

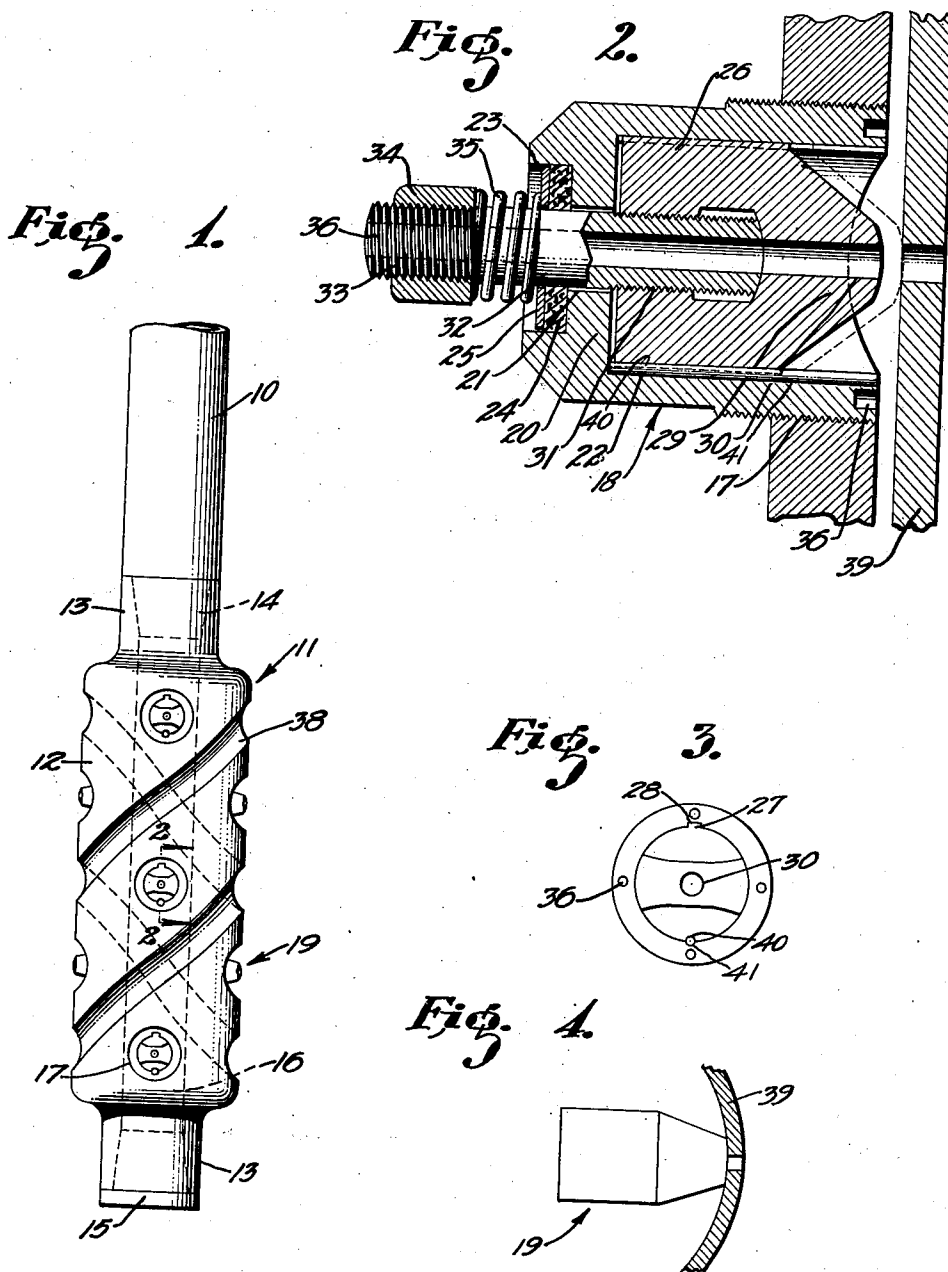
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CASING WASHER

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## CASING WASHER

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10 Claims. (Cl. 166—20)

This invention relates to oil well tools and particularly pertains to a casing washer.

When oil wells are on production perforated casing or screen is used in the producing area to permit the inflow of cognate fluid to the well. In the course of operation sand, silt, and other extraneous matter often accumulates in and around perforations to clog the same. It is necessary to provide various means for removing this accumulated material so that the perforations will be free and clear. In U. S. Letters Patent No. 1,524,592 issued to L. E. Stephens January 27, 1925, a desirable type of casing washer is shown for accomplishing the above results. This type of washer operates on the principle that a member is lowered into the well casing supported by a string of pipe, the lowered member carrying a plurality of nozzles which project fluid flow laterally from the structure as delivered by the string of pipe. In order that this structure shall operate effectively the nozzles are mounted so that they will move outwardly against the side wall of the casing or adjacent thereto to project a jet of fluid into the perforations to remove the clogging material therefrom. The outward movement of the nozzles is produced by the pressure of the fluid used to clean the perforations, and in the form of structure shown in the Stephens patent the design of the nozzles and their relative pressure areas is such as to cause the nozzles to be forced against the side wall of the casing with a pressure of large magnitude, which is objectionable. It is the principal object of the present invention, therefore, to provide a casing washer of the type shown in the aforesaid Stephens patent but which has a nozzle structure designed and arranged to operate upon a relatively small fluid pressure and to be easily manipulated in the hole to clean the casing and its perforations without becoming lodged in the hole due to the pressure applied by the nozzle elements as they bear against the inner face of the casing.

The present invention contemplates the provision of a body member supported at the lower end of a string of tubing and which body member carries a plurality of laterally movable nozzles through which a fluid jet may be projected and which nozzles are actuated by the fluid pressure, the nozzles being so housed as to present a relatively small area of effective pressure surface against which the fluid acts.

The invention is illustrated by way of example in the accompanying drawing, in which:

Figure 1 is a view in elevation showing the casing washer as suspended upon a tubular support

and disclosing the nozzle arrangement and also the arrangement of water courses around the outer surface of the body of the member.

Fig. 2 is an enlarged view in vertical section showing the details of the nozzle construction.

Fig. 3 is an enlarged end view showing the nozzle cylinder.

Fig. 4 is a view in plan showing the shape of the nozzle and the manner in which it conforms to the surface of the casing.

Referring more particularly to the drawing, 10 indicates a tubular support such as a string of well tubing or a drill string and at the lower end of which a casing washer 11 is mounted. The body 12 of the washer is cylindrical and is formed at its opposite ends with extensions 13. These extensions are here indicated as being threaded boxes which receive the pin end 14 of the tubular support 10. The lowermost of these members is closed by a plug 15 or may carry a perforated nipple if required. Extending entirely throughout the length of the body member 12 is a central fluid passageway which communicates with the tubular support 10 and through which fluid may be delivered. This fluid may be any suitable clean fluid, oil, water, or chemicals to jet out and clean the perforations. This fluid is forced downwardly through the tubular support 10 by any suitable means, such for example as the mud pumps at the well, or other pumping structures. The body member of the washer is formed with a plurality of radially extending threaded openings 17 which receive the nozzle cylinders 18 of nozzle units 19. The cylinders 18 are of relatively large cross-section and are formed with their outer ends open and their inner ends closed by an end wall 20. The wall 20 is formed with a central cylindrical bore 21. This bore is of a diameter materially less than the main bore 22 of the cylinder. The outer face of the end wall 20 is formed with a counterbore 23 which receives a packing washer 24 and a pressure washer 25. Mounted within the main bore 22 of the cylinder is a piston nozzle 26. This nozzle is designed to reciprocate within the bore 22 and is formed with a key 27 along its outer surface which fits within a keyway 28 cut in the wall of the bore 22. Thus, the piston nozzle may reciprocate without rotation. Complementary grooves 40 and 41 are cut in the walls of the piston and cylinders to permit displacement of fluid from within the cylinder and behind the piston. The length of the piston nozzle is substantially the length of the bore 22 and is formed at its outer end with an end surface representing a segment of a cylinder vertically disposed. The

arcuate face agrees in radius with the inner face of the casing being washed. The nozzle point is otherwise substantially conical. This end, 29, has a central passageway 30 therethrough. It is desirable that when the piston 26 is in its retracted position the point of the nozzle will be within the bore 22 so that it will not project beyond the line of the cylindrical outer face of the body member 13 as it is being lowered into the hole, thus insuring that the structure will not be injured by encountering the side wall of the casing or the casing joints.

The opposite end of the nozzle from its tapered end is square and may abut against the face of the wall 20 when the nozzle is in its retracted position. The bore 30 is counterbored at the opposite end of the piston nozzle as indicated at 31. This bore is threaded and receives a tubular piston stem 32 which extends through the opening 21 in the cylinder end 20 and also through the packing washer 24 and the pressure washer 25. The portion of the piston stem 32 which extends through the bore 21 and the washers is cylindrical and smooth so that the stem may freely reciprocate. The outer end of the stem is formed with a head 34. Interposed between the pressure washer 25 and the nut 34 is a helical spring 35. The spring 35 is of relatively light tension due to the fact that the design of the structure here shown requires a relatively small amount of fluid pressure to move the piston and to project it to its outermost position. A central passageway 36 is formed through the piston stem and is in alignment with the passageway 30 formed in the piston so that the fluid used for cleaning and abrading purposes may flow directly through the two passageways. In order to facilitate the mounting of the cylinders 18 within the threaded bores 17 the outer ends of the cylinder wall are formed with spanner wrench holes 37 which receive the pins of a spanner wrench and permit the cylinders to be screwed into place.

In order to insure that the discharge fluid from the nozzles will readily clear the area in which a cleaning action is being made and for the additional purpose of facilitating in lowering the tool into the hole and removing it therefrom helical grooves 38 are formed around and along the outer surface of the body member 12. The nozzles occur between these grooves.

In operation of the present invention the structure is assembled as here shown. The nuts 34 are adjusted on the stems so that the springs 35 will be under proper tension to hold the piston nozzles in their retracted positions. Attention is directed to the fact that the innermost ends of the pistons 26 are covered and that the only effective pressure area against which the fluid under pressure can act is the area represented by the end surface of the piston stem 32. This surface is materially small due to the fact that the bore 36 extends through the piston. Thus when fluid pressure is applied by delivering a pressure fluid to the washing device through the pipe 10 fluid will pass through the passageways 36 and 30 to be discharged from the nozzle portion 29. At the same time this fluid under pressure acts against the end of the stem 32 to force the nozzle outwardly from the cylinder 18 and to cause it to bear against the inner surface of the casing wall 39. Attention is directed to the fact that this will occur under relatively light pressure due to the small pressure area against which the fluid acts. Thus, the end of the nozzle may bear lightly against the wall of the casing and permit the

casing washer to be moved up and down the casing while the fluid is being discharged from the nozzle. This can be accomplished without any binding action and without any damage to the ends of the nozzles in the event they encounter irregularities in the casing wall. Attention is further directed to the fact that due to the use of the packing washer 24 and the freely movable pressure washer 25 which is held in its seated position by the spring 35 the fluid within the device will act against the pressure washer 25 to produce a suitable fluid-tight seal around the piston stem 32 so that fluid will not enter the cylinder and exert its pressure over the entire end face of the piston nozzle 26 when pump pressure is discontinued the packing will be free.

It will thus be seen that by the invention here disclosed it is possible to provide a casing washer in which nozzles will be moved outwardly to positions in contact with the wall of the casing by the pressure exerted by the fluid to be discharged through the casing and that said outward pressure holding the nozzle against the casing even though when washing under high pump pressure will be relatively light and insure that the casing washer may be easily manipulated without damage when in operation, and furthermore, that upon a cessation of the application of pressure of fluid within the structure the springs 35 will instantly retract the nozzles into the cylinders so that the casing washer may be readily withdrawn from the well.

While I have shown the preferred form of my invention as now known to me, it will be understood that various changes may be made in combination, construction and arrangement of parts by those skilled in the art, without departing from the spirit of my invention as claimed.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A casing washer employing a washing fluid under pressure and comprising: a body portion having a passageway therein communicating with a tubular support, a jet structure mounted in the wall of said body portion and including a cylinder opened at its outer end to the exterior of the wall and closed at its inner end, a bore through the closed inner end of a diameter substantially less than the bore of the cylinder, a piston nozzle reciprocating within the bore of the cylinder and being formed at its outer end with a conical nozzle point, a reduced stem at the opposite end of said piston nozzle extending through the bore in the end wall of the cylinder, a fluid passageway being formed entirely through the stem and the piston nozzle whereby a fluid jet may be ejected from the nozzle end of the piston under the pressure established within the body portion, said fluid pressure acting against the end of the stem to force the piston nozzle outwardly.

2. Same as 1, adding the following: and yieldable means acting against the fluid pressure exerted against the end of the piston stem tending to hold the piston nozzle in its retracted position.

3. Same as 1, adding the following: and packing means disposed at the end of the cylinder head and surrounding the piston stem to be subjected to the pressure of fluid within the body portion to form a fluid seal between the piston stem and the end of the cylinder.

4. Same as 1, adding the following: and means cooperating between the piston nozzle and the cylinder for holding the piston against rotation within the cylinder while permitting it to have longitudinal movement.

5 5. A casing washer employing a washing fluid under pressure and comprising a cylindrical body portion disposed with its longitudinal axis vertically, said body portion being formed with an internal passageway, a supporting tubular member connected to said body portion and communicating with said passageway, laterally directed washing fluid nozzles mounted in the wall of the body portion and acting to direct jets of fluid laterally therefrom, and grooved water courses formed along the outer face of the body portion.

10 6. Same as 5, adding the following: and between the nozzles, said water courses being helically disposed.

15 7. A casing washer employing a washing fluid under pressure and comprising: a cylindrical body member suspended at the lower end of the tubular support, said body member having an internal chamber in communication with said tubular support whereby a washing fluid under pressure may be delivered thereto, a plurality of laterally disposed bores in the side wall of said body member, each of said bores receiving a nozzle unit, said nozzle units including a cylinder substantially closed at its inner end and open at its outer end, said cylinder being mounted within the bores formed in the wall of the body member and with their open end disposed outwardly, the wall at the inner end of said cylinders being formed with a bore of relatively small diameter as compared to the bore of the cylinder, a piston nozzle reciprocally mounted within said cylinder and having a conical outer end, a stem formed at the inner end of said piston and projecting through the bore in the cylinder wall, the end of the stem representing an area materially less than the area of the end of the piston, said stem and piston having a fluid duct formed centrally through them to the point of the nozzle whereby fluid under pressure within the cylindrical body member will be forced through said passageway to project a

jet of washing fluid from the point of the nozzle and to simultaneously exert pressure on the end of the stem to force the piston nozzle outwardly beyond the end of the cylinder and toward the position of contact with the wall of a casing into which the structure is lowered, and yieldable means acting in opposition to said fluid pressure and tending to hold the nozzle in its retracted position.

5 8. Same as 7, adding the following: and adjustable means acting to vary the action of the yieldable means.

10 9. Same as 7, adding the following: adjustable means acting to vary the action of the yieldable means, and packing means interposed between the yielding means and the end of the cylinder wall and around the piston stem whereby the yielding means and the fluid pressure will act to form a fluid-tight seal around the stem as it reciprocates.

15 10. A casing washer employing a washing fluid under pressure and comprising a cylindrical body portion disposed with its longitudinal axis vertically, said body portion being formed with an internal passageway, a supporting tubular member connected to the body portion and communicating with said passageway, a cylinder bore within the body portion and extending with its longitudinal axis laterally disposed, said bore communicating with the internal passageway in the body member, a piston nozzle reciprocating within said bore and being formed with a central fluid passageway therethrough whereby fluid delivered to the cylinder will act to move the piston outwardly and will project a jet of fluid simultaneously through the passageway in the piston, and means for permitting by-pass of fluid around the piston when the piston moves to a retracted position.

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