Oct. 21, 1958 F. H. CARPENTER 2,857,141

WELL TOOL

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Fig. 1

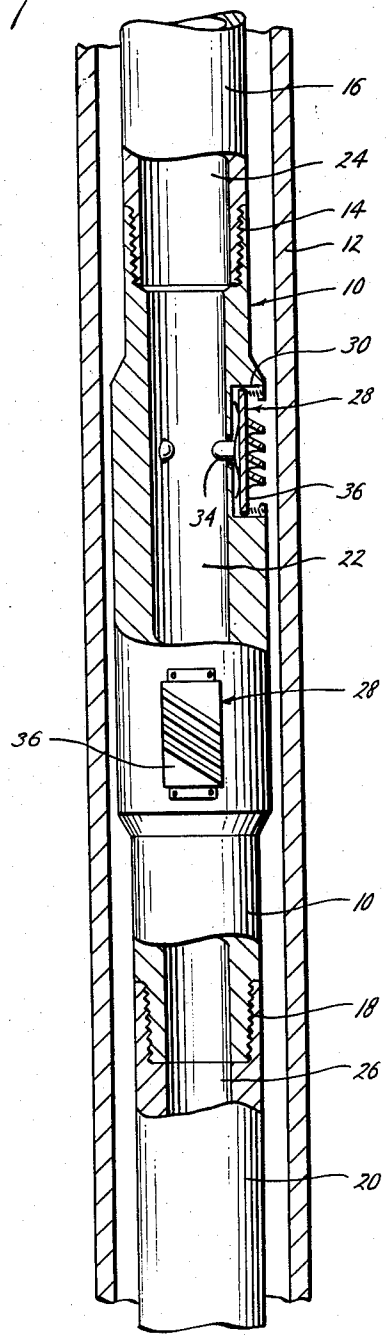
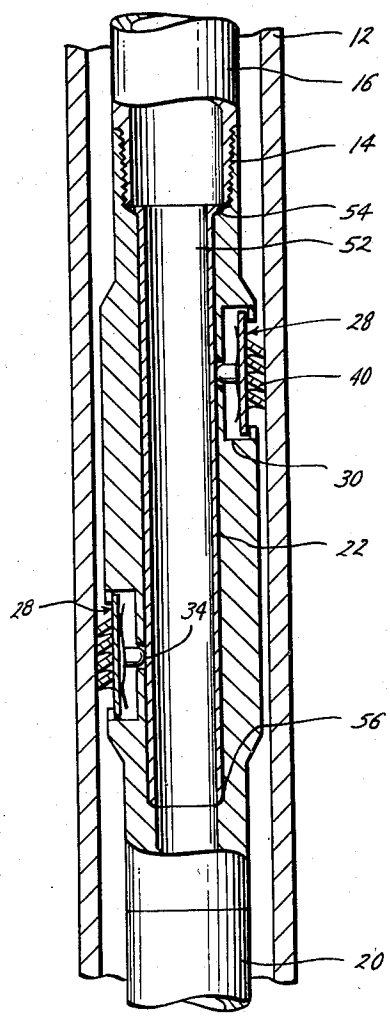



Fig. 2




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Fig. 3

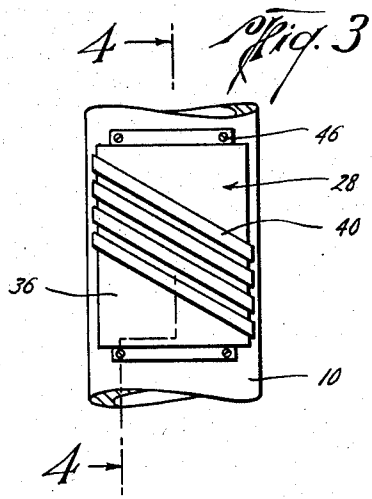



Fig. 4

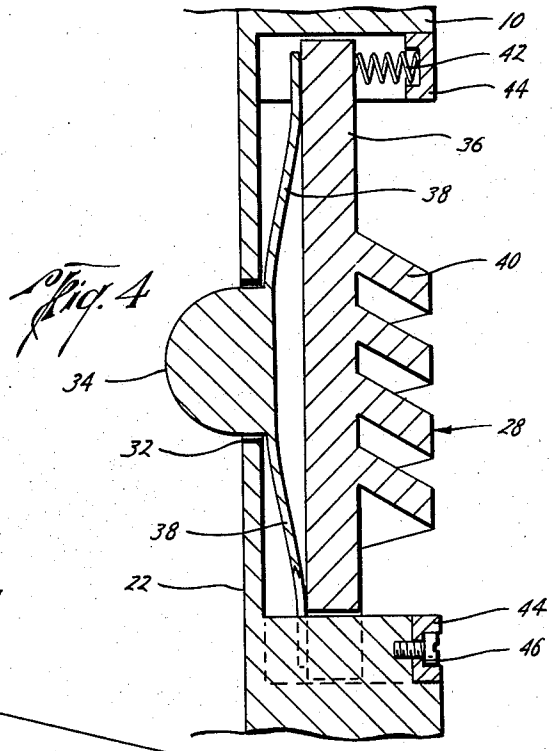
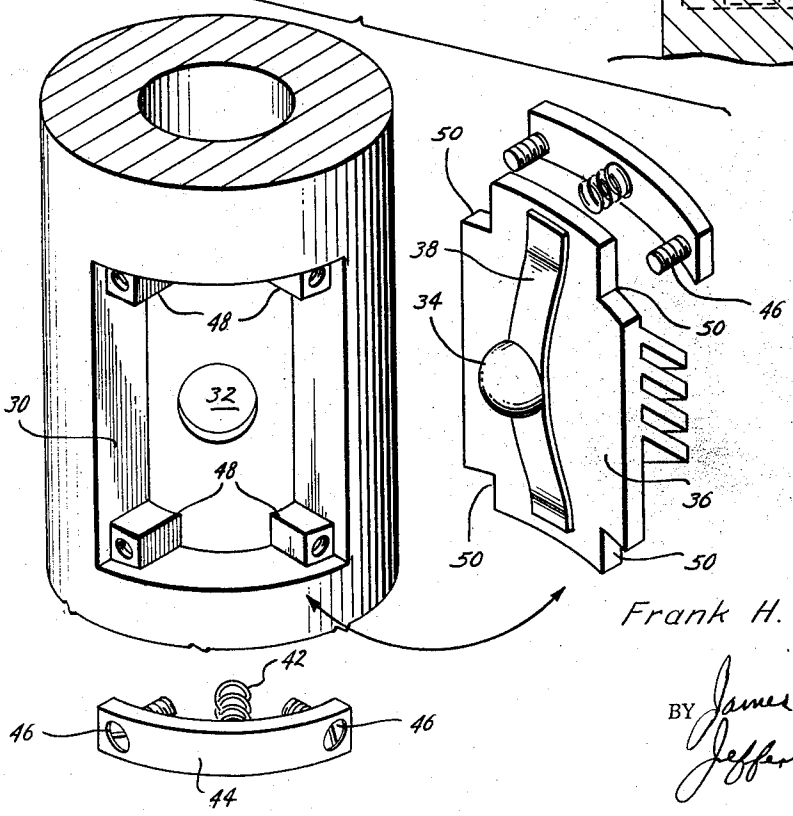



Fig. 5







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2,857,141

# WELL TOOL

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Application April 25, 1957, Serial No. 655,038

6 Claims. (Cl. 255—74)

This invention relates to well tools, and, more particularly, relates to well tools having expansible and retractable scrapers or blades so that selective scraping, cutting or reaming may be provided in a well bore.

It would be advantageous in the drilling of oil wells to have a tool which may be incorporated into the drill string as a normal part thereof and which has normally retracted blades or cutters which do not interfere with other operations, but which includes means by which the blades or scrapers may be expanded quickly and readily to scrape, cut or ream, as required, and may subsequently be retracted so that the other operations may proceed without the necessity of removing and reinserting the drill string into the well bore for each operation. It would also be advantageous to have an improved scraper, cutter or reamer which may be utilized to selectively operate as desired which is of simplified construction and easily and inexpensively manufactured and maintained and which is reliably efficient in use.

Accordingly, it is an object of the present invention to provide a well tool having laterally expansible and retractable scraper, cutter or reamer elements, which tool may be secured in a string of pipe in a well bore and does not interfere with operations being performed in the well bore, the scraper, cutter or reamer elements being selectively expansible and retractable when desired.

Still a further object of the present invention is the provision of a well tool having scraper, cutter or reamer elements which are normally retracted but which may selectively be expanded by mechanical means and yet which resiliently engage the surface to be scraped, cut or reamed.

Still a further object of the present invention is the provision of an improved scraper, cutter or reamer which is inexpensive to manufacture and maintain, easily repaired, and which is efficiently reliable and rugged in use.

Other and further objects, features and advantages will be apparent from the following description of a presently preferred example of the invention, given for the purpose of disclosure, and taken in conjunction with the accompanying drawing, where like character references designate like parts throughout the several views, and where

Figure 1 is an elevational view, partly in section, illustrating a well tool according to the invention shown in retracted position in casing in a well bore,

Figure 2 is a view similar to that of Figure 1, but illustrates the well tool of Figure 1 in position to scrape the casing,

Figure 3 is a fragmentary elevational view illustrating a scraper segment of the well tool of Figures 1 and 2,

Figure 4 is an enlarged, sectional view taken along the line 4—4 of Figure 3, and

Figure 5 is an enlarged, expanded view of the elements making up the cutter or scraper sections as illustrated in Figures 3 and 4.

Referring now to the drawings, and particularly to Figure 1, the reference numeral **10** designates the tool, which is of elongate configuration so that it may be introduced into the casing **12** or a well bore, not shown, as



desired. Preferably, the well tool includes a generally tubular body **10** which has the threaded box **14** at its upper end for connection to the pipe **16** extending to the surface, not shown, and a lower threaded pin **18** for connection to the pipe **20** or to the operating string or other tools and parts, as desired. Thus, the well tool of the present invention may readily be secured in an operating string and may be provided with the usual and customary connections at each end for inserting it therein.

A flow passage **22** is provided in the generally tubular body **10** which communicates with and is substantially of the same size or diameter as the flow passages **24** and **26** in the pipe elements **16** and **20**, respectively, of the operating string.

A plurality of laterally expansible and retractable cutter, scraper or reamer elements, generally indicated by the reference numeral **28**, are disposed circumferentially about the body **10**. Any suitable spacing or arrangement may be utilized, as desired; however, spacing the cutters circumferentially on 120° centers and providing two sets of cutters staggered with respect to one another, as shown, provide satisfactory and complete circumferential cutting, reaming or scraping. Of course, one or more of such cutters may be provided, as desired.

A plurality of pockets or slots **30** is provided in the body **10** to receive the cutter, reamer or scraper elements **28** and there is provided an opening **32** in each pocket **30** into the flow passage **22** through which the projections **34** on the body elements **36** project for the purpose of expanding the cutter, reamer or scraper elements **28**, as will be described.

As best seen in Figures 4 and 5, to which reference is now made, the projections **34** may be substantially rounded projections which fit through the rounded openings **32** in the central portion of the pockets **28**, although any preferred shape and arrangement may be utilized, as desired. It is highly advantageous to have the cutters, scrapers or reamers resiliently or yieldingly engage the wall of the casing or formation and, for this purpose, a spring **38** serves as the connection between the projections **34** and the plate-like body members **36**.

Preferably, the plate-like body members should be curved to correspond with the curvature of the outer portion of the body **10** of the tool and are provided with the projecting cutter, scraper or reamer blades **40**, which preferably should extend outwardly substantially the same distance as the projections **34** extend inwardly into the flow passage **22** of the body **10**. Thus, when the projections **34** are projected through the openings **32** so that they are flush with the inner surface of the flow passage **22** the cutting, scraping or reaming elements **44** will be fully expanded yet, they will be of a minimum length so that they are strong and durable in use.

As shown, the blades or scrapers **40** may be made integral with the body plate **36** or may be secured thereto, as desired.

The cutter or scraper elements **40** and body member **36** are yieldingly held in retracted position by means of the springs **42** pressing against the upper and lower portions of the body member **36** and against the stop members **44** secured to the body **10** by the bolts **46**, although they may be secured thereto by any desired means. The arrangement illustrated is desirable, however, as it permits removal and replacement of cutter, scraper, or reamer elements. In order to threadedly receive the bolts **46**, what might be termed threaded lugs **48** are provided at each corner of the pocket **28** and the body member **36** is notched at its four corners, as at **50**, for this purpose.

Thus, as the projections **34** are moved outwardly they resiliently or yieldingly urge the cutter elements **28** out-

wardly. Once the means moving the projections **34** outwardly has been removed, the springs **42** quickly retract the cutter, scraper or reamer elements **28**.

Mechanical means are provided to engage the projections **34** of the cutter, reamer or scraper elements **28** and, to this end, a go-devil or bar **52**, as best seen in Figure 2, is provided which seats in the upper **54** and lower **56** annular seats in the flow passage **22**. Thus, with the go-devil or bar **52** in the position illustrated in Figure 2, the cutter, scraper or reamer elements **28** are resiliently and yieldingly expanded into engagement with either the wall of the casing or the formation, as desired. Once the cutting, reaming or scraping function has been performed, it is a relatively simple matter to fish out the go-devil or bar **52** by a conventional fishing or grappling tool or to pump it out by reverse circulation. If desired, a suitable head may be provided on the go-devil to assist in this fishing it out of the operating string **16**.

Thus, it is seen that the well tool of the present invention constitutes, in effect, a part of the operating string except when it is desired to either cut, scrape or ream. At this time, a go-devil or bar **52** is dropped or pumped into position which thereby yieldingly expands the cutter, reamer or scraper elements **28**. Rotation of the operating string and movement either downwardly or upwardly accomplishes the cutting, scraping or reaming action, after which, the bar **52** may be removed and other operations performed, all without removing the operating string from the well bore.

The well tool of the present invention may advantageously be used for a number of purposes. For example, it may be used to scrape the inside of casing following a perforating job, after drilling cement or bridging plugs, after drilling to relieve the casing of scale etc., for under-reaming, cutting and the like. Also, the scraper, cutter or reamer blades may be engaged or disengaged at any desired time with a very few minutes delay. For example, it is common practice in drilling a bridging plug to make a trip out of the hole for a scraper to scrape the area where the plug was set. After scraping the area, if more drilling is necessary, another trip is made to remove the scraper out of the well bore and reinsert a bit. Thus, additional round trips are required in first removing the bit, inserting the scraper, removing the scraper and then reinserting the bit. In addition, in those scrapers which are not retractable, the operating string cannot be rotated while going into or coming out of the hole due to the cutting action of the blades which causes considerable delay. The well tool of the present invention enables the operator to insert the well tool in the operating string with the blades entirely retracted, drill the desired footage, engage the blades, scrape the drilling area, disengage the blades and continue to drill or do any other operation desired or necessary without coming out of the hole. This, of course, is highly advantageous in that it saves a large amount of money spent for rig time in making these additional round trips into and out of the well bore.

The present invention, therefore, is well suited to attain the objects and ends and has the advantages and features mentioned as well as others inherent therein.

While only a presently-preferred embodiment of the tool has been given for the purpose of disclosure, numerous changes in details, arrangement of parts and uses will readily suggest themselves to those skilled in the art which are encompassed within the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. A well tool comprising, an elongate body provided with an internal passage and at least one external pocket, each said pocket having an opening communicating with the internal passage, a blade element disposed in each pocket, means yieldingly maintaining each blade element retracted in each pocket, a projection extending through each opening into the interior of the internal passage and adapted to be engaged by an expander element in the passage for urging the projection outwardly, and means resiliently connecting the projection to the blade element whereby the blade element is yieldingly expanded upon outward movement of the projection.

2. A well tool comprising, an elongate body provided with an internal passage and at least one external pocket, each said pocket having an opening communicating with the internal passage, a blade element disposed in each pocket, means yieldingly maintaining each blade element retracted in each pocket, a projection extending through each opening into the interior of the internal passage, means resiliently connecting the projection to the blade element, and an expander element adapted to seat in the passage and engage each projection and thereby urge each projection outwardly in each opening thereby yieldingly urging each blade element outwardly.

3. A well tool comprising, an elongate body provided with an internal passage and at least one external pocket, each said pocket having an opening communicating with the internal passage, a body in the pocket, a plurality of outwardly extending blades on the body, means yieldingly maintaining each body retracted in each pocket, a projection extending through each opening into the interior of the internal passage and adapted to be engaged by an expander element in the passage for urging the projection outwardly, and a spring connecting the projection and body whereby the body and blades are yieldingly expanded upon outward movement of the projection.

4. A well tool comprising, an elongate body provided with a substantially unrestricted and normally open flow passage throughout its length, means at least at the upper end of the body for connecting the body to an operating string, said body provided with at least one external pocket, each said pocket having an opening communicating with the internal passage, a blade assembly disposed in each pocket, means yieldingly maintaining each blade assembly retracted in each pocket, a projection in force transmitting relationship with said blade assembly extending through each opening into the interior of the internal passage, at least one annular seat in the internal passage, and an expander member adapted to be inserted into the internal passage and seat on the seat for engaging and urging each projection outwardly thereby urging each blade assembly outwardly.

5. A well tool comprising, a generally elongate tubular body provided with a substantially unrestricted flow passage throughout its length, means at each end of the body for connecting the body in an operating string, said body provided with a plurality of external slots, each said slot having an opening communicating with the flow passage, a blade assembly disposed in each slot, means yieldingly maintaining each blade assembly completely retracted within each pocket, a projection in force transmitting relationship with each said blade assembly extending through each opening into the internal passage, a seat in the internal passage and an expander adapted to be inserted into the internal passage and seat upon said seat and engage said projections and move them outwardly and thereby urge said blade assemblies outwardly.

6. The well tool of claim 5 in which there are at least two sets of axially-spaced slots, each set of slots being circumferentially spaced about the well tool and each set being staggered circumferentially with respect to the other.

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