April 9, 1929. C. A. BUTLER 1,708,051

CASING SPIDER

Filed June 17, 1927

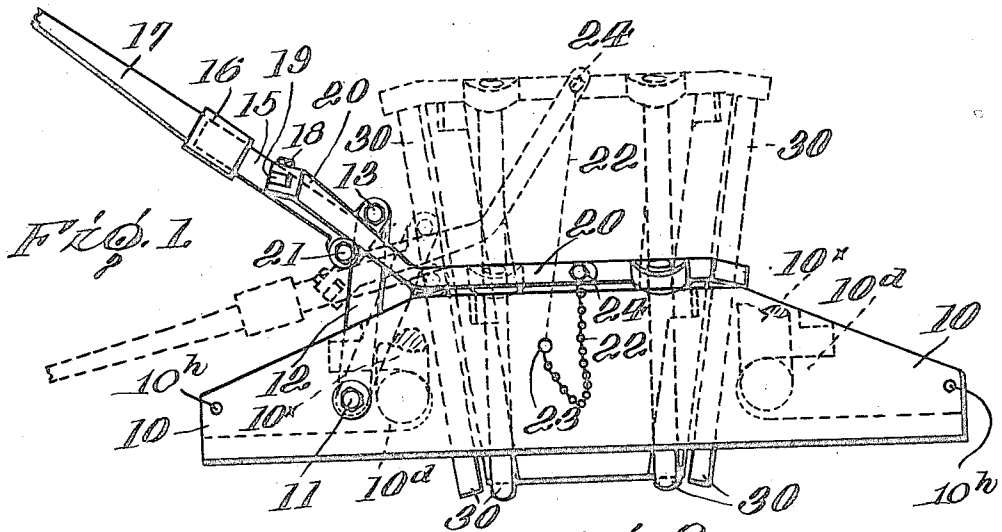


Fig. 1.

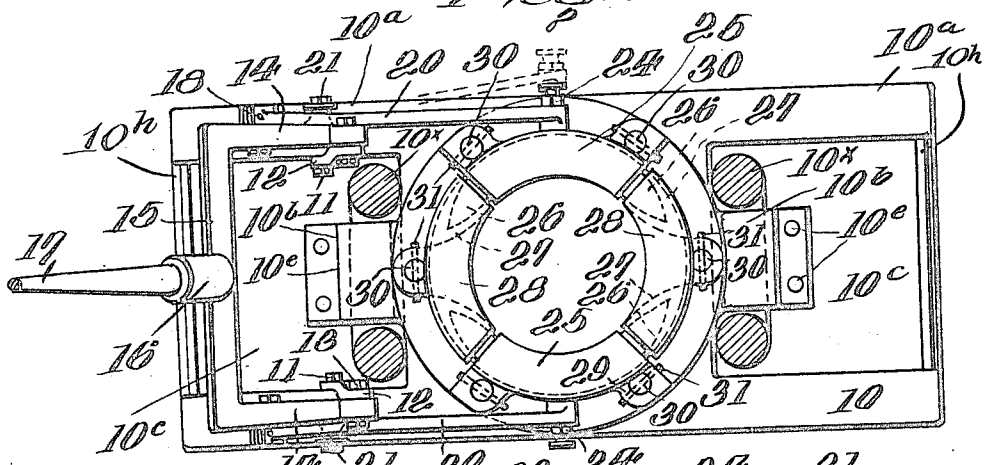


Fig. 2.

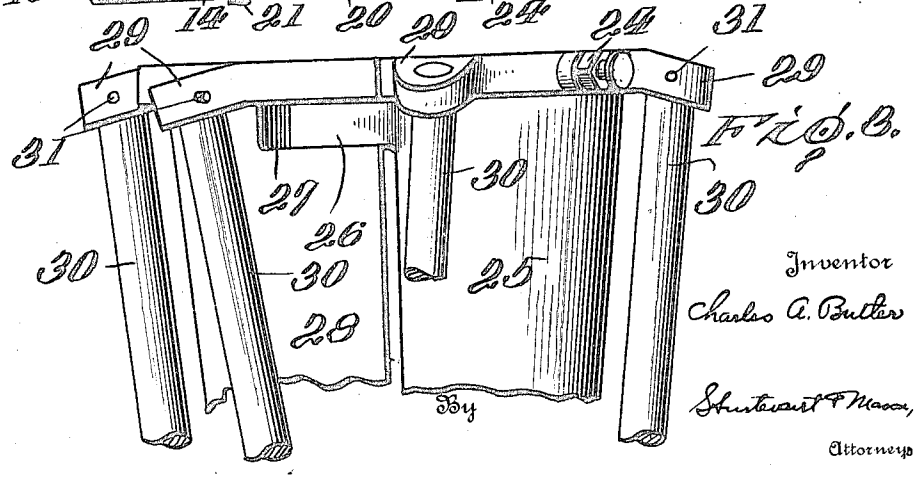


Fig. 3.

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CASING SPIDER.

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This invention relates to improvements in casing spiders, and more particularly to the construction of and operating mechanism for such spiders.

Casing spiders are employed in the operations of lifting and lowering well casings, particularly in the oil fields, where the individual lengths of casing are heavy, and where a well casing may weigh several hundred tons as a whole. It is necessary to have a firm support for the separate lengths of casing, as they are being raised and lowered, and particularly while they are being coupled together, or supported one from another. It is essential that this coupling and uncoupling operation should be accomplished easily and quickly: and yet a firm support must be accorded the remaining length of casing during the separation of the topmost section. In view of the great weight of the casing itself, it is necessary to employ wedge blocks, the so-called slips, to hold the casing lengths which themselves are strong and heavy, and it is found that these slips may weigh over eight-hundred pounds per set. It is likewise necessary to design the spider so that it may be firmly supported over and around the mouth of the well, and so that it may be quickly placed and removed.

According to the present invention such a casing spider is provided with clamping blocks adapted to wedge between the casing and a conical wall of the spider base whereby to support the casing in the well by engagement adjacent its top, so that a further length may be connected or disconnected easily. A very simple and efficient construction is provided which may be operated by a single attendant and which causes the clamping blocks to engage the casing equally at all sides, and assists in centering the casing by effecting the single uniform upward and downward movement of the clamping lug. The base block of the spider is simple in form, but so arranged that its parts mutually support each other and provide a firm seat for the clamp blocks and operating mechanism, and yet which may be supported on suitable timbers at the well mouth: and further it is provided with means whereby in case of need the spider itself may be employed to raise the casing. Another object is to provide positive guides for the movement of the respective blocks while being raised and lowered and to accomplish this guiding by fixing the relationship of the clamping blocks to the base blocks of the spider itself.

With these and other objects in view I have illustrated one form of my invention on the accompanying drawings, in which:

Figure 1 is an elevation of the spider showing the parts in clamping position in full lines and in releasing position in dotted lines.

Fig. 2 is a plan view of the spider in clamping position.

Fig. 3 is a detail on a larger scale showing the interlocking relationship of the lateral and end clamping blocks, with the guide bolts, away from the base block.

This spider is composed of the base block 10 which has a central aperture of conical form therethrough, converging downwardly to receive the clamping blocks and force and guide them inward against the casing as the blocks move downwardly. This base block is formed with vertical sides, which extend beyond the proper wall of the central aperture to form the wings 10^a at each end, having a space between them in which projects the lugs 10^b which are spaced from the floor section 10^c of the base block proper to form a notch 10^d (Fig. 1) at each end into which may be engaged lifting links 10^x or the like in case it is desired to lift the casing by means of the spider, in which event bolts may be dropped through the apertures 10^e in these lugs to prevent the slippage of the lifting links. Likewise, these lugs may be employed for moving the spider into and out of position at the mouth of the well. It will thus be seen that the base block is H-shaped in horizontal section, the vertical walls 10 and 10^a constituting the legs of the H and the portion surrounding the downwardly converging central aperture constituting the cross bar of the H, while the floor sections 10^c brace and support the vertical walls with respect to one another and the central portion.

It is preferred to provide transverse bars 10^h by which the spider may be transported and manufactured by hand.

Pivotally mounted on the base block 10 by the bolts 11 are the link arms 12 which are pivoted by bolts 13 at their upper ends to the forked ends 14 of the hand lever 15. This hand lever has an outwardly extending prong

to receive the sleeve 16 of the detachable handle 17. The forks 14 are provided at their respective outer sides with a pivot bolt 18 which passes through an eye 19 of the respective fork 14 and through the eyes of the lifter links 20, 20 which project at each side of the central aperture of the base block 10. Conically tapered stop lugs 21 are provided on each fork 14 to support the links 20, 20 and enable them to raise the weight of the spider clamps. A safety chain 22 is connected at the outer end of the respective link 20 and to a pin 23 on the base block 10, and prevents the link 20 being raised so far that the guide pins hereinafter mentioned are pulled from their guide holes.

The free ends of the links 20 are connected by bolts 24 to the lateral spider clamp blocks 25, which each approximate a quadrant in dimension, and are provided with a quarter-cylindrical internal surface which may be formed with suitable teeth to bite and grip the casing firmly: and the external surfaces are formed conically to fit with and be guided by the conical surface of the aperture in the base block 10, as shown in Fig. 3. At the segment ends, each of these blocks is provided with the extending fins 26 which are received in the suitably formed recesses 27 of the end blocks 28. These end blocks 28 are likewise of approximately a quadrant in dimension, and are formed with toothed cylindrical inner surfaces and conical outer surfaces.

The upper ends of the clamping blocks 25, 28 are formed respectively with projecting lugs 29 to receive the guide bolts 30 which are securely locked to the respective blocks 25, 28 by the pins 31 (Fig. 2). These guide bolts 30 are engaged in holes extending through the base blocks 10 from top to bottom, the holes being inclined, and are disposed at such an angle that the axis of each is parallel with the adjacent generatrix of the cone which lies in the diametral plane passing through the axis of the central aperture in the base block 10, and through the center of the respective block 25 or 28. As illustrated, two parallel guide bolts 30 are provided on each of the lateral segments 25 and one such guide bolt on each of the end segments 28.

It is necessary that the clamping block should move relatively outward from the axis of the casing by a distance of around one inch for each block in its outward radial movement with respect to the casing axis, in order that the clamping block shall have moved far enough from the casing so that the casing couplings may slip freely downward. It is preferred that the angles of the bolts and of the inner surface of the wall of the central aperture of the base block should be around seven and one-half degrees, since this has been found excellent in practice: although it is obvious that other angles may be employed.

In operation, the handle 17 is depressed into the position shown in dotted lines in Fig. 1, whereby the free ends of the links 20 are raised into the position likewise shown in dotted lines, drawing with them the lateral clamping blocks 25, which are guided upwardly and outwardly by their respective guide bolts 30, the links 20 swinging about their pivot bolts 18 into the position indicated by dotted lines at the top of Fig. 2, the pivots 18 and the looseness of the bolts 24 permitting this free movement of the links 20, this movement being facilitated by the conical shape of the supporting lugs 21. At the same time, the lever 15 rocks toward the casing aperture upon the supporting links 12, so that the pivot bolt 24 is permitted to move upward and outward without any movement from right to left or vice versa in Fig. 1. The guide bolts 30 draw the respective blocks 25 outward and away from the axis of the aperture. As the blocks 25 move upward, the engagement of their extensions 26 in the recess 27 likewise raises the end clamping blocks 28, which are likewise guided upwardly and away from the axis of the central aperture by their respective bolts 30, until finally the blocks are in the position in dotted lines in Fig. 1. In this position, the lever 20 holds the blocks ready for receiving the casing and a limitation is imposed upon the movement of the lever, which in conjunction with the safety chains 22, prevents a lifting of the blocks 25, 28 out of their operative positions.

A length of casing may now be lowered through the enlarged space between the clamping blocks 25, 28 until the coupling is a few inches above the tops of the raised clamping blocks 25, 28. The hand lever 17 is then raised, so that the free ends of the links 20 are lowered and the clamping blocks 25, 28 are permitted to return by gravity. These blocks 25, 28 are guided in their return movement by their respective bolts 30 and move inward uniformly and engage the pipe and support it axially alined in the central aperture, by reason of their guiding by the bolts 30 and by the engagement of their conical outer surfaces with the conical internal surface of the wall of this central aperture. The movement of these blocks is uniform and simultaneous, so that one block does not move faster than the other and there is no tendency to crush or distort the casing.

A new length of casing is now screwed into the connection of the supporting casing, and when this has occurred, the blocks are raised as before so that the casing lifter may lower the new length of casing into the well, with a free passage of the coupling through the spider, and then the spider is again brought into action to fix the new length just beneath its own coupling, and so on.

The device is simple and efficient, and may be readily operated by a single attendant.

It is obvious that the invention is not lim-

ited to the specific form of employment illustrated, but that it may be modified within the scope of the appended claims.

What is claimed as new is:

1. In a casing spider, a base having a central downwardly convergent tapered aperture therein, the walls of said aperture having passages therethrough parallel to wall elements of the said tapered aperture, slip blocks to engage the walls of said aperture to clamp the well casing, bolts secured to said slip blocks and slidable in said passages whereby to guide said slips inwardly and outwardly during their downward and upward movement, a slip lifting lever mounted on a horizontal pivot, lateral lifter links pivotally mounted on said lever so that their free ends are supported opposite and adapted to move relatively outward away from the axis of said aperture, and connections between said links and said slip blocks to raise and lower the said slip blocks, said lifter links following the inward and outward movement of the slip blocks in their downward and outward movement.

2. In a casing spider, a base block having a downwardly convergent tapered aperture therein, quadrant slip blocks fitting said aperture, supporting links pivoted on said base block, a lifting lever pivoted on said supporting links, laterally swinging and raising links moving with said lever in its lifting movement, and connections between said raising links and diametrally opposite quadrant blocks, said diametrally opposite blocks having means whereby to raise the intermediate blocks, the swinging of said raising links permitting the free outward and inward movement of said blocks.

3. In a casing spider, a base block, slip blocks to clamp the casing, guide means to cause the slip blocks to move away from the casing in proportion to their raising movement, and means to raise and lower the slip blocks including a lever pivoted to move in a vertical plane, lifter links pivoted on said lever to move away from said vertical plane during the raising and outward movement of the slip blocks, and means for connecting said lifter links and said slip blocks.

4. In a casing spider, a base comprising a central apertured portion to receive slip blocks, vertical upstanding walls formed integrally with said central portion and spaced one from another, and floor sections formed integrally with said portion and vertical walls, said vertical walls and floor sections extending away from said central portion and constituting supporting and bracing means therefor.

5. In a casing spider, a base of substantially H-shaped horizontal section, the central bar of the H having a downwardly substantially conical aperture therein to receive slip blocks, floor sections connecting the lateral walls forming the legs of the H, said floor sections supporting and bracing the said lateral walls and constituting a support by which the base may be supported adjacent the mouth of the well.

In testimony whereof I affix my signature.

CHARLES A. BUTLER.