inches long extending coaxially of the blade. In this instance, the ends of the opening are rounded, but they may be square if desired. The scraper blade **22** is made of spring steel about ⅛ inch thick, and may be considered to consist of two spaced similar connecting end parts **28** and two spaced similar elongated side parts **26** provided with scraping edges **30**. The scraper blade is about 2⅛ inches wide, although it will be understood that the width of the blade will vary with the size of the tubing in which it is to be employed so that its width will be slightly less than the diameter of the tubing and the scraping edges **30** will be adjacent the inner surface of the wall of the tubing, as is well known to those skilled in the art. The side parts **26** of the scraper blade have been pressed under spring tension to a position beyond the side of the sucker rod opposite that upon which the connecting end parts **28** rest, have had a key **32** inserted between the rod and the side parts **26** of the scraper blade, and the side parts of the scraper blade had been allowed to spring back so that they bear upon the key **32** with a spring tension of from about 100 to about 500 pounds.

The key **32** is shown as a flat steel strip about ⅛ inch thick, about ¾ inch wide and about 2 inches long. It extends transversely across the opening **24** in the scraper blade and the side parts **26** of the blade at the bottom of the bends therein and has a wide surface at its midportion bearing against a side of the sucker rod and the opposite side surface of its ends bearing on the wide surfaces of the side parts of the scraper blade.

The scraper blade **22** may originally be a single flat strip of spring steel which is sufficiently flexible to be bent under spring tension as above described. Usually, however, the blade will be stamped out of sheet steel and formed with its connecting parts **28** bowed so that their inner surfaces are curved on a radius substantially equal to the radius of the sucker rod, providing large bearing surfaces to contact the sucker rod. Also, each side part **26** of the scraper blade is usually preformed in bent position so that its midportion will be spaced from the plane connecting its ends by a distance less than the diameter of the sucker rod. The cumulative preformation of the connecting parts and side parts will be such that, when the blade is placed upon the sucker rod with its connecting parts bearing against a side of the sucker rod, the midportion of each side part will be adjacent the opposite side of the sucker rod. After being so formed, the blade will be tempered or otherwise heat treated to give it the desired springiness. For example, a scraper blade of such construction was made from SAE 1075 carbon steel and, after preforming, heat treated at a Rockwell C scale of 51–52 to give a Brinell hardness of about 514–534. The key was made of the same ma-

terial. Such preforming of the scraper blade permits the use of stiffer spring steel.

It will be understood that the dimensions heretofore given are for illustrative purposes solely. The blade may be from about 1/16 to about 1/4 inch thick. The width of the opening, the distance between the opposed inner edges of the side parts, will depend upon the diameter of the sucker rod to which the blade is to be attached and will be slightly greater than the diameter of the sucker rod so that the blade can be applied to the sucker rod in the described manner. The opening may be from about 3 to about 7.5 times its width. The blades should be at least 4 inches long and may be as long as desired. However, blades, of the type shown in Figs. 1 to 3, will preferably be from about 6 to about 12 inches long. The connecting end parts of the blade should extend for at least 1/2 inch beyond the ends of the opening, so as to provide sufficient strength to prevent them readily breaking in service. Usually, the connecting end parts 28 will be from about 3/4 to about 1 inch wide. While I have shown the blade as being tapered toward its ends, it will be understood that this is not necessary but that it may be of the same width throughout its length, with square ends. However, in the latter case, it will usually be desirable to have the corners rounded so as to avoid sharp corners.

The keys may be made of the same material as the blades and should be from about 1/2 inch to about 1 inch wide. However, the keys may be made of a different steel, particularly a more rigid steel than the blades, and may be from about 1/16 to about 1/2 inch thick. The keys may be as long as the width of the blade but should not exceed the width of the blade. Preferably, they are made slightly shorter than the width of the blade.

Figs. 4 to 6 illustrate another form of scraper blade 34 of my invention attached to the sucker rod 20. This scraper blade is provided with two longitudinally spaced openings 36, similar to the opening 24 of the scraper blade of Figs. 1 to 3. Otherwise, the scraper blade 34 is similar to that of Figs. 1 to 3 and may be made and secured to the sucker rod in the same manner. It is composed of two side parts 38, two connecting end parts 42, and a middle connecting part 46 between the two openings and similar to the connecting end parts 42 and functioning in a similar manner. The side parts 38, midway the length of the openings, have been pressed under spring pressure to a position beyond the opposite side of the sucker rod and the keys 48 inserted as shown and as described in relation to Figs. 1 to 3. In this case, the key 48 is bowed midway between its ends so that the radius of the inner surface of the bowed portion is substantially equal to the radius of the sucker rod, forming an enlarged bearing surface. As in the case of the structure of Figs. 1 to 3, the blade 34 may be made of a flat spring steel strip which is sufficiently elastic so that it can be sprung into the desired position without exceeding its elastic limit. However, in practice, the scraper blade 34 is made of stiffer spring steel, such as SAE 1075 carbon steel, and the connecting parts 42 and 46 preformed with bowed midportions and the side parts 38 preformed in bent position in the manner heretofore described with respect to the blades of Figs. 1 to 3. Preferably, the bowed portions of the connecting parts will extend over an arc of from about 60° to about 180°, generally

about 60° to about 80°. Usually the blades of Figs. 4 to 6 will be from 6 inches up to about 3 feet in length but preferably will be from about 8 to about 12 inches in length. Their dimensions may be otherwise varied as described with respect to the blades of Figs. 1 to 3.

It will be apparent that blades, of the character shown in Figs. 4 to 6, may be made as long as desired up to the length of the sucker rod and provided with three or more longitudinally spaced openings similar to the two openings shown in Figs. 4 to 6.

Figs. 7 to 11, inclusive, illustrate a third form of scraper blade of my invention. In this structure, the blade 52 is a substantially rectangular strip of steel provided with a rectangular opening 54 extending coaxially of the blade, and consists of connecting end parts 60 and elongated side parts 56 having outer scraping edges 58. It is originally in flat form as shown in Figs. 7 and 8 which, if the blade is to be applied to a 1/2 inch sucker rod, will be about 2 1/4 inches in width with the opening about 1 1/4 inches wide. The end parts 60 will then be formed to be permanently bent about the axis of the blade into substantially U-shaped form as shown at 62 in Fig. 10 with the inner surface having a radius substantially equal to the radius of the sucker rod over an arc of about 180°. The blade is then heat treated in known manner to give it the desired spring steel characteristics.

The bending of the connecting end parts 60 brings the side parts 56 closer together so that the opening 54 will be about 5/8 inch measured from the inner edge of one side part 56 to the inner edge of the other side part 56; or, in other words, the straight-line distance, between the junctions of each connecting part with the respective inner edges of the side parts, will be slightly greater than the diameter of the sucker rod. The outer scraping edges 58 will then be spaced apart by the distance required by the tubing in which the blade is to be used. Such bending of the connecting end parts 60 also brings the side parts 56 to a position adjacent the side of the sucker rod opposite to that against which the midportions 62 of the end parts will bear.

This blade 52 as so formed will be placed upon the sucker rod as shown in Figs. 9 and 10, then the midportions of the side parts 56 will be pressed beyond the sucker rod and a key 32, similar to that shown in Figs. 1 to 3, will be inserted in the manner hereinbefore described with respect to the other forms of blade of my invention. In this construction, since the entire blade is made of spring steel, the spring tension on the blade, when secured to the sucker rod, will tend to cause the lower portions of the legs of the U-shaped bends in the end parts to move toward each other and more firmly grip the sucker rod.

As described in connection with the other form of my invention the blade may be from about 1/16 to about 1/4 inch thick, and the end parts 60 may extend for any desired distance in excess of 1/2 inch beyond the ends of the openings 54. Also, the form of blade shown in Figs. 7 to 11 may be made of any desired length up to the length of the sucker rod and provided with a plurality of longitudinally spaced openings 54, as has been heretofore described with respect to the other blades of my invention.

Figs. 12 to 14 illustrate a form of blade similar to that shown in Figs. 7 to 11, but made of a plurality of separate pieces. As shown in Fig. 12, the side parts 64 are made of two similar pieces

of spring steel from about 1/8 to about 1/4 inch thick, provided with outer scraping edges 66 and inner opposing edges 68. Each side part 64 is provided with a small opening 70 at each end to accommodate a rivet. The connecting parts 72 may be made of the same material as the side parts 64 or may be made of more rigid steel. These connecting parts 72 may be from about 1/8 to about 1/2 inch thick and should be at least 1/2 inch wide. Each connecting part is formed with a U-shaped midportion, having the inner surface curved on an arc of about 180° and having a radius substantially equal to the radius of the sucker rod to which the blades are to be attached. Each connecting part 72 is provided at each end with an outwardly extending foot 74 which extends outward for a distance substantially equal to the width of the side parts 64. Each foot 74 is provided at its center with an upstanding rivet 76 adapted to fit in the openings 70 of the side parts 64.

The blade, to be attached to the sucker rod, is formed from the parts shown in Figs. 12 to 14 by placing an end part at each end of the pair of side parts, inserting the rivets 76 through the openings 70, and riveting the parts together. The scraper blade will then be applied to the sucker rod in the manner heretofore described with respect to Figs. 7 to 11.

It will be apparent that the structure of Figs. 12 to 14 can be considerably modified. The side parts 64 may carry the rivets 76 and the outwardly extending feet 74 of the end parts may be provided with the holes 70. It is not necessary to make the rivets 76 integral with any of the parts, but both the side parts and the end parts may be provided with registering holes for receiving rivets, bolts, and the like. Furthermore, holes and rivets may be eliminated entirely, and the side parts welded to the end parts. Still further, the side parts can be made considerably longer, up to substantially the length of the sucker rod, and secured to additional connecting parts 72 intermediate their lengths as well as their ends, so as to provide a scraper blade having a plurality of longitudinally spaced openings, similar to those described with respect to the other forms of my invention.

It will be understood that the forms of scraper blades shown in the drawings and hereinbefore described in detail are merely illustrative and that my invention is not intended to be limited to any of the specific embodiments so disclosed and described. Usually, the end parts or connecting parts will be from about 1/2 to about 1 inch wide; that is, they will extend for that distance along the length of the rod. When the scraper blades are provided with a single opening, they will usually be from about 4 inches to about 12 inches long and a plurality of such blades will be secured to each sucker rod and spaced apart by distances slightly less than the length of the stroke of the rod in operation. When a scraper blade contains only two elongated openings it may be from about 6 inches to about 3 feet in length and each sucker rod will be provided with a plurality thereof spaced apart by a distance less than the stroke of the rod. The same considerations will prevail with scraper blades of greater length, but of insufficient length to extend over more than one-half the length of the sucker rod. It will also be understood that scraper blades of different forms and different lengths may be applied to a single sucker rod.

The resistance of the scraper blades to slipping on the sucker rod may be increased by providing hardened and rough or file-like surfaces on the connecting parts of the blades and on the keys. Also, if the end of the opening in the scraper blade is square across the longitudinal axis of the blade as in the forms shown in Figs. 7 to 14, they may be provided with sharp edges, whereby the spring tension will cause such edges to tend to bite into the rod and prevent slipping. Such expedients will reduce the spring tension required to maintain the scraper blades and keys in position. However, such rough bearing surfaces and sharp edges will generally be objectionable and usually will be unnecessary. Ordinarily, the surfaces of the scraper blades and of the keys will be substantially smooth, since the friction of the bearing surfaces on the sucker rod under the high tensions employed will be sufficient to maintain the scraper blades and keys in position on the sucker rod over long periods of service. Obviously, high polished bearing surfaces will usually be avoided.

It will be apparent that when the scraper blades are made with their connecting parts prebowed, or their side parts prebent, or both, the degree of prebowing and prebending may be varied from substantially zero to the maximum shown and described. That is, the distance, between the bends in the side parts and the midportions of the connecting parts measured perpendicular to the axis of the blade, may vary from zero up to substantially the diameter of the sucker rod to which the blade is to be attached.

While I have shown the keys as being bent at their mid-portion 50 in Figs. 4 to 6, it will generally be preferred to employ flat keys, such as those shown in Figs. 1 to 3. The flat key will be maintained in position under ordinary conditions. Bowed keys, of the character shown in Figs. 4 to 6, make it necessary to spring the side parts of the blades greater distances beyond the adjacent side of the sucker rod to permit insertion of the keys. This increases the danger of bending the side parts beyond the elastic limit of the steel; or requires the use of more flexible steel, which must spring back a greater distance before the side parts contact the keys, so that part of the spring pressure will be lost and the maximum spring tension will not be obtained.

It will also be apparent that the side parts need not be of the same width, but that one side part may be of a width to provide a paraffin scraping edge and the other side part be made considerably narrower so that its outer edge is spaced a material distance from the oil well tubing. However, such latter form of scraping blade does not have any substantial advantages over the double-edged scraping blades.

It will be seen that, by my invention, I have provided a novel type of paraffin scraper blade which as adapted to be detachably attached firmly to a sucker rod and which may be readily and easily attached to the sucker rod or removed therefrom at the oil well, without requiring transportation of the sucker rod to a specially equipped plant or long shut downs of the oil well. It will also be seen that I have provided a novel combination of a sucker rod having firmly secured thereto in a novel manner a novel type of paraffin scraper, which scraper blade can be readily removed for repairs or replacement at the oil well. Furthermore, such paraffin scraper blades, and the means for attaching them to the sucker rod, are simple and economical in construction and manufacture. Therefore, it will be apparent that

my invention constitutes a valuable advance in and contribution to the art.

I claim:

1. An elongated paraffin scraper blade adapted to be attached to a sucker rod, which blade consists of a single slotted strip of spring steel about $\frac{1}{16}$ to about ¼ inch thick and at least 4 inches long and comprises spaced similar elongated side portions and spaced similar connecting portions extending transversely between the side portions, the side portions having outer scraping edges and parallel inner edges spaced apart by a distance slightly greater than the diameter of the sucker rod; and the connecting portions being at least ½ inch wide and spaced apart by a distance equal to from 3 to about 7.5 times the diameter of the sucker rod and each having a longitudinally bowed midportion whose inner radius is substantially equal to the radius of the sucker rod; the plane of the midportions of the connecting portions being spaced oppositely from the plane of the midportions of the side portions by a distance up to substantially the diameter of the sucker rod.

2. An elongated paraffin scraper blade adapted to be attached to a sucker rod, which blade consists of a single slotted strip of spring steel about $\frac{1}{16}$ to about ¼ inch thick and at least 4 inches long and comprises spaced similar elongated side portions and spaced similar connecting portions extending transversely between the side portions, the side portions having outer scraping edges and parallel inner edges spaced apart by a distance slightly greater than the diameter of the sucker rod and each side portion being bent transversely intermediate its ends; and the connecting portions being at least ½ inch wide and spaced apart by a distance equal to from 3 to about 7.5 times the diameter of the sucker rod, and each having a longitudinally bowed midportion whose inner radius is substantially equal to the radius of the sucker rod; the plane of the midportions of the connecting portions being spaced oppositely from the plane of the midportions of the side portions by a distance up to substantially the diameter of the sucker rod.

3. An elongated paraffin scraper blade adapted to be attached to a sucker rod, which blade consists of a single slotted strip of spring steel about $\frac{1}{16}$ to about ¼ inch thick and at least 4 inches long and consists of two spaced similar elongated side portions and two spaced similar connecting portions extending transversely between the side portions, the side portions having outer scraping edges and parallel inner edges spaced apart by a distance slightly greater than the diameter of the sucker rod; and the connecting portions being at least ½ inch wide and spaced apart by a distance equal to from 3 to about 7.5 times the diameter of the sucker rod and each having a longitudinally bowed midportion whose inner radius is substantially equal to the radius of the sucker rod; the plane of the midportions of the connecting portions being spaced oppositely from the plane of the midportions of the side portions by a distance up to substantially the diameter of the sucker rod.

4. An elongated paraffin scraper blade adapted to be attached to a sucker rod, which blade consists of a single slotted strip of spring steel about $\frac{1}{16}$ to about ¼ inch thick and at least 4 inches long and consists of two spaced similar elongated side portions and two spaced similar connecting portions extending transversely between the side portions, the side portions having outer scraping edges and parallel inner edges spaced apart by a distance slightly greater than the diameter of the sucker rod and each side portion being bent transversely intermediate its ends; and the connecting portions being at least ½ inch wide and spaced apart by a distance equal to from 3 to about 7.5 times the diameter of the sucker rod, and each having a longitudinally bowed midportion whose inner radius is substantially equal to the radius of the sucker rod; the plane of the midportions of the connecting portions being spaced oppositely from the plane of the midportions of the side portions by a distance up to substantially the diameter of the sucker rod.

5. An elongated paraffin scraper blade adapted to be attached to a sucker rod, which blade consists of a single slotted strip of spring steel about $\frac{1}{16}$ to about ¼ inch thick and at least 6 inches long and comprises two spaced similar elongated side portions and three spaced similar connecting portions extending transversely between the side portions, the side portions having outer scraping edges and parallel inner edges spaced apart by a distance slightly greater than the diameter of the sucker rod; and the connecting portions being at least ½ inch wide and spaced apart by a distance equal to from 3 to about 7.5 times the diameter of the sucker rod and each having a longitudinally bowed midportion whose inner radius is substantially equal to the radius of the sucker rod; the plane of the midportions of the connecting portions being spaced oppositely from the plane of the midportions of the side portions by a distance up to substantially the diameter of the sucker rod.

6. An elongated paraffin scraper blade adapted to be attached to a sucker rod, which blade consists of a single slotted strip of spring steel about $\frac{1}{16}$ to about ¼ inch thick and at least 6 inches long and consists of two spaced similar elongated side portions and three longitudinally spaced similar connecting portions extending transversely between the side portions, the side portions having outer scraping edges and parallel inner edges spaced apart by a distance slightly greater than the diameter of the sucker rod and each side portion being bent transversely midway of each opening; and the connecting portions being at least ½ inch wide and spaced apart by a distance equal to from 3 to about 7.5 times the diameter of the sucker rod, and each having a longitudinally bowed midportion whose inner radius is substantially equal to the radius of the sucker rod; the plane of the midportions of the connecting portions being spaced oppositely from the plane of the midportions of the side portions by a distance up to substantially the diameter of the sucker rod.

7. In combination, a sucker rod and an elongated paraffin scraper blade secured thereto, said blade consisting of a single slotted strip of spring steel about $\frac{1}{16}$ to about ¼ inch thick and at least 4 inches long and provided with 1 to 2 elongated openings each having a width slightly greater than the diameter of the sucker rod and a length of from about 3 to about 7.5 times its width extending coaxially of the blade; each of the transverse portions of the blade being at least ½ inch wide and bearing against the same side of the sucker rod, and being permanently bowed about the longitudinal axis of the blade so that the surfaces bearing upon the sucker rod are curved on a radius substantially equal to the radius of the sucker rod; the side portions of the blade op-

posite the opening having outer scraping edges and being bent transversely midway their length under a spring tension of from about 100 to about 500 pounds to a position adjacent the opposite side of the sucker rod; and a steel key from about $\frac{1}{16}$ to about ½ inch thick and from about ½ to about 1 inch wide extending transversely across the opening and the side portions of the blade at the bottom of the bends therein, a wide surface of the midportion of the key bearing against the aforesaid opposite side of the sucker rod and the opposite surface of the ends of the key bearing upon the surfaces of the side portions of the blade and holding the side portions in their spring bent positions.

8. In combination, a sucker rod and an elongated paraffin scraper blade secured thereto, said blade consisting of a single slotted strip of spring steel about $\frac{1}{16}$ to about ¼ inch thick and at least 4 inches long and provided with a single elongated opening having a width slightly greater than the diameter of the sucker rod and a length of from about 3 to about 7.5 times its width extending coaxially of the blade; the end portions of the blade extending beyond the ends of the opening for at least ½ inch and bearing against the same side of the sucker rod and being permanently bowed about the longitudinal axis of the blade so that the surfaces bearing upon the sucker rod are curved on a radius substantially equal to the radius of the sucker rod, the side portions of the blade opposite the opening having parallel inner edges and outer scraping edges and being bent transversely midway their length partially permanently and partially under a spring tension of from about 100 to about 500 pounds to a position adjacent the opposite side of the sucker rod; and a steel key from about $\frac{1}{16}$ to about ½ inch thick and from about ½ to about 1 inch wide extending transversely across the opening and the side portions of the blade at the bottom of the bends therein, a wide surface of the midportion of the key bearing against the aforesaid opposite side of the sucker rod and the opposite surface of the ends of the key bearing upon the surfaces of the side portions of the blade and holding the side portions in their spring bent positions.

9. In combination, a sucker rod and an elongated paraffin scraper blade secured thereto, said blade consisting of a single slotted strip of spring steel about $\frac{1}{16}$ to about ¼ inch thick and at least 6 inches long and provided with two longitudinally spaced elongated openings each having a width slightly greater than the diameter of the sucker rod and a length of from about 3 to about 7.5 times its width extending coaxially of the blade, the transverse portions of the blade between the openings and beyond the ends of the openings being at least ½ inch wide and bearing against the same side of the sucker rod and being permanently bowed about the longitudinal axis of the blade so that the surfaces bearing upon the sucker rod are curved on a radius substantially equal to the radius of the sucker rod, the side portions of the blade opposite the openings having outer scraping edges and parallel inner edges and each side portion being bent transversely midway of each opening partially permanently and partially under a spring tension of from about 100 to about 500 pounds to a position adjacent the opposite side of the sucker rod; and 2 steel keys from about $\frac{1}{16}$ to about ½ inch thick and from about ½ to about 1 inch wide each extending transversely across an opening and the side portions of the blade at the bottom of the bends therein, a wide surface of the midportion of each key bearing against the aforesaid opposite side of the sucker rod and the opposite surface of the ends of each key bearing upon the surfaces of the side portions of the blade and holding the side portions in their spring bent positions.

FORREST LEON CARSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
372,625	Jones	Nov. 1, 1887
662,847	Wood	Nov. 27, 1900
758,780	Renaker	May 3, 1904
1,566,451	Vaughn	Dec. 22, 1925
2,321,275	Blackburn	June 8, 1943
2,575,307	Walker	Nov. 13, 1951