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V. EMANUEL
WELL CASING SCRAPER
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2,693,239

Fig. 1.

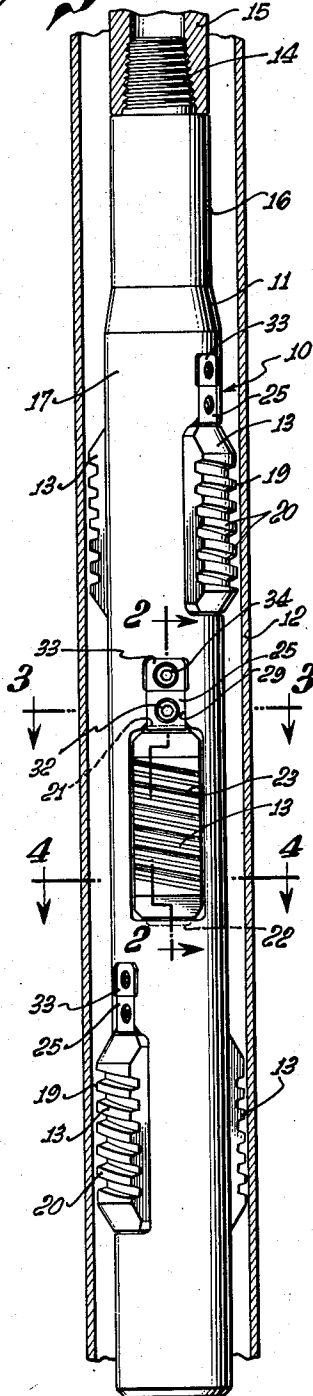


Fig. 2.

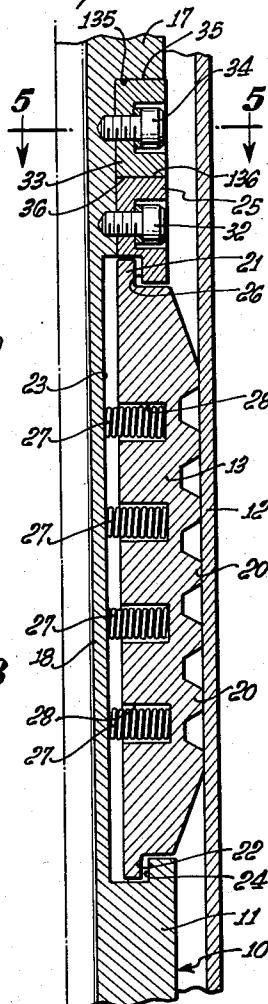


Fig. 3.

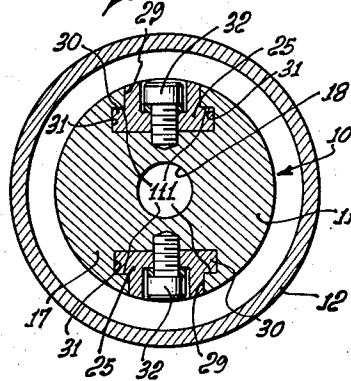


Fig. 4.

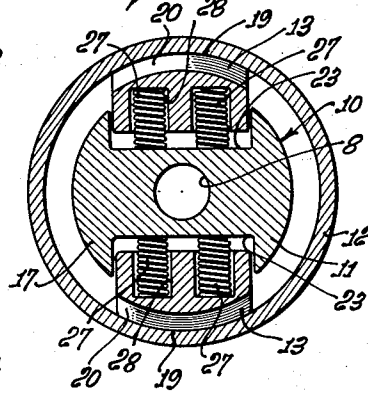


Fig. 5.

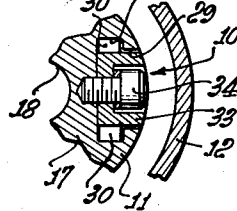
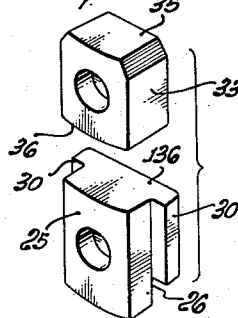


Fig. 6.



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WELL CASING SCRAPER

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8 Claims. (Cl. 166—173)

This invention relates generally to well tools and particularly to improved scraping devices for removing bullets, burrs, cement, paraffin, or other accumulations from a well casing or bore wall.

The scraping tools of the present invention are of a type including generally a tool body to be lowered into a well, and a number of wall engaging scraping members removably carried by and movable with the body. The invention is directed particularly to the provision in such a tool of improved means for positively retaining the scraping members to the body. In certain broad respects, the present invention may be considered to be an application of the general type of retaining arrangement shown in copending application Serial No. 224,568 filed June 5, 1951 by Henry Salvatori and Virgil R. Douglas, and owned by the assignee of this application.

An object of the invention is to so mount the scraping members to the body as to permit their easy removal and replacement, while at the same time effectively maintaining them against undesired displacement relative to the body in use. Specifically, I employ for attaching each scraping member to the body a specially formed retaining element mounted by the body for sliding movement between an active position, in which it positively holds the associated scraper to the body, and a retracted position in which the scraper is freely removable. Preferably, the scraper member has a pair of integral projections or flanges extending across its opposite ends and adapted to interfit with and be confined by the body and retaining element respectively, to hold the scraper to the body.

A further feature of the invention has to do with the provision of improved means for locking such a retaining element in its active scraper holding position. For this purpose, I may employ in conjunction with each retaining element an associated locking element attachable to the body in the retracting path of the retaining element to positively block its retraction from holding position. The locking element may be interposed between and directly engage both the retaining element and an opposed portion of the body, to maintain the retaining element in holding position independently of any strain on the fasteners which may be employed for attaching the two elements to the body.

To attain a most effective scraping action, each of the scraper members is preferably urged outwardly against the well casing by a plurality of springs interposed between the body and member. A particular feature of the invention involves the special construction of the device in a manner permitting variation of the force exerted by these springs. Specifically, I attain a regulation of the spring force by providing for a variation in the number of individual springs acting against each scraper. In this connection, it is noted that for a proper distribution of the spring force, to effectively stabilize the scraper members, at least four springs should bear against each member in all conditions of the apparatus. Consequently, in order to permit a variation of the spring force, I find it extremely important that the apparatus be adapted to receive a number of springs greater than four for each scraper.

The above and other features and objects of the present invention will be better understood from the following detailed description of the typical embodiment illustrated in the accompanying drawing, in which:

Fig. 1 is a view showing a casing scraper embodying the invention lowered to operative position in a well;

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Fig. 2 is an enlarged fragmentary vertical section through one of the scraper members of the device;

Figs. 3 and 4 are enlarged horizontal sections taken on lines 3—3 and 4—4 respectively of Fig. 1;

Fig. 5 is a fragmentary horizontal section taken on line 5—5 of Fig. 2; and

Fig. 6 is an enlarged exploded perspective view of one of the scraper retaining elements and the associated locking element.

The illustrated casing scraping device 10 includes a vertically elongated body 11 to be lowered into a well casing 12, and carrying a number of casing engaging scraper members 13. Body 11 has a threaded portion 14 at its upper end by which it is connectable to the lower end of a suspending and controlling tool string 15. Adjacent its upper threaded portion 14, the body may have a first cylindrical portion 16, beneath which is formed a second and somewhat enlarged diameter cylindrical portion 17 to which the various scraper members 13 are mounted. As seen in Figs. 3 and 4, the body may contain a central bore 18 extending vertically along its entire length.

The scraper members 13 are preferably arranged in staggered pairs as shown, the two members of each pair being carried by the body at diametrically opposite locations. Each scraper member is essentially rectangular and vertically elongated and presents an outer scraping face 19 having a series of slightly inclined vertically spaced casing engaging teeth 20. Extending across its upper and lower ends, each scraper member 13 has a pair of reduced thickness flanges or projections 21 and 22, by which it is retained to the body 11.

The scrapers 13 are partially received within individual rectangular recesses 23 in the body. Across the lower end of each recess 23, the body is undercut at 24 to receive and retain the lower flange 22 of the corresponding scraper. The upper flange 21 of the scraper is confined by a retaining element 25, whose lower end portion is undercut at 26 to receive the flange. Flanges 21 and 22 are of a thickness less than the spaces within which they are confined, to permit limited movement of the scraper member radially of body 11. The scraper member is urged radially outwardly against the casing by a number of coil springs 27 received within individual recesses 28 in the back of the scraper member and bearing against the opposed portions of the body. Preferably, each scraper member contains a number of recesses greater than four, as for instance four pairs as shown, so that the spring tension may be adjusted by removal or replacement of one or more springs, while always maintaining the scraper stabilized by a minimum of four springs.

Each retaining element 25 is received within an upper body recess 29 opening into and forming an upper reduced dimension extension of the corresponding scraper receiving recess 23. As best seen in Figs. 3 and 6, the retaining element has a pair of laterally projecting flange portions 30 at its opposite sides slidably received within a pair of grooves or undercuts 31 in the walls of recess 29 to form a sliding connection guiding the element for vertical sliding movement toward and away from its illustrated scraper holding position. As will be understood, the undercutting of body 11 at 31 forms on the body two radially inwardly facing shoulders or surfaces 111, which engage flanges 30 of the retaining element to hold the retaining element against outward displacement from the body. The retaining element is fastened in holding position by a bolt 32, extending through the element and into the body. An essentially rectangular locking element 33 is receivable within upper recess 29 above retaining element 25, and is fastened to the body by screw 34. The locking element has a pair of upper and lower parallel faces 35 and 36 lying in planes extending perpendicular to the path of sliding movement of the retaining element and abutting directly against correspondingly parallel faces 135 and 136 on the body and retaining element respectively, to positively block any upward movement of the retaining element from its scraper holding position. More specifically, upward forces are transmitted through the locking element to a

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transverse shoulder or face 135 formed on the body at the upper end of upper recess 29.

While mounting or removing one of the scraper members 13, the corresponding locking element 33 is removed from the body, so that the retaining element 25 is slidable upwardly within recess 29 away from its illustrated holding position. After a scraper member has been properly located within recess 23, downward movement of retaining element 25 confines the upper flange 21 of the scraper member in a manner such that the body itself, acting independently of fastener 32, prevents outward removal of the member from the body. Locking element 33 may then be positioned above element 25 to prevent its upward retracting movement. It is particularly noted that by virtue of the formation of the upper and lower faces of the locking element, and the faces on the body and retaining element which engage those upper and lower locking element faces, to be mutually parallel and to each extend perpendicularly to the path of retaining element movement, all upward forces against the locking element are transmitted directly to and are taken by the body. There is consequently no excessive strain on the fasteners 32 and 34 in use, and virtually no danger of the cutter being accidentally broken loose from the body.

After the various scraper members 13 have been properly mounted on body 11, the body is lowered into the well and then vertically reciprocated to scrape the inner wall of casing 12. Springs 27 urge the scraping members into engagement with the casing, so that teeth 20 are caused by vertical reciprocation of the device to remove any cement, paraffin, or the like from the casing. By virtue of the unique manner of mounting scraper members 13, any displacing forces exerted against the scraping members in use are taken by body 11 and elements 25 and 33, rather than by the elements mounting screws 32 and 34. That is, the sliding interengagement of element 25 and the body retains that element to the body independently of screw 32. Also, locking element 33 prevents upward movement of element 25, without the exertion of any upward force against screws 32 or 33.

If it becomes desirable to vary the force with which scraper members 13 are urged outwardly against the casing, one or more of the springs 27 may be removed or added to attain the desired condition. However, to maintain a properly distributed force against the casing, the number of springs should at all times be at least four.

I claim:

1. A well scraping tool comprising a body to be lowered into a well and containing a first recess at one side, a scraper member partially received in said recess and having a wall engaging and scraping portion at an outer side facing away from the body, said body containing a second and reduced dimension recess opening into said first recess, a retaining element, means forming a sliding connection mounting said retaining element in said second recess for sliding movement toward and away from a position of holding engagement with the scraper member, said means forming the sliding connection including shoulder means on the body retaining said element to the body in said position of holding engagement with the scraper, said retaining element and body having portions interfitting with the scraper member when the retaining element is in said holding position and acting to positively retain the member to the body and against turning from the condition in which said scraping portion of the member is directed outwardly, a rigid locking element removably positioned in said second recess in the retracting path of said retaining element away from said holding position, and a fastener removably fastening said locking element to the body in said second recess and in said retracting path of the retaining element, said body forming an integral shoulder at the end of said second recess away from said first recess and engaging said locking element so that forces tending to retract said retaining element are transmitted through the locking element to said body.

2. A well scraping tool comprising a body to be lowered into a well and containing a first rectangular recess at one side, a rectangular scraper member partially received in said recess and having a wall engaging and scraping portion at an outer side facing away from the body, said scraper member having a pair of reduced thickness flanges extending across its opposite ends, said body containing a second and reduced dimension recess opening into one end of said first recess, a retaining ele-

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ment in said second recess having lateral flanges received in grooves in the body to mount the retaining element for sliding movement toward and away from a position of holding engagement with the scraper member, said retaining element and body being undercut at opposite ends of said first recess to receive and retain said scraper member flanges, said retaining element being disengageable from the body by sliding movement into said first recess, a rigid locking element removably positioned in said second recess in the retracting path of said retaining element away from said holding position, and a screw extending through said locking element and into said body to removably fasten said locking element to the body in said retracting path of the retaining element, said body forming an integral shoulder at the end of said second recess away from said first recess and engaging said locking element so that forces tending to retract said retaining element are transmitted through the locking element to said body.

3. A well scraping tool comprising a body to be lowered into a well and containing a first recess at one side, a scraper member partially received in said recess and having a wall engaging and scraping portion at an outer side facing away from the body, said body containing a second and reduced dimension essentially rectangular recess opening into said first recess, an essentially rectangular retaining element, means forming a sliding connection mounting said retaining element in said second recess for sliding movement toward and away from a position of holding engagement with the scraper member, said means forming the sliding connection including shoulder means on the body retaining said element to the body in said position of holding engagement with the scraper, said retaining element and body having portions overlapping and received outwardly of different mounting portions of the scraper member when the retaining element is in said holding position and acting to positively retain the member to the body and against turning from the condition in which said scraping portion of the member is directed outwardly, said scraper member being free for limited movement outwardly away from the body when retained by the body and retaining element, a plurality of springs interposed between the body and scraper member and urging the member outwardly away from the body, said retaining element being disengageable from the body by sliding movement into said first recess, an essentially rectangular rigid locking element receivable in said second recess, said locking element being interposed between and engaging the retaining element and an opposed shoulder formed on the body at an end of said second recess to prevent movement of the retaining element from said holding position, and a pair of screws extending through said retaining element and said locking element respectively and into the body to removably fasten said elements in said second recess.

4. A well scraper comprising a body to be lowered into a well, a scraper member carried at a side of the body and having a wall engaging and scraping portion at an outer side facing away from the body, a retaining element, means forming a sliding connection mounting said retaining element to the body for sliding movement toward and away from a position of holding engagement with the scraper member, said means forming the sliding connection including shoulder means on the body retaining said element to the body in said position of holding engagement with the scraper, said retaining element and body having portions interfitting with the scraper member at different locations when the retaining element is in said holding position and acting to retain the member to the body and to maintain the member against turning from the condition in which said scraping portion of the member is directed away from the body, said scraper member being removable from the body when the retaining element is slidably moved away from said holding position, a rigid locking element attachable to the body in the path of the retaining element away from said holding position to maintain the retaining element in said position, and a fastener in addition to said retaining and locking elements removably fastening said locking element to the body in said path of the retaining element, said body having an integral shoulder engaging said locking element at a side opposite the side at which said locking element engages the retaining element so that forces tending to displace the retaining element to re-

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tracted position are transmitted through the locking element to the body.

5. A well scraper comprising a body to be lowered into a well, a scraper member carried at a side of the body and having a wall engaging and scraping portion at an outer side facing away from the body, a retaining element, means forming a sliding connection mounting said retaining element to the body for sliding movement toward and away from a position of holding engagement with the scraper member, said means forming the sliding connection including shoulder means on the body retaining said element to the body in said position of holding engagement with the scraper, said retaining element and body having portions interfitting with the scraper member at different locations when the retaining element is in said holding position and acting to retain the member to the body and to maintain the member against turning from the condition in which said scraping portion of the member is directed away from the body, said scraper member being removable from the body when the retaining element is slidably moved away from said holding position, a rigid locking element attachable to the body in the path of the retaining element away from said holding position to maintain the retaining element in said position, said body having an integral shoulder engaging said locking element at a side opposite its point of engagement with the retaining element and at a location alined with said point of engagement in the direction of said path so that forces tending to displace the retaining element to retracted position are transmitted directly through the locking element to the body.

6. A well scraper as recited in claim 5, in which said locking element has a pair of oppositely facing parallel surfaces extending in planes perpendicular to the retracting path of said retaining element and abutting against the retaining element and body respectively to transmit said forces through the locking element.

7. A well scraper comprising a body to be lowered into a well, a scraper member carried at a side of the body and having a wall engaging and scraping portion at an outer side facing away from the body, a retaining element, a sliding connection mounting said retaining element to the body for sliding movement toward and

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away from a position of holding engagement with the scraper member, said sliding connection including shoulder means on the body retaining said element to the body in said position of holding engagement with the scraper, said retaining element and body having portions interfitting with the scraper member at different locations when the retaining element is in said holding position and acting to retain the member to the body and to maintain the member against turning from the condition in which said scraping portion of the member is directed away from the body, said body and retaining element permitting limited movement of the scraper member radially of the body, spring means yieldingly urging said member radially outwardly, said scraper member being removable from the body when the retaining element is slidably moved away from said holding position, a rigid locking element attachable to the body in the path of the retaining element away from said holding position to maintain the retaining element in said position, and a fastener attaching said locking element to the body, said body having an integral portion engaging said locking element and acting independently of said fastener to prevent any movement of the locking element as a result of forces exerted thereagainst by said retaining element, whereby said forces are transmitted substantially entirely to said body without excessive strain on the fastener, said portion of the body including a body shoulder engaging the locking element at a side opposite its point of engagement with the retaining element.

8. A well scraper as recited in claim 4, including a second fastener acting to attach said retaining element to the body in said holding position.

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