

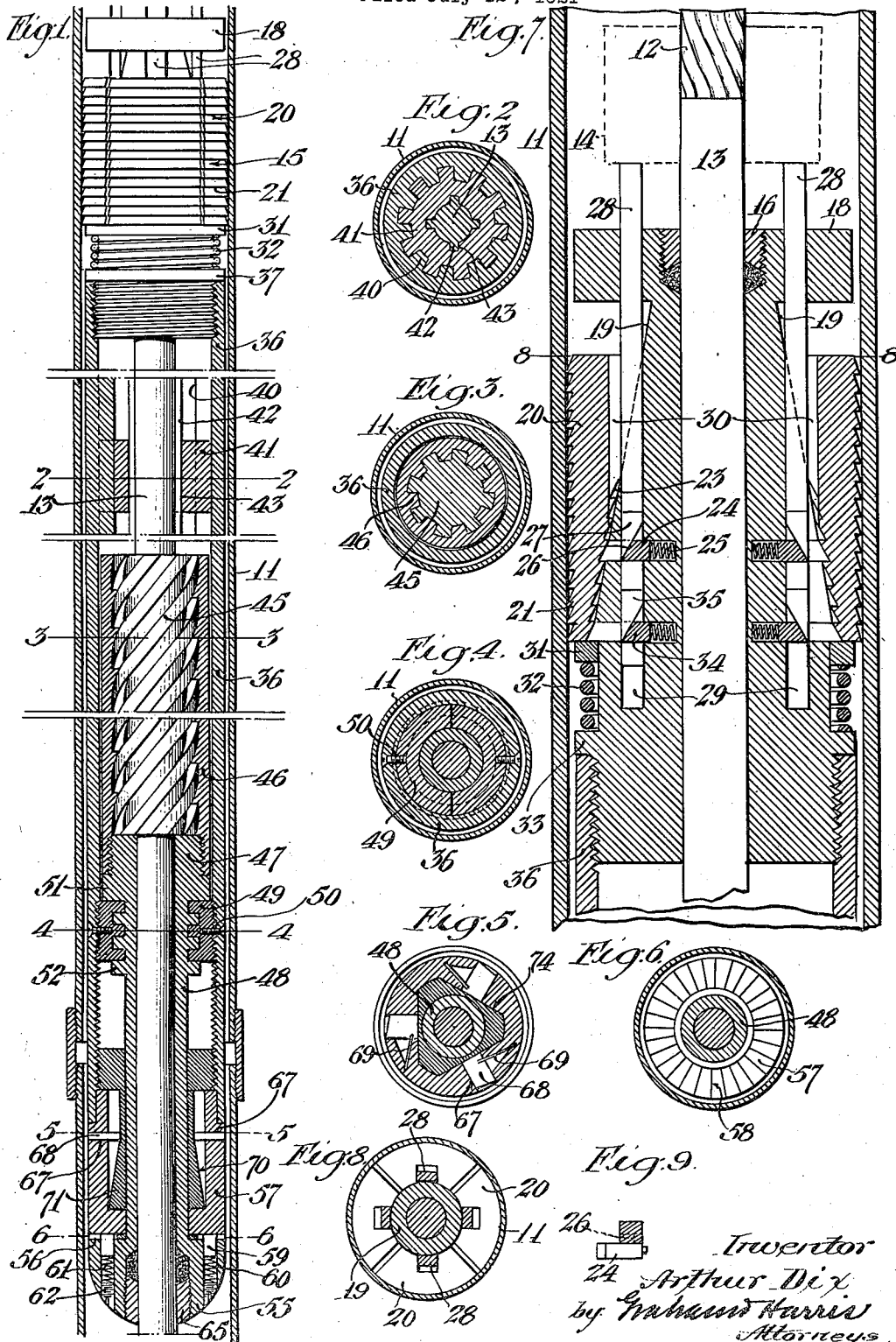
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CASING CUTTER

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CASING CUTTER.

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To all whom it may concern:

Be it known that I, ARTHUR DIX, a citizen of the United States, residing at Taft, in the county of Kern and State of California, have invented a new and useful Casing Cutter, of which the following is a specification.

My invention relates to the art of drilling oil wells, being more particularly a device for cutting off the casing in an oil well.

It sometimes happens that in order to remove a casing from a well it is necessary to cut off such casing and the principal object of my invention is to produce a casing cutter of the class described which may be efficiently operated for the desired purpose.

Other objects and advantages will appear hereinafter from the following specification and drawings.

Referring to the drawings, which are for illustrative purposes only,

Fig. 1 is a vertical sectional view of a casing cutter embodying a form of my invention, the cutter being shown within the casing and the parts being in the position assumed just prior to the cutting operation.

Fig. 2 is a cross sectional plan view on line 2—2, Fig. 1.

Fig. 3 is a cross sectional plan view on line 3—3, Fig. 1.

Fig. 4 is a cross sectional plan view on line 4—4, Fig. 1.

Fig. 5 is a cross sectional plan view on line 5—5, Fig. 1.

Fig. 6 is an inverted sectional plan view on line 6—6, Fig. 1.

Fig. 7 is an enlarged vertical sectional view of the upper end of the casing cutter.

Fig. 8 is a sectional view on line 8—8, Fig. 7, such view being on a smaller scale, and

Fig. 9 is a sectional plan view of one of the latch bars shown in Fig. 7, together with a dog operated thereby.

11 designates a casing of a well which casing is to be cut by the casing cutter.

12 designates a drill cable to which is secured a pull rod 13 by means of a coupling indicated in dotted lines at 14. The pull rod slidably extends through the upper end of the cutter which upper end may be designated a casing gripping device or trip spear 15, such trip spear having a stuffing box 16 at the upper end thereof by means

of which dirt and other foreign matter are prevented from passing downwardly into the tool around the pull rod 13. The upper end of the trip spear terminates in a circular flange 18, the spear under such flange being circular in cross section and having tapered walls or faces 19 which receive slips 20, such slips having a series of teeth 21 on their outer face arranged to engage the inside of the casing for the purpose hereinafter described.

The inside faces of the slips are also provided with teeth 23 which are arranged to be engaged by upper dogs 24 yieldingly held in such engagement by means of coiled springs 25, each dog 24 is provided with a beveled face 26 arranged at one side thereof, such beveled face being arranged to be engaged by wedges 27 formed on the sides of latch bars 28, such latch bars extending upwardly through a recess 29 formed in the trip spear 15, the slips 20 having slots 30 so as to provide clearance for the latch bars. The upper ends of the latch bars slidably extend through the flange 18 and upwardly therefrom a short distance as shown in Fig. 7 of the drawings.

31 designates a ring which engages under the lower end of the slips 20, such ring being yieldingly held in such engagement by means of a coiled spring 32, the lower end of which rests upon and engages a circular flange 37 formed on the trip spear, adjacent or near the lower end of the same. The ring 31 is held against the spring 32 by means of lower dogs 34 which engage the upper face of the ring, such dogs being arranged to be engaged by wedges 35 on the latch bars 28, as hereinafter described. The lower end of the trip spear 15 is exteriorly threaded to receive the threaded upper end of a barrel or pipe section 36, such pipe section being of slightly smaller diameter than the inner diameter of the casing. The upper end of the barrel is provided with a plurality of inwardly extending ribs 40, which ribs are engaged by a sliding block 41 slotted to receive such ribs, the barrel being stationary during the operation of the cutter, the sliding block 41 may move vertically but is prevented from rotating in the barrel. The pull rod 13 at this point is provided with outwardly extending ribs 42 which engage in slots in the sliding block, such construction and engagement of the block with the rod 13

and barrel 40 permitting a vertical sliding movement of the pull rod but preventing rotative movement of the pull rod.

45 is a spirally threaded shaft which is secured in any well known manner to the pull rod 13 so that the pull rod and such shaft are in fact in rigid relation with respect to each other. The threaded shaft 45 engages an interiorly threaded rotary pipe 46 by means of which the vertical reciprocal movement of the pull rod is converted into a rotary movement of the rotary pipe 46. The lower end of the rotary pipe 46 is interiorly threaded to receive the threaded upper end 47 of a sleeve 48. The rotary pipe 46, the sleeve 48 and associated parts are permitted to freely rotate in the barrel 36 but are prevented from vertical longitudinal movement therein by a split bronze bearing 49 secured to the barrel 36 by means of set screws 50, the sleeve 48 above such bearing being provided with an outwardly extending circular flange 51 which engages between the lower end of the pipe 46 and the upper face of the bearing 49, the lower face of the bearing 49 engaging the upper face of a smaller circular flange 52 formed on the sleeve 48. The lower end of the sleeve 48 is provided with an enlarged rounded head 55, the upper face 56 of which extends outwardly under a circular knife block or holder 57, such knife block 57 having formed on its under face a series of radially disposed ratchet teeth 58 arranged to be engaged by dogs 59 mounted in ways 60 formed in the head 55. The dogs 59 are yieldingly held in engagement with the ratchet teeth 58 by means of coiled springs 61 held behind the dogs by means of threaded plugs 62. The head 55 is also provided with a stuffing box 65 for preventing an entry of dirt to the interior of the cutter, the interior of the cutter being preferably filled with oil, such stuffing box also prevents the loss of such oil.

The knife block 57 in the form shown is provided with radially disposed slots 67 in each of which is arranged a knife blade 68, each knife blade being elastically held in retracted position by means of a flat spring 69, the inner end of each blade engages a wedge 70 formed on a feed block 71, the upper end of such feed block being threaded into the pipe section or barrel 36. The lower end of the pipe section or barrel 36 is stripped of its threads and forms a bearing for the upper end of the knife block 57, such construction being for the purpose of permitting the knife block 57 to rotate freely on the lower end of the pipe section or barrel 36. The inner ends of the knife blades 68 each engage a wedge, as heretofore referred to, such wedges being formed on flat faces 74 on the feed block, such flat faces being engaged by corresponding faces on the inside of the

knife block, and through such engagement transmit any rotary movement of the knife block to the feed block.

The cutter is operated in the following manner:

The pull rod 13 having been secured to the cable 12, heretofore referred to, the cutter is let down into the well to the point where it is desired to cut the casing. Now, by giving the cable an upward pull, the slips 20 will engage the inner face of the casing and be held in such engagement by means of dogs 24 engaging the teeth on the inner face of the slips. This engagement of the slips with the casing prevents turning of certain parts of the cutter during the cutting operation, that is, the pipe section or barrel 36 being secured to the lower end of the casing spear, as heretofore described, is stationary and is prevented from moving up and down due to the engagement of the slips with the casing.

Now, by operating the cable up and down, by attaching the same to the walking beam of the drilling mechanism and preferably by letting enough slack in the cable to permit the walking beam to work and no more, the up and down movement imparted to the pull rod 13 by the cable is converted into a rotary movement through the medium of a shaft 45, which, in turn, rotates the sleeve 48.

The connection between the head 55 on the sleeve 48 and the knife block 57 being of the character of a ratchet and pawl, it is understood that the movement of the sleeve 48 in one direction is transmitted to the knife block 57 and through the engagement of the knife block with the feed block 71, such movement is transmitted to the feed block. The feed block being threaded into the lower end of the stationary barrel 36, is caused by such movement to move upwardly in the knife block 57 and such upward movement, due to the engagement of the wedges 70 with the knives, brings the knives into engagement with the casing and the cutting operation is carried on until the lowered end of the feed block has moved above and out of engagement with the knives, such action taking place when the knives have expanded a sufficient distance to entirely cut through the casing. When the feed block moves above the knives, the springs 68 retract the knives 69 into a position inside the outer circumference of the knife block 57.

The cutting operation having been finished, it is understood that the cutter is removed from the well by permitting some slack in the cable thereby permitting the coupling 14 to fall and strike the upper ends of the latch bars 28 causing the same to move downwardly and, due to their engagement with the dogs 34, heretofore described, such dogs are retracted from engagement with the teeth on the inside of the slips,

thereby freeing the slips. The latch bars, during their downward movement, just described, also operate the dogs 34 to release the ring 31 which is forced upwardly against the lower ends of the slips 20 thereby forcing the slips out of engagement with the casing and freeing the tool so that the tool may be withdrawn from the casing.

I claim as my invention:

1. A casing cutter comprising a trip spear; a pull rod slidably extending through said spear; a plurality of slips mounted on said spear; teeth formed on the outer face of said slips arranged to engage the inner face of the casing; teeth on the inner face of each slip; upper dogs mounted in said spear arranged to engage the teeth on the inside of said slips; means for elastically holding such dogs in engagement with the teeth; a ring on said spear engaging the under face of said slips; a coiled spring under said ring arranged to elastically hold said ring in engagement with said slips; a plurality of lower dogs in said spear engaging the upper face of said ring; means for elastically holding said lower dogs in engagement with said ring; a plurality of latch bars slidably mounted in said spear; means on each latch bar for simultaneously detracting its associated upper and lower dogs; means on said pull rod for operating said latch bars; a plurality of cutting blades and means operated by said pull rod for operating said blades.

2. A casing cutter comprising a trip spear; a pull rod slidably extending through said spear; a plurality of slips mounted on said spear; teeth formed on the outer face of said slips arranged to engage the inner face of the casing; teeth on the inner face of each slip; upper dogs mounted in said spear arranged to engage the teeth on the inside of said slips; means for elastically holding such dogs in engagement with the teeth; a plurality of latch bars in said spear; means on each latch bar for simultaneously moving said dogs out of engagement with the teeth on the slips; means on said pull rod for operating said latch bars; a plurality of cutting blades and means operated by said pull rod for operating said blades.

3. A casing cutter comprising casing gripping means; a pull rod slidably extending through said gripping means; rotatably reciprocating means operated by said pull rod; a knife holder; a plurality of knives mounted in said knife holder; means associated with said rotatably reciprocating means for rotating said knife holder in one direction; means operated by said reciprocating means whereby said knives are brought into cutting action on said casing and means for yieldingly holding said knives in retracted position.

4. A casing cutter comprising casing

gripping means; a pull rod slidably extending through said gripping means; a rotatably reciprocating sleeve on said pull rod operated thereby; a knife holder; means operated by said sleeve for rotating said knife holder in one direction; a plurality of knife blades in said knife holder; and a feed block operated by said knife holder arranged to operate said blades to cut the casing.

5. A casing cutter comprising casing gripping means; a pull rod slidably extending through said gripping means; a rotatably reciprocating sleeve on said pull rod operated thereby; a knife holder; means operated by said sleeve for rotating said knife holder in one direction; a plurality of knife blades in said knife holder; springs engaging each blade for yieldingly holding said blades in inoperative position; and a feed block operated by said knife holder arranged to engage the inner ends of said blades and move the blades into cutting position; said feed block being arranged to pass out of engagement with said blades upon completion of the cutting operation thereby permitting retraction of the blades by said springs.

6. A casing cutter comprising casing gripping means; a pull rod slidably extending through said gripping means; a rotatably reciprocating sleeve on said pull rod operated thereby; a knife holder; means operated by said sleeve for rotating said knife holder in one direction; a plurality of knife blades in said knife holder; a feed block, wedges on said feed block engaging said blades; means for operating said feed block by said knife holder to move said blades into engagement with said casing and continuing such movement of the feed block above said knife holder to release said blades; means for retracting said knives; and means for releasing said gripping means.

7. A casing cutter comprising casing gripping means; a pull rod slidably extending through said gripping means; a stationary barrel secured to said gripping means; a rotary pipe in said stationary barrel; means operated by said pull rod for rotating said pipe; a sleeve secured to said pipe; a knife block; a series of knife blades in said knife block; means operated in said sleeve for rotating said knife block in one direction; a feed block operated by said knife block to move said knife blades into operative position; means for retracting said blades on completion of said cutting operation; and means for releasing said gripping means.

8. A casing cutter comprising casing gripping means; a stationary barrel secured to said gripping means; a pull rod slidably extending through said gripping means; 130

means on said barrel for preventing rota-
tive movement of said pull rod; a threaded
shaft fixed to said pull rod; an interiorly
threaded rotary pipe engaging said thread-
5 ed shaft whereby reciprocating vertical
movement of the pull rod causes said pipe
to rotate; a sleeve secured to said rotary
pipe; means on said barrel for preventing
vertical movement of said sleeve; a plu-
10 rality of cutting blades; means operated by
said sleeve for moving said blades into cut-
ting position; and means for detracting said
gripping means from the casing.

9. In a device of the character described,
15 the combination of: a spear; a plurality of
slips on said spear; teeth formed on the
outer faces of said slips for engaging the

inner face of the casing; teeth formed on
the inner faces of said slips; pawls held by
said spear adapted to engage said inner 20
teeth; resilient means normally holding said
slips in retracted position, said resilient
means being compressible so as to permit
engagement of said slips with said casing,
by a jerk upon said spear; bars having 25
means formed thereupon for removing said
pawls from engagement with said inner
teeth when it is desired to release said slips
from said casing; and means for actuating
said bars to release said pawls. 30

In testimony whereof, I have hereunto set
my hand at Taft, California, this 5 day of
July, 1921.

ARTHUR DIX.