

Jan. 23, 1951

I. T. MINYARD

2,539,353

PARAFFIN SCRAPER STOP

Filed Aug. 12, 1946

3 Sheets-Sheet 1

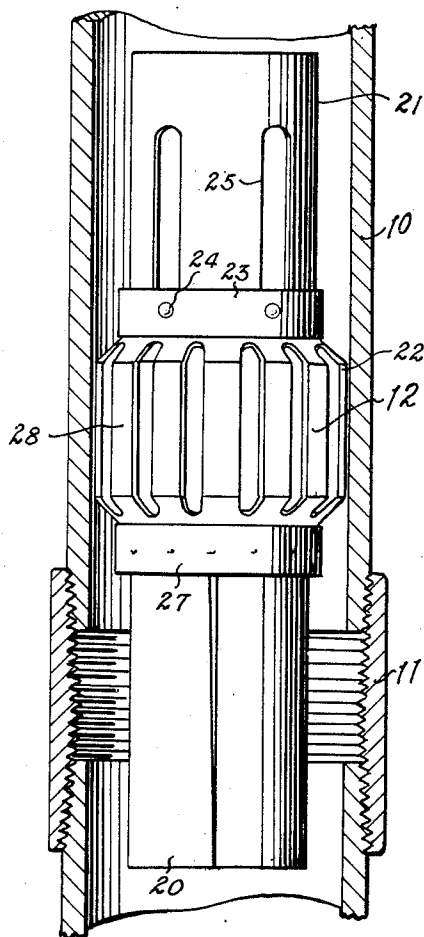


Fig. 1

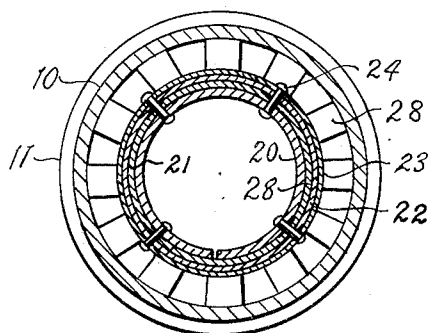


Fig. 3

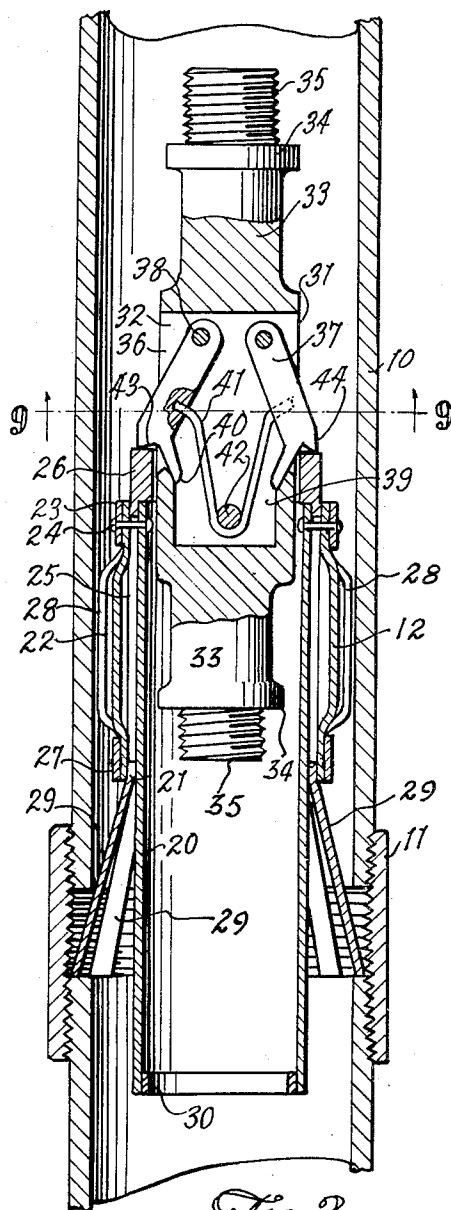


Fig. 2

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3 Sheets-Sheet 2

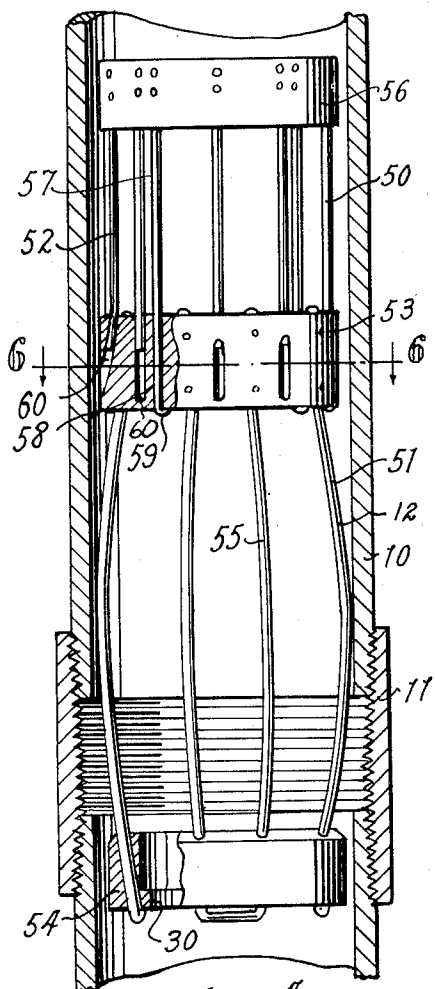


Fig. 4

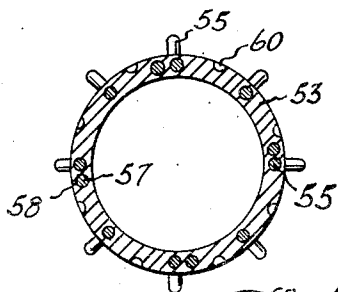


Fig. 6

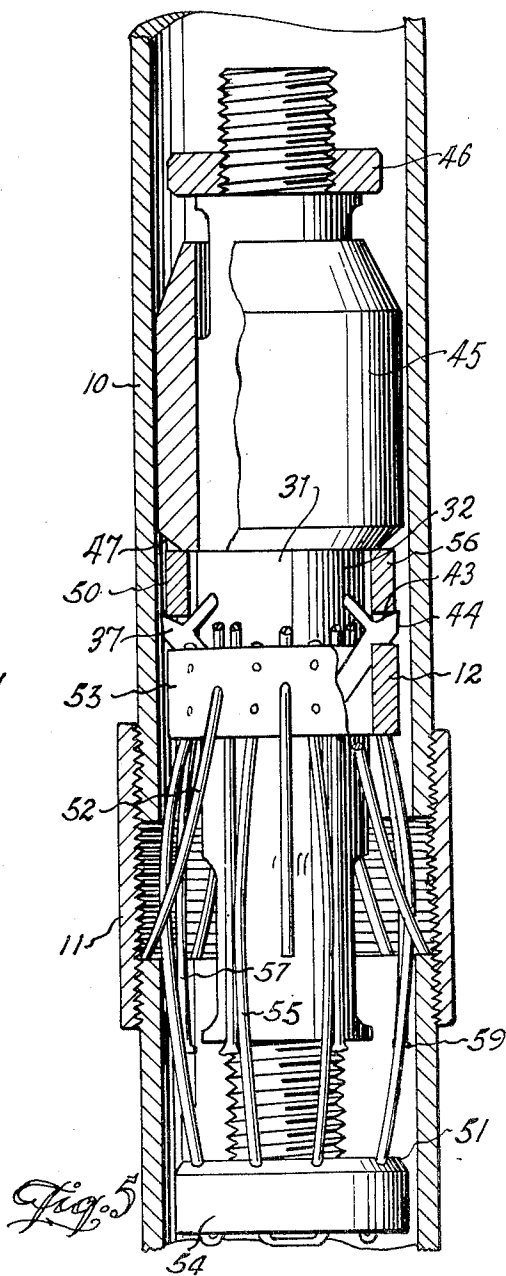


Fig. 5

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3 Sheets-Sheet 3

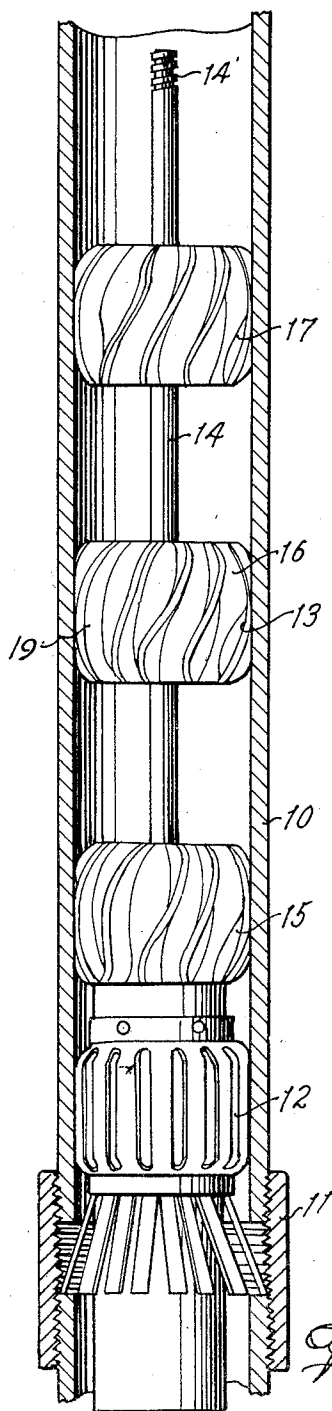


Fig. 7

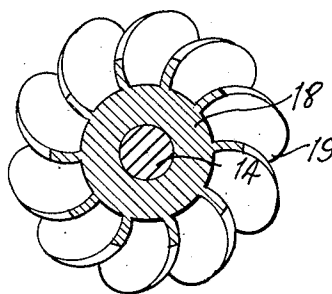


Fig. 8

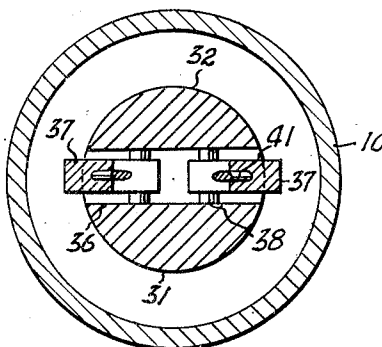


Fig. 9

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UNITED STATES PATENT OFFICE

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PARAFFIN SCRAPER STOP

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1 Claim. (Cl. 166—18)

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This invention relates to new and useful improvements in paraffin scraper stops.

In scraping the paraffin incrustation from well tubing and pipes, it has been customary to pump a scraper longitudinally through a pipe or tubing and these scrapers are known as "rabbits." When the rabbit is pumped down a pipe or tubing, it is highly desirable to have a stop below the paraffin section on which the scraper comes to rest. It is also desirable to locate this stop just below the paraffin section, which may be several hundred feet above the bottom of the well and prevent the rabbit from falling to the bottom of the well, thus saving the time and effort required to pump said rabbit up to the location of the stop. It is also advantageous to have the cutters or scrapers so disposed that when the rabbit is passing through a gate valve or T, at least two of said cutters or scrapers will always be operative in the tubing, above and below said valve or T; thus one object of the invention is to provide an improved paraffin scraping apparatus which includes a rabbit or scraper and a stop arranged to meet the foregoing requirements.

Another object of the invention is to provide an improved rabbit or scraper having a plurality of scraper or cutting bodies disposed and spaced so that at least two of said bodies will be operative in the tubing when one of said bodies is passing through a gate valve or T, thus guiding the scraper, limiting its side movement and preventing it from becoming fouled in a valve or T.

An important object of the invention is to provide an improved stop which may be lowered into the tubing in a collapsed or retracted form and expanded or released at the desired elevation, whereby it may be set or anchored in a coupling at the desired elevation, as well as removed from the tubing, without disturbing said tubing.

A further object of the invention is to provide an improved stop which when set in the tubing, will provide adequate means for arresting the downward movement of the scraper and at the same time permit the passage of small tools and devices therethrough.

Still another object of the invention is to provide an improved stop including anchor or stop fingers adapted to catch in a tubing or pipe coupling, which fingers are retracted, while the stop is being lowered to the desired location; together with friction elements engaging the inner surface of the tubing and acting both to guide the stop in its descent and to support the stop,

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whereby its fingers may be released or expanded into anchoring position.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawing, wherein an example of the invention is shown, and wherein:

Fig. 1 is a view, partly in elevation and partly in section, of a portion of a well tubing having a stop therein, constructed in accordance with the invention and in its collapsed position.

Fig. 2 is a transverse sectional view showing the stop in anchored position,

Fig. 3 is a horizontal cross-sectional view through the stop at the rivets, the parts being in the position illustrated in Fig. 2,

Fig. 4 is a view similar to Fig. 1, illustrating a modified form of the invention,

Fig. 5 is a transverse sectional view of the same form, anchored in a collar of the tubing,

Fig. 6 is a horizontal cross-sectional view of the stop, taken on the line 6—6 of Fig. 4,

Fig. 7 is a view of a rabbit constructed in accordance with the invention, with the stop illustrated in Fig. 2, anchored in the tubing, the rabbit and stop being in elevation and the tubing being in section,

Fig. 8 is a horizontal cross-sectional view through one of the scraping bodies of the rabbit, and

Fig. 9 is a horizontal cross-sectional view at the line 9—9 of Fig. 2.

In the drawings, the numeral 10 designates a well tubing or pipe made up of a plurality of sections coupled by the usual collars, one of which is shown at 11. In making up such strings of tubing or pipe, it is the practice to leave a sizeable space between the ends of the sections, within the collar. In using the scraping apparatus, a stop, indicated generally by the numeral 12, is anchored in the collar as shown in Fig. 7. This stop is located just below the paraffin section which may be several hundred feet above the bottom of the well and its purpose is to arrest the rabbit and prevent it from sinking or moving to the bottom of the well.

An improved rabbit 13 is shown in Fig. 7, resting upon the stop 12. This rabbit includes a longitudinal mandril or rod 14 having a fishing neck 14' at its upper end. Three whirling type, annular scrapers 15, 16 and 17 respectively, are mounted on the mandril. Each scraper includes

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a hub 18 which is fastened on the mandril and upright wings or blades 19, curved outwardly from the hub. These wings each have a sinuous form, vertically.

It has been the practice to employ a scraper with two of these scrapers spaced apart, but where two scrapers are employed, as they have been for many years, only one of said scrapers will be located in the tubing, when the other scraper is passing through a gate valve or T (not shown) and consequently such rabbits, being motivated entirely by a pressure fluid, and are not guided by the tubing and frequently foul or become caught in a valve or T. The rabbit 13 has its scraper 15 at its bottom so as to come to rest upon the stop 12; while its scraper 17 is near its upper end. The scraper 16 is intermediate the other scrapers and all of said scrapers are spaced apart sufficiently that when the rabbit is being pumped through a valve or T, two of said scrapers will always be in the tubing, thus guiding the rabbit and preventing it from becoming fouled or caught in said fixtures.

The stop 12 may assume different forms having dominating features in common, which will be fully described. One form is shown in Figs. 1, 2 and 3, while another form is shown in Figs. 4, 5 and 6.

In Figs. 1, 2 and 3, the stop 12 includes an inner tubular core 20, surrounded by an annular carrier 21, which has a sliding fit thereon. An annular supporting member 22 surrounds the carrier. The upper end of the supporting member is surrounded by a ring or collar 23 which is connected with the top of the core by radial rivets 24, extending through the member and vertical slots 25 in the carrier. These rivets are loose enough to permit a free sliding movement of the carrier between the core and the member. The carrier has an inwardly-directed annular flange 26 at its top, overhanging the upper edge of the core, so as to engage on the latter before the upper ends of the slots 25 engage the rivets, thus preventing shearing of said rivets or injury to the slots.

A bottom ring or collar 27 surrounds the lower end of the supporting member and is suitably secured thereto, as by peening or spot welding. The member between the collars is cut and extruded to form spaced, flat, vertical shoes or wall-engaging elements 28. The member is formed of resilient metal, thus making the shoes resilient. The projection of the shoes is such that they must be slightly compressed when inserted in the tubing 10, which provides a frictional engagement with the inner surface of the tubing. This contact while permitting the stop to be pushed down the tubing, is sufficient to hold the member in a stationary position when the carrier 21 is moved downwardly from the position shown in Fig. 1 to the position shown in Fig. 2.

Below the slots 25 the lower portion of the carrier, which is also formed of resilient metal, is slit vertically to form self expanding fingers 29, the lower ends of which are adapted to anchor on the upper edge of the lower tubing section in the collar 11. When the carrier 21 is pulled upwardly between the core 20 and the members 22, the fingers will be retracted and restrained from expansion; the stop thus being collapsed. For moving the stop downwardly in a tubing without releasing the fingers, an inwardly-directed flange 30 is provided within the bottom of the core. With the parts in the position shown in Fig. 1, it is obvious that a suitable tool inserted

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in the stop and engaged on the flange 30, may be used to push the stop down the tubing without releasing the fingers.

While any suitable tool 31 may be employed, I have illustrated a satisfactory tool in Figs. 2, 5 and 9. The tool includes a medial body 32 with integral pin shanks 33 at each end. At the outer end of each shank, a collar 34 is formed integral therewith and a screw-threaded pin 35 extends therefrom. The tool is reversible. The body is formed with a vertical slot 36, in the upper portion of which, a pair of oppositely directed dogs 37, are pivoted at 38. The lower portion of the slot is provided with a sump 39. The dogs have downwardly inclined lugs 40 on their lower ends which engage the upper edges of the sump to limit the outward swing of said dogs. A V-shaped spring 41 has its upper ends turned outwardly and embedded in the inner faces of the dogs, intermediate their ends. The spring is held under a cross pin 42 in the sump. The lower ends of the dogs 37 are cut at angles to form shoulders 43 and faces 44.

When the stop is to be inserted in the well, the dogs 37 are pressed inwardly so that the tool may be passed downwardly into the core 20. The dogs will expand so that their shoulders 43 will engage in the flange. The tool 31 is connected with a suitable rod string (not shown) by means of the upper pin 35 and the stop thus pushed down the well tubing. When the desired location is reached the tool is raised until the dogs spring out above the flange 27 of the carrier 21 (Fig. 1). The tool is again pushed downwardly. The frictional contact between the shoes 28 and the tubing wall will be sufficient to hold the member 22 stationary, whereby the tool moves the carrier 21 downward, thus releasing the fingers 29 which expand. This downward movement may be continued until the fingers anchor in the collar 11. Since the shoulders rest on the flange 26 and the latter rests upon the core 20, the member 22 will be moved downwardly because of the connection by the rivets 24.

After the stop has been anchored, the tool is withdrawn from the tubing. While the flange 26 is of sufficient diameter to arrest the rabbit 13, or any other rabbit, the internal diameter of said flange is ample to permit the passage of small tools and appliances through the stop; the same is also true of the flange 30. When it is desired to remove the stop, the tool 31 is inverted so that the dogs 37 will be directed upwardly. A cylindrical sleeve 45 (Fig. 5) is slidably mounted on the body 31 and a retaining ring 46 is screwed onto the adjacent pin 35. The lower edge of the sleeve is beveled at 47 and this beveled edge engages on the shoulders 43 of the dogs, whereby the sleeve is supported. The tool is lowered so that the dogs pass through the flange 26 of the core 20 (Fig. 2). Since the upper end of the sleeve 45 will engage the ring 46 and come to rest on top of the core, the passage of the dogs down into the core will be limited. When the tool is pulled upwardly, the shoulders 43 will engage under the flange 26 and the stop may thus be pulled from the well.

In the form shown in Figs. 4, 5 and 6, 50 designates the carrier, 51 the supporting member and 52 the fingers, the core being omitted. The supporting member includes an upper ring 53 and a lower ring 54. Bowed wires or rods 55 constitute the shoes and these wires have their ends suitably secured in the rings, whereby a unitary body is formed. The carrier 50 includes a top ring 56

in which the upper ends of the fingers 52 are suitably fastened.

Pilot rods 57 have their upper ends secured in the top ring and are mounted to slide through bores 58 in the ring 53 of the supporting member; the lower ends of the rods having heads 59 to limit the upward movement of the carrier. The fingers 52 are in the form of wires or wickers which have their lower ends curved to engage in guides 60, which extend from the top of the ring 53, downwardly and outwardly through the outer wall of said ring. The fingers being resilient will expand when the carrier is moved downwardly from the position shown in Fig. 4 to that shown in Fig. 5.

In running the stop into the tubing, the tool 31 is employed, however, instead of using the flange 30, the dogs 37 are engaged on top of the bottom ring 54. In anchoring the stop, the tool is pulled up until the shoulders 43 of the dogs engage on top of the ring 56, so that a downward movement of the tool will move the carrier 50 down to the anchoring position shown in Fig. 5. The retracting operation is the same as has been described, except that the dogs will engage under the ring 56; the fingers 52 preventing this ring from being moved down to the ring 53.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claim, without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

A paraffin scraper stop including, an elongate tubular core, a supporting member surrounding the core and spaced therefrom, wall engaging elements carried by the supporting member for engaging in a joint between pipe sections, means connecting the core with the supporting member, a carrier movable longitudinally between the core and the supporting member, resilient anchoring fingers carried by the carrier and initially retained between the core and the supporting member, and means for moving the carrier with respect to the core and supporting member to move said fingers therefrom, whereby said fingers may expand into anchoring position.

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