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TUBING PACKER

Filed July 3, 1946 2 SHEETS—SHEET 1

Fig. 1.

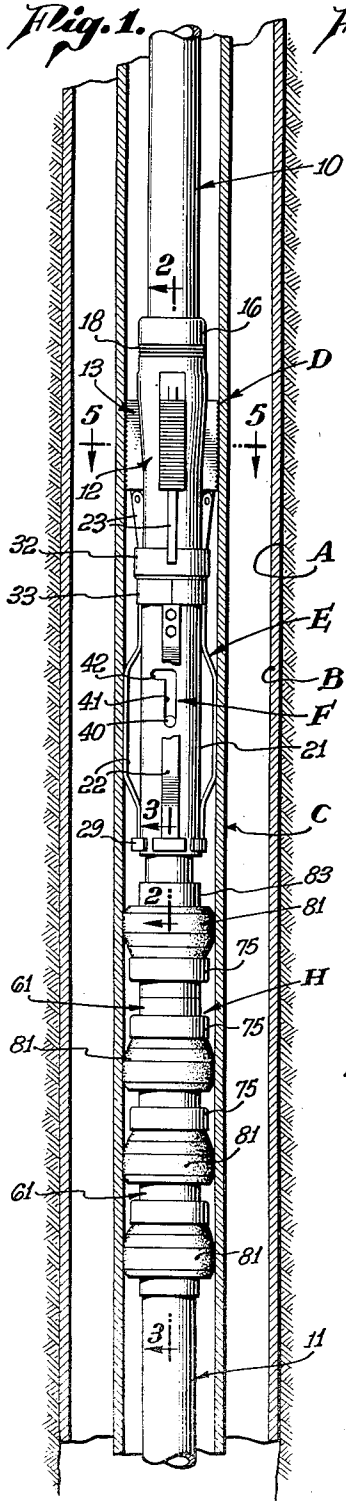

Fig. 2.

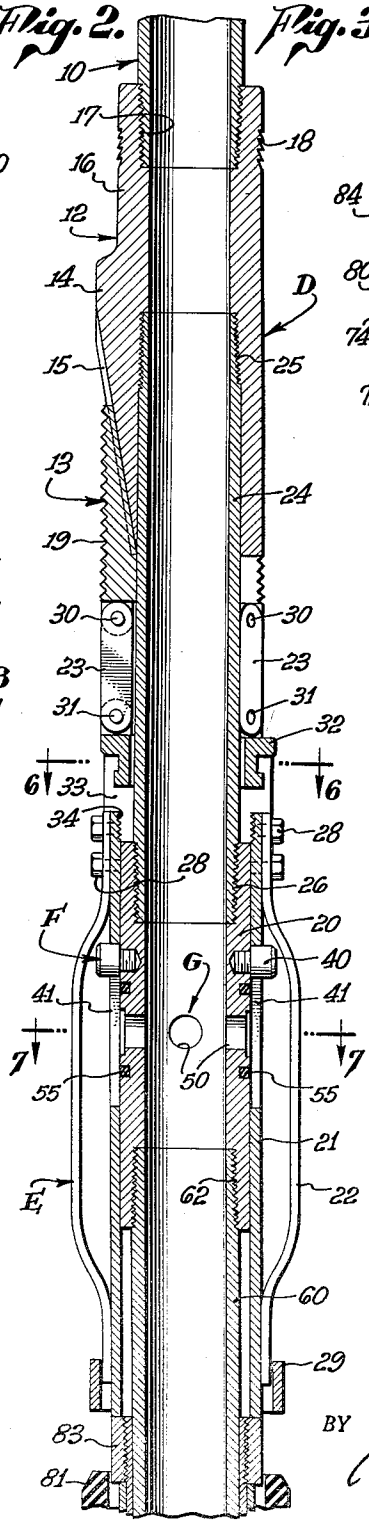

Fig. 3.

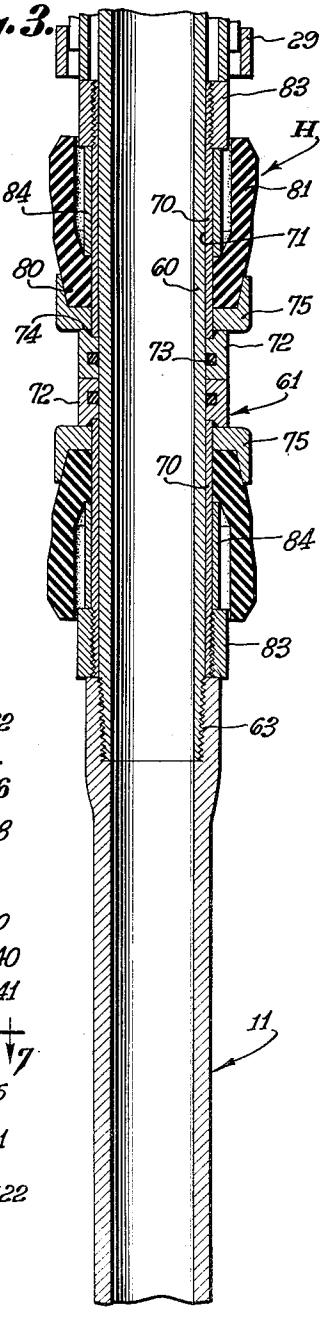

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Fig. 4.

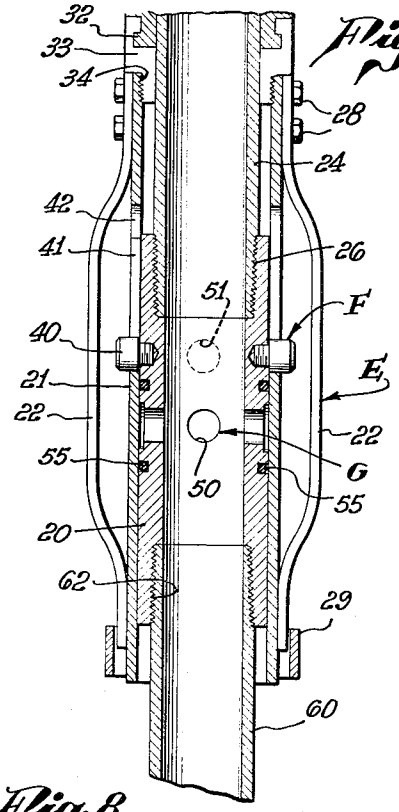


Fig. 5.

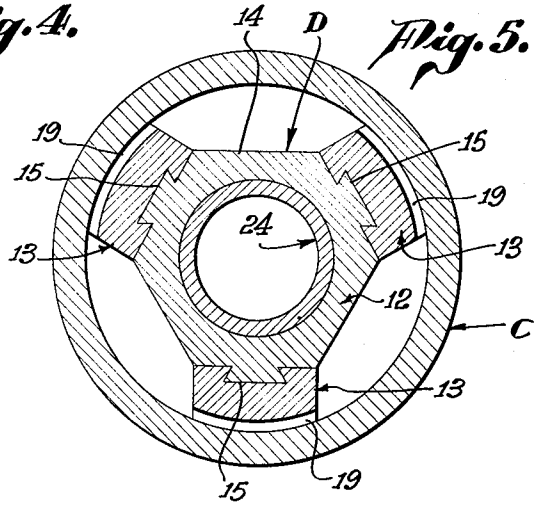


Fig. 6.

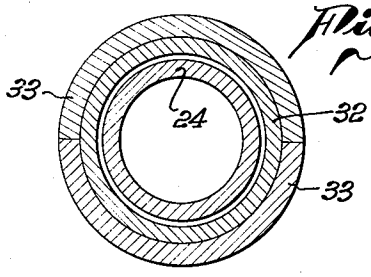


Fig. 8.

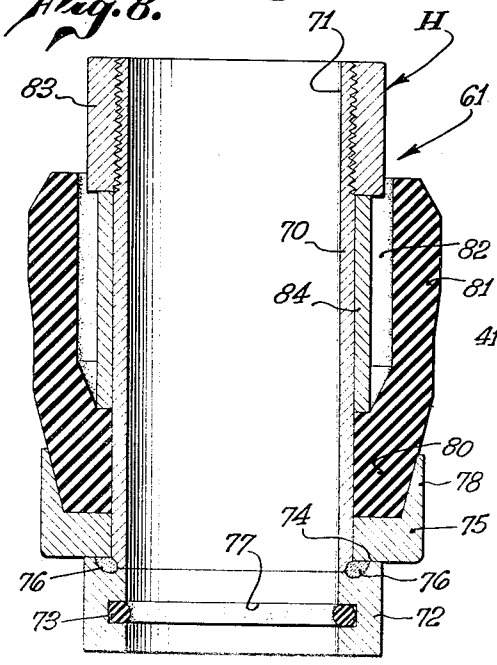
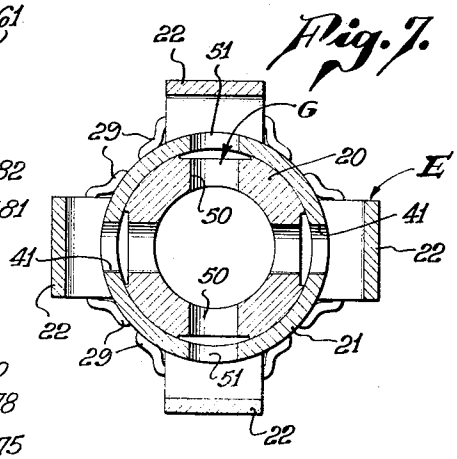


Fig. 7.



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TUBING PACKER

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8 Claims. (Cl. 166—12)

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This invention relates to a tubing packer and is more specifically concerned with a tubing packer combined with a tubing support, it being a general object of the invention to provide a tool of this character which is simple, practical, safe and dependable.

It is a general object of the present invention to provide a tool of the general character referred to involving a gripping mechanism or slip device that can be set or engaged independently of the packers or packing means included in the tool.

Another object is to provide a gripping device and a packer related as above outlined so that if pressure is acting to urge the packer upwardly the packer will merely act to aid in the setting of the gripping mechanism.

Another object is to provide a tool wherein a packing means may serve to set or to aid in setting the gripping means but will not act to release the gripping means in the event that there is a reversal of pressure operating the packing means in the opposite direction.

Another object is to provide a tool wherein the gripping means or slip mechanism serves to carry the load or weight of the tubing so that the packing means is not under such load but is actuated by fluid pressure to maintain a tight seal.

Another object is to provide a tool embodying a plurality of packers which can be arranged or faced in any desired manner. The present invention contemplates providing the tool with a plurality of packer units and any desired number of such units can be faced in either direction or in both directions, as well conditions may require. The construction of the tool is such that it can be readily extended to accommodate a large number of packing units if they become necessary.

Another object is to provide a tool involving packing means freely slidable on the main body of the tool which packing means is sealed with the body of the tool and being free does not impede or offer a drag to prevent operation of the gripping means employed for supporting the tubing.

Another object is to provide a tool involving a bleeder or by-pass means allowing flow between the inside and the outside of the tool during running in or pulling out. In the preferred form of the invention the by-pass is such as to be open when the slips of the gripping means are held retracted and it is closed when the slips are set.

In the specific form of the invention described bayonet slots employed in the control of the gripping means or slips are utilized as passages in the by-pass means.

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Another object is to provide a tool which is of simple practical construction and which involves few rugged easily formed parts that can be readily assembled or taken apart.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of my invention, through which description reference is made to the accompanying drawings, in which:

Fig. 1 is a sectional view of a part of a well showing a liner located within a casing and showing the tool of the present invention sealed in the liner and supporting a string of tubing therein. Fig. 2 is an enlarged detailed sectional view of the mechanism of the present invention, being a view taken as indicated by line 2—2 on Fig. 1. Fig. 3 is an enlarged detailed sectional view of a tool taken substantially as indicated by line 3—3 on Fig. 1, showing two packer units in place instead of four, as shown in Fig. 1. Fig. 4 is a view similar to a portion of Fig. 2 showing the parts in a different position. Fig. 5 is an enlarged detailed transverse sectional view taken as indicated by line 5—5 on Fig. 1. Fig. 6 is an enlarged detailed transverse sectional view taken as indicated by line 6—6 on Fig. 2. Fig. 7 is an enlarged detailed transverse sectional view taken as indicated by line 7—7 on Fig. 2, and Fig. 8 is an enlarged sectional view of one of the packer units.

The tool of the present invention can be used in various situations. However, as above pointed out it is particularly useful on or in connection with tubing arranged within a tubular string such as a liner and, therefore, in Fig. 1 of the drawings I have shown a situation where there is a well bore A lined with a casing B within which there is a liner C. A string of tubing is shown within the liner and the tool of the present invention is shown in connection with the tubing supporting the tubing in the liner and establishing a packing or seal between the tubing and the liner. The tool of the present invention can be used on or in a string of tubing; that is, it can be applied to the lower end of a string of tubing or it can be incorporated intermediate the ends of a string of tubing, in which case, as shown in the drawings, it is arranged between an upper section 10 of a tubing string and a lower section 11 of the tubing string.

The tool of the present invention involves, generally, a slip mechanism or gripping device D carried by or connected with the tubing and engageable with the liner, operating means E for the slip mechanism, control means F for the means E, bypass means G provided to maintain

free communication between the inside and the outside of the tool when the slip mechanism is held retracted or in the released position and packing means H serving to pack the tool or the tubing in or with the liner C.

The slip mechanism D is preferably located or incorporated in the tool so that it occurs at the upper end portion thereof, and in its preferred form it involves, generally, a body section 12 and a plurality of slips 13 carried by and cooperating with the section. The body section of the means or mechanism D is an elongate tubular part or structure having an enlargement or head portion 14 with a plurality of circumferentially spaced inclined guideways 15 which carry the slips 13. The upper end portion 16 of the body section 12 is of reduced diameter and is in the nature of a stem by which the body section is connected to the tubing and which serves as a part to be engaged if it is necessary to fish the tool from the well. In the case illustrated the stem 16 is shown with an internally threaded opening 17 to receive the lower end of the upper section 10 of the tubing string and its exterior is provided with wickers 18 to cooperate with a fishing tool.

The slips 13 may be of the type generally employed in tools of this general character, that is, they may be wedge-shaped parts having gripping teeth 19 on their outer faces and they are preferably keyed or locked to the guideways 15 of the body so that they are properly maintained in the desired position thereon. The manner in which the slips are engaged with the guideways of the body is clearly illustrated in Fig. 5 of the drawings.

The operating means for the slip mechanism involves, generally, an elongate tubular body section 20, a sleeve 21 slidable on the body section 20, a plurality of grippers or spring fingers 22 carried by the sleeve, links 23 connected to the slips 13 and a coupling between the links 23 and the sleeve 21.

The elongate tubular body section 20 is arranged below the body section 12 of means D and is shown attached thereto by a tubular coupling 24. In the particular construction illustrated the coupling 24 is an elongate tubular part entering the lower end of body section 12 and threaded thereto at 25 and entering the upper end of the body section 20 and threaded thereto at 26. The coupling 24 may be considered a part or continuation of either of the body sections and when the body sections are joined by the coupling these parts, that is, the body sections 12, 20 and the coupling 24, form a rigid, continuous tubular body structure.

The sleeve 21 of means E is slidable and rotatable on the body section 20 and it serves primarily as a carrier for the fingers 22.

The spring fingers or grips 22 may be of the form and construction employed, generally, in tail pieces, and they are carried by the sleeve 21 to normally frictionally engage the interior of the liner C. In the particular case illustrated the upper end portions of the fingers 22 are shown secured to the upper end portion of sleeve 21 by suitable fastening devices 28 while the lower end portions of the fingers slidably bear on the lower end portion of the sleeve where they extend under guards 29. The middle or outwardly bowed portions of the fingers are free and project outwardly to bear in the liner in the manner illustrated in Fig. 1 of the drawings.

The links 23 are in the nature of connecting links having their upper ends connected to the

lower ends of the slips 13 as by pivot pins 30 while their lower ends are connected to the coupling which joins the links to the sleeve 21 as by pivot pins 31.

The particular coupling provided between the links and sleeve illustrated in the drawings involves, generally, an annular collar 32 fitting loosely around the coupling 24 and formed to receive and hold the pivot pins 31 which hold the lower ends of the links. A split ring 33 is assembled around and embraces a portion of the collar 32 to be coupled thereto and is threaded at 34 into the upper end of the sleeve 21 so that its sections are maintained in the desired assembled position embracing the collar.

The control means F for the operating means E is preferably a bayonet type control. For instance, as shown in the drawings, it involves one or more projections or pins 40 projecting from the exterior of the body section 20 and cooperating with bayonet slots in the sleeve 21. In the particular case illustrated I show two projecting pins 40 on the body section 20 located diametrically opposite each other and I provide two bayonet slots each having a vertical or longitudinal section 41 and a top or lateral section or notch 42 at the upper end of the section 41. When the pins are engaged in the notches 42 the sleeve is locked against longitudinal movement on the body section 20 but when the pins 40 are in register with the sections 41 of the slots the sleeve is free to move vertically far enough to allow full movement of the slips 13 upward on the inclined parts of the body section 12.

The by-pass means G provided to maintain free communication between the inside and the outside of the tool when the control means F is set holding the slips down is a port construction involving or embodying parts of the body section 20 and parts of the sleeve 21. In the preferred form of the invention illustrated in the drawings one or more by-pass ports 50 are provided in the body section 20 intermediate its ends or at a point where it is covered by the sleeve 21. If the number of ports 50 is made to correspond to the number of bayonet slots provided in the sleeve 20 the ports 50 may be made to cooperate with the bayonet slots. In the case illustrated I have shown two bayonet slots in the sleeve 21 and four by-pass ports 50 in the body section 20. In this case two of the ports 50 cooperate with the bayonet slots and two of the ports 50 cooperate with by-pass ports 51 provided in the sleeve 21 between the bayonet slots. Where four ports 50 are provided, as shown in the drawings, they are preferably located 90° apart and the bayonet slots and ports 51 are located 90° apart the ports being located and related so that when the pins 40 of means F are engaged in the notches 42 of the bayonet slots the ports 50 register with the bayonet slots and ports 51 providing free passage or communication between the interior of the tool and the exterior thereof. This relationship of parts is clearly illustrated in Fig. 2 of the drawings. When the pins 40 are rotated out of the notches 42 so that they are in the longitudinal portions of the bayonet slots the ports 50 are out of register with the bayonet slots and ports 51 so that communication between the interior of the tool and the exterior thereof is shut off. This relationship of parts is illustrated in Fig. 4 of the drawings. To prevent or minimize leakage it is preferred to provide packing means at or in connection with the port construction just described. In the case illus-

trated packing rings 55 are provided between the body 20 and sleeve 21 and below the ports 50. In the case illustrated the wall of the body 20 is thicker than that of the sleeve 21 and therefore the packing rings are shown carried in the body 20.

The packing means H that I have provided is preferably located below the structure thus far described or, in other words, at the lower end portion of the tool. In its preferred form the packing means involves, generally, an elongate tubular body section 60 and one or more packer units 61 carried on the body section. The body section 60 is preferably a simple, tubular part having its upper end joined or coupled to the body structure above described. In the case illustrated the upper end of the body section 60 is shown threaded into the lower end portion of body section 20 at 62. The body section 60 is made of such length as to accommodate the number of packing units 61 desired in the tool and consequently it may vary widely in length. In Fig. 1 I illustrate a body of such length as to accommodate four packer units whereas in Fig. 3 I illustrate a body which is shorter and such as to accommodate only two packer units. In practice the lower end portion of the body section 60 may be capped or finished in any desired manner. Where the tool is inserted between sections of a string of tubing as for instance between sections 10 and 11 the lower end of the body section 60 may be threaded into an upset end 63 on the upper end of the uppermost tubing section 11. The enlargement 63 on the tubing section 11 may be considered a part of the present tool to the extent that it is applied to the lower end of the body section 60 and forms an enlargement retaining the packer units 61 on the body section, it being understood that any such part can be employed that will serve this purpose if the tool is not used in connection with a lower tubing section, as shown in the drawings.

It is a feature of the present invention that I can employ one or more packer units 61 as circumstances require and I can arrange the packer units to face in either or both directions, that is, I can use one or more packer units all faced up, or one or more packer units all faced down, or I can use a combination of packer units some faced up and some faced down. In Fig. 1 of the drawings I illustrate four packer units, three faced down and one faced up, the uppermost of the group being faced up. In Fig. 3 I show a simple arrangement where there are but two packer units, one faced up and one faced down, the uppermost being faced up. With the construction that I have provided the desired combination and arrangement of packer units can be gained quickly and conveniently since it is merely necessary to slide the packer units onto the body section 60 facing them in the desired direction as they are applied and it is unnecessary to operate threaded connections or joints of any kind.

Each packer unit 61 is, in general, an independent packer individually and freely movable on the body section 60. In the preferred form of the invention each packer unit 61 includes, generally, an elongate tubular part or sleeve 70 having a bore or opening 71 therethrough such as to slidably accommodate the body section 60. The sleeve 70 is provided at one end with an enlargement or head 72 which carries packing 73 and forms an abutment or shoulder 74 for a

packing support 75. In the particular case illustrated the head 72 is formed separate from the rest of the sleeve and is secured thereto by welding 76 and the packing 73 is a ring of suitable shape and formed of suitable material carried in a channel 77 provided in the head 72. The packing ring projects somewhat inward from the head 72 to have sealing engagement with the exterior of the body section 60. The packing support 75 may be a simple collar slid onto the sleeve from the end opposite the head 72 until it bears against the shoulder 74 and it has a projecting part of flange 78 which forms a retainer for the annular body of the packing element.

The packing element is preferably a unit of rubber or the like having an annular body portion 80 carried on the sleeve 70 in engagement with the support 75 and so that it extends under the retaining flange 78. An annular extension 81 is provided on the body 80 forming a sealing lip shaped and proportioned to normally yieldingly bear outwardly in the liner C. Being formed as just described the lip 81 has a cavity or chamber 82 within it for the reception of fluid so that fluid under pressure acts inside or within the lip to urge it out into sealing engagement with the liner. A retainer such as a collar 83 is applied to the sleeve 70 to retain the packer body in engagement with the support 75. In the case illustrated the collar 83 is threaded to the end portion of the sleeve 70 and a spacer 84 is arranged between the collar and the body 80. With this arrangement the collar 83 occurs outward of and beyond the end of lip 81 so that it is easily accessible.

From the foregoing description it will be apparent that I have provided a tool that can be advantageously applied to or incorporated in a string of tubing and that the tool can be positioned with the slips retracted and so that it can be readily run into the well to the desired point or location. When at the desired point in the well the means F is released by suitable rotation of the tool disengaging the pins 40 from the notches 42. With the slips released they can be actuated by lowering the tubing slightly causing the body 12 to move down relative to the slips 13, the slips being supported against downward movement by the spring fingers 22 frictionally engaged in the liner C. If there is upward pressure in the liner C below the tool it may act on the packers or packer units 61 so that they move up causing the uppermost unit to engage the lower end of sleeve 21 causing the slips to be forced up on the body section 12. It is to be observed that with the arrangement that I have provided the uppermost packer unit 61 is free to bear against the lower end of sleeve 21 to effect the action just described. By providing a plurality of packer units 61 constructed as above described and by arranging them in the desired manner, I am able to pack against leakage in either direction. It is to be understood that as the tool is being lowered into the well the by-pass means G is open allowing free circulation of fluid between the inside and the outside of the tool above the packer units, but when the means F has been released the means G is closed.

It is to be noted that each packer unit 61 is sealed on the supporting body section and it will be apparent that sufficient play or longitudinal movement is provided for shifting of the packer units along the body section 60 so that in the

event there is a reversal of pressure, for instance a down pressure in the liner C, the packer units are free to merely move away from the lower end of sleeve 21 without in any way disturbing the setting of the means D. Furthermore, it is to be observed that the several body sections incorporated in the tool when assembled or arranged together, as above described, form a continuous tubular body structure extending from one end of the tool to the other and which serves as a duct or continuation of the tubing when the tool is connected in a tubing string, as above described.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. A well tool of the character described for operation in a well casing including, a central tubular body, a gripping mechanism on the body and engageable in the casing, operating means for the mechanism including a member on the body shiftable longitudinally thereof and normally frictionally engaging the casing, and packing means including a unit shiftable longitudinally of the body and relative to the mechanism and also relative to the said operating means abutting said member when moved in one direction.

2. A well tool of the character described for operation in a well casing including, a central tubular body, a gripping mechanism on the body and engageable in the casing, operating means for the mechanism including a member on the body frictionally engaging the casing shiftable longitudinally of the tool, said member having a continuous uniform frictional engagement with the casing, and packing means including a plurality of packer units shiftable along the body and relative to said member and one arranged to abut said member when shifted in one direction.

3. A well tool of the character described for operation in a well casing including, a central tubular body, a casing gripping mechanism on the body, operating means for the mechanism including a casing engaging member shiftable longitudinally of the body, and packing means including a plurality of packer units shiftable along the body and relative to said member and one arranged to abut said member when shifted in one direction, each unit including a sleeve slidable on the body and a packing element on the sleeve and engaging the casing, and seals between the sleeves of said units and the body.

4. A well tool of the character described including, a central tubular body, a casing gripping mechanism on the body, operating means for the mechanism including a casing engaging member shiftable longitudinally of the body and having uniform and continuous frictional engagement with the casing, and packing means including a plurality of cup-shaped packer units shiftable along the body and relative to said member and one arranged to abut said member when shifted in one direction, there being units faced in each direction lengthwise of the tool.

5. A tool of the character described for operation in a well casing including, an elongate tubular body, casing engaging slips carried at the upper end portion of the body, a member carried on the body below the slips shiftable lengthwise of the body to operate the slips and having spring fingers in uniform continuous frictional engagement with the casing, and a casing engaging packer unit slidable on the lower end portion of the body and into abutting engagement with said member upon being moved upwardly on the body.

6. A tool of the character described for operation in a well casing including, an elongate tubular body, casing engaging slips carried at the upper end portion of the body, a member carried on the body below the slips and releasably latched thereto, the member being shiftable lengthwise to operate the slips and having spring fingers in uniform continuous frictional engagement with the casing, means controlling the shifting of said member lengthwise of the body, and a casing engaging packer unit slidable on the lower end portion of the body and relative to said member and into abutting engagement with said member upon being moved upwardly on the body.

7. A tool of the character described for operation in a well casing including, an elongate tubular body having a fixed tapered head thereon, slips carried by the body cooperating with the head, a sleeve on the body shiftable lengthwise thereof and operatively coupled with the slips, a spring finger carried by the sleeve and normally frictionally engaging the casing, packing means carried by the body adjacent the sleeve and shiftable relative thereto, and means controlling movement of the sleeve lengthwise of the body including a pin on the body cooperating with a slot on the sleeve, the slot having a portion extending lengthwise of the tool and a lateral notch at one end of said portion, and by-pass means including cooperating ports in the body and sleeve in register when the pin is in the notch holding the sleeve against longitudinal movement.

8. A tool of the character described including, an elongate tubular body, slips carried by the body, a rigid annular sleeve shiftable along the body, and a connection between the slips and sleeve including links, pivot pins connecting the links to the slips and a coupling between the links and sleeve including a rigid annular collar engaged freely around the body, pivot pins connecting the links to the collar, and a sectional sleeve including a plurality of separable arcuate sections assembled around a portion of the collar to be coupled therewith, the sectional sleeve having an externally threaded portion on which the rigid sleeve is threaded to hold the sections of the sectional sleeve assembled and to couple the two sleeves together.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
2,005,955	Renouf	Jan. 25, 1935
2,179,812	Calkins	Nov. 14, 1939
2,189,697	Baker	Feb. 6, 1940
2,290,441	McGaffey	July 21, 1942
2,338,369	Williams	Jan. 4, 1944
2,368,401	Baker	Jan. 30, 1945
2,390,112	McGaffey	Dec. 4, 1945
2,506,680	Otis	May 9, 1950