

J. LORENZ.

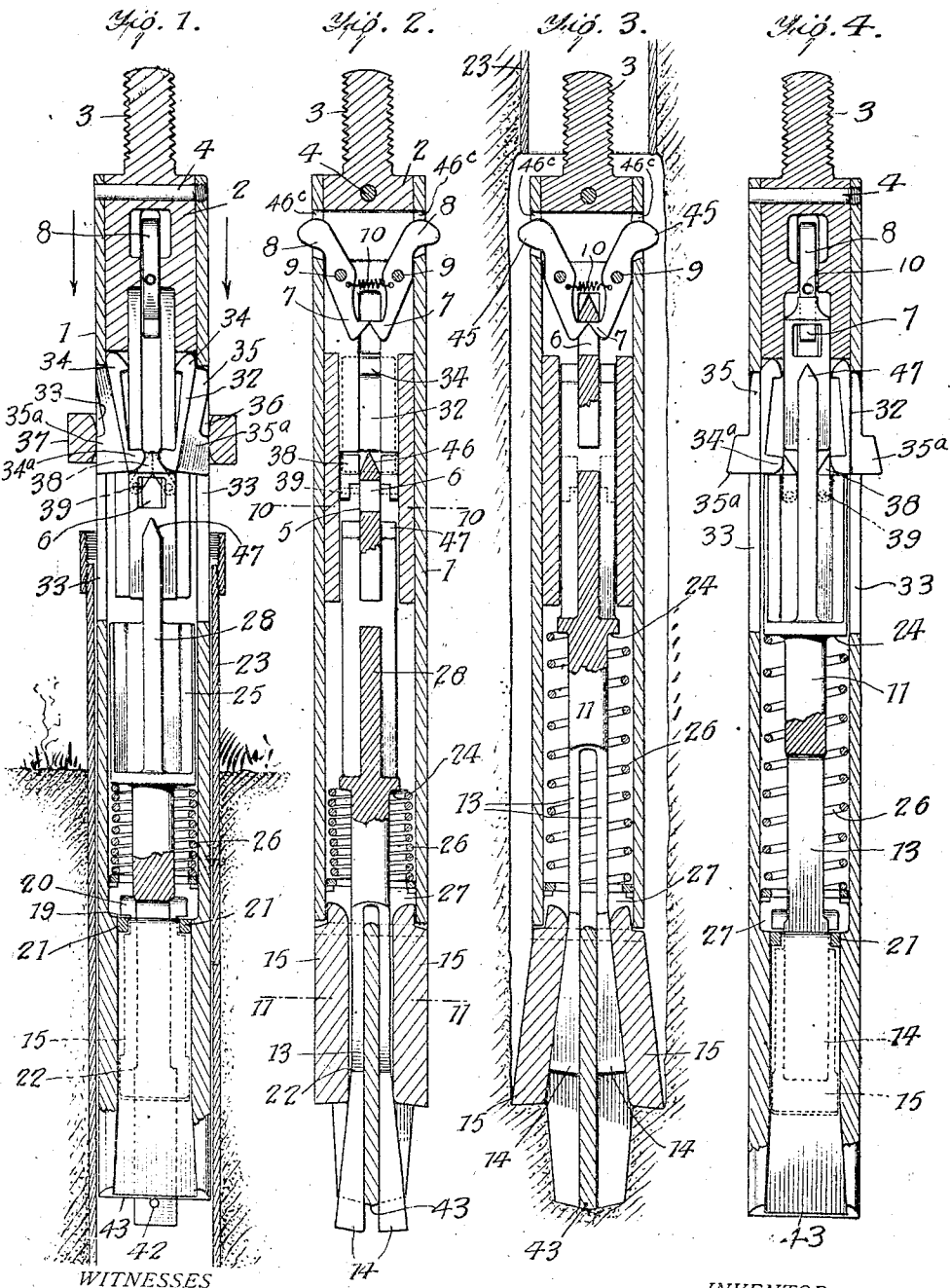
REAMER.

APPLICATION FILED MAR. 15, 1911.

Patented Apr. 15, 1913.

2 SHEETS—SHEET 1.

1,059,179.



WITNESSES

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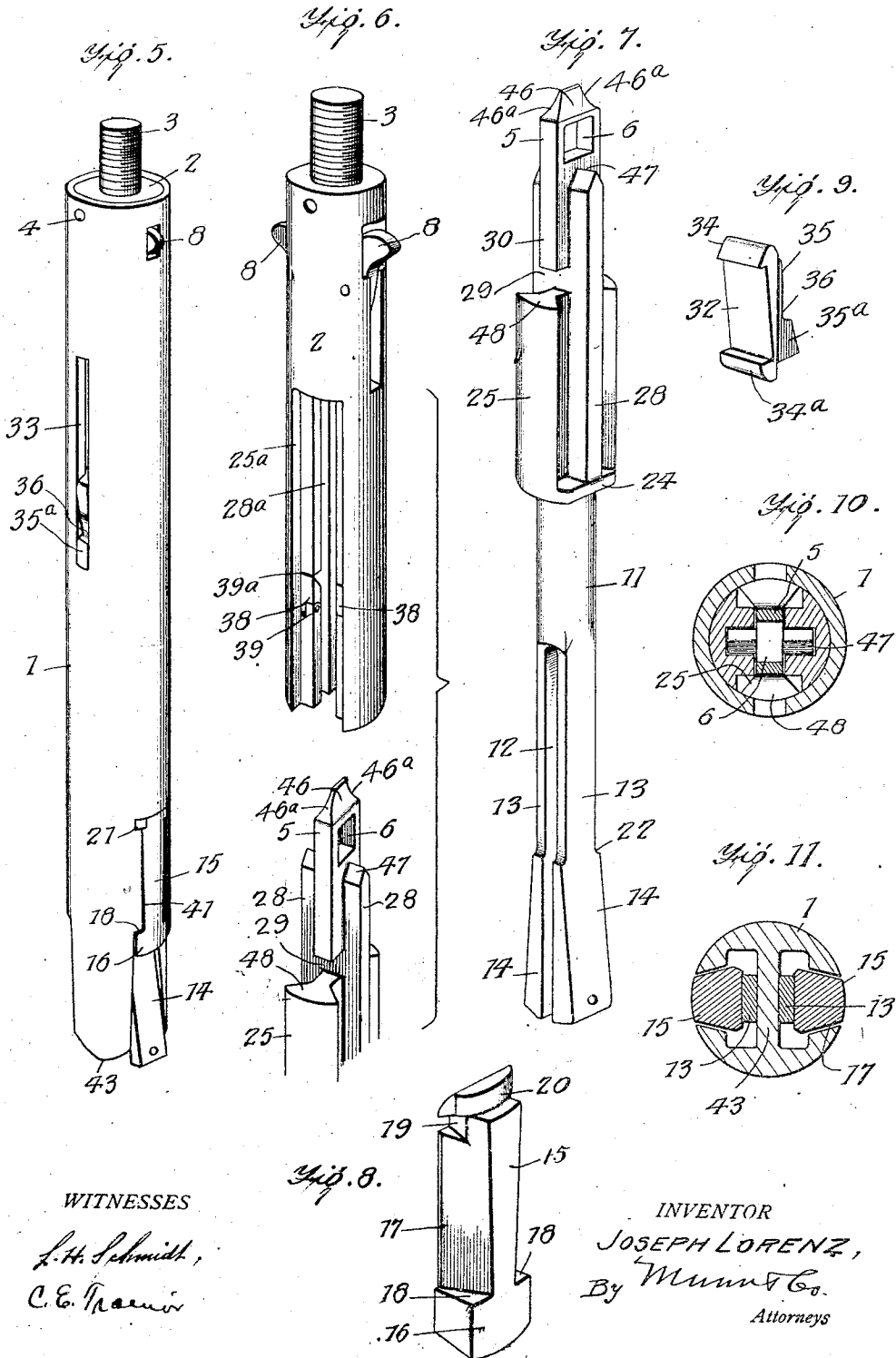
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1,059,179.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOSEPH LORENZ, a citizen of the United States, and a resident of Robinson, in the county of Crawford, State of Illinois, have invented a new and useful Improvement in Reamers, of which the following is a specification.

My invention is an improvement in reamers, and consists in certain novel constructions and combinations of parts hereinafter described and claimed.

The object of the invention is to provide a tool of the character specified, especially adapted for under reaming, wherein the parts may be contracted to permit the passage of the tool through the well casing, which will automatically expand into working condition when the proper position is reached, and wherein a safety device is provided for preventing the accidental displacement of the parts.

Referring to the drawings forming a part hereof: Figure 1 is a vertical section of the improvement with the parts in position to permit the device to be lowered through the well casing; Fig. 2 is a similar view of the improvement at right angles to Fig. 1; Fig. 3 is a view similar to Fig. 2, showing the parts in the well in working position; Fig. 4 is a similar view at right angles to Fig. 3; Fig. 5 is a perspective view of the complete tool with the parts in the position of Fig. 1; Fig. 6 is a similar view of the plug and a part of the stem; Fig. 7 is a perspective view of the stem; Fig. 8 is a perspective view of one of the reamer bits; Fig. 9 is a perspective view of one of the safety dogs; and Figs. 10 and 11 are sections on the lines 10-10 and 11-11, respectively, of Fig. 2.

The present embodiment of the invention comprises a tubular casing 1, in which is mounted at the top a plug 2, provided with a threaded stem 3, at its top for attachment to a drill stem and the plug is held in place by a pin 4, passing transversely through the casing and plug and threaded into the casing at one end as indicated.

A stem 11, Fig. 7, is held in the casing, the said stem having a lug 5 at its top, which is provided with a transverse rectangular opening 6 for engagement by the teeth 7 of dogs or latches 8 pivoted at 9 in openings in the plug and pressed together into engagement with the opening by a coil spring 10.

The stem 11 is divided from slightly below its center to its lower end by a longi-

tudinal slot 12 into two substantially parallel resilient arms 13, each of which is provided at its lower end with a wedge-shaped extension or cam 14. The stem is of such length that when the dogs 8 are engaged with the opening 6 the upper or connected ends of the wedges are at the level of the bottom of the casing.

The reaming bits 15 are two in number and are oppositely arranged. Each reamer, Fig. 8, is provided at its bottom with a cutting edge 16, above which it is reduced laterally at 17 to form shoulders 18 at the upper end of the cutter. At the top of the reduced portion each bit is provided with a transverse groove 19 on each side and above the grooves the outer face of the bit is rounded at 20 to fit within the casing 1.

The bits are held in place by pins 21 passing transversely through the grooves 19, and engaging above shoulders 22 between the wedges or cams 14 and the arms 13. It will be evident that when the wedges are pulled upward, that is, when the dogs 8 are engaged with the opening 6, the bits are pressed outwardly beyond the outer face of the well casing 23 and into cutting position.

A shoulder 24 is provided on the stem between the round portion and an enlarged portion 25, and a spiral spring 26 encircles the stem below the shoulder and between the same and a cap 27 which encircles the stem above the shoulders 22. The spring normally acts to raise the wedges into the position shown in Fig. 3.

The portion 25 of the stem is of a diameter to fit the casing 1, but the said portion is cut away at opposite sides to form a pair of longitudinally extending spreading fingers 28 on each side. Above the portion 25 the stem is rectangular in cross section, as shown at 29, to about the longitudinal center of the lug 5, and the said lug is extended laterally on both sides of the said rectangular portion, as shown at 30, so that the stem is practically cross shaped in cross section.

The plug 2 (Fig. 6) is hollow and is cut away at each side at 25^a to receive the portions 25 of the stem. On the inner face of the plug between the cut away portions guideways 28^a are provided extending longitudinally of the plug for receiving the fingers 28.

A pair of dogs 32 are arranged in slots 33 in the wall of the casing 1, the said slots being directly opposite each other and being

of greater length than the dogs. Each of the said dogs 32 (Fig. 9) is provided at each end on its inner face with a transverse rib 34 and 34^a respectively, and on its outer face each dog is provided with a longitudinal rib 35, having a transverse notch 36 intermediate the ends of the rib, and that portion 35^a of the rib below the notch is inclined outwardly, as shown in Figs. 1 and 4.

The portions 35^a of the dogs extend through the slots 33 and are adapted to be engaged by a ring 37 which encircles the casing 1. The said ring when pressed downwardly on the casing engages the inclined edges of the portions 35^a and forces the lower ends of the dogs inwardly, so that the portion 35^a of the rib 35 below the notch 36 is flush with the outer face of the casing.

The dogs are moved outwardly to project the portions 35^a of the ribs beyond the surface of the casing 1 by levers 38, each of which is pivoted at one end at 39 in a recess 39^a formed in one side of the adjacent guideway 28^a. The free ends of the levers extend upwardly between the lower ends of the dogs 32 and it will be evident that when the levers are spread by the fingers 28, the lower ends of the dogs will also be moved outwardly.

The lower end of the casing 1 is slotted at each side at 41 to permit the reamer bits to swing in flush with the face of the casing, and the slot 41 is continued to the lower end of the casing to permit the wedges to move freely. Each of the wedges is provided with an opening 42 for the insertion of a tool to move the wedges manually, and when in their uppermost position the wedges extend far enough below the casing to expose the openings. The casing is also provided with a transverse longitudinally extending web 43 between the wedges, and when the wedges are in their lowest position the junction of the arms 13 is near the top of the web. The upper or outer ends 45 of the dogs 8 extend through openings or slots 46^c in the wall of the casing 1, as shown in Figs. 2 and 3.

The upper end of the lug 5 is beveled to form oppositely arranged inclines 46, and oppositely arranged shoulders 46^a. The inclines 46 are adapted to enter between and spread the dogs 8 to permit the teeth 7 of the said dogs 8 to engage the opening 6 of the lug 5, and the shoulders 46^a are adapted for engagement by the ribs 34^a of the dogs 32, as shown in Fig. 1, to hold the stem and the wedges in lowered position. The ribs 34^a are beveled downwardly, and the shoulders 46^a are shaped to fit the said bevel of the ribs, so that the said ribs will retain and hold the stem in lowered position, as long as they are in the position shown in Fig. 1. The ring 37 will retain the dogs in this position, until the lower ends of the said dogs

have entered the well casing. After the dogs have entered the well casing, the said casing will retain the dogs in such position until the said dogs pass out at the lower end of the well casing, when the springs 26 will force the stem upwardly, and the shoulders 46^a of the stem will spread the dogs to permit the passage of the lug 5. The dogs 32 are spread by the levers 38 acted upon by the spreading fingers 28. The upper end of each portion 28 of the stem is beveled, as shown at 47, for engaging the levers to spread the said levers and the dogs, as indicated in Fig. 4.

To introduce the tool, the parts are arranged in the position shown in Fig. 1, that is with the wedges in their lowermost position, so that the outer surface of the bits 15 is flush with the outer surface of the casing 1, the spring 26 being compressed, and the dogs 8 disengaged from the lug 5. The dogs 32 are in their innermost position, and are held in this position by the ring 37. While the dogs 32 are in this position, the lugs 34^a at their lower ends engage above the shoulders 46^a at the upper end of the stem. The tool is now introduced into the well casing, and lowered until the ring 37 rests upon the top of the said well casing. The further movement of the tool causes the tool to slip through the ring 37, the said ring being held at the top of the casing. The dogs 32, however, cannot move outward, because of the engagement of the portions 35^a with the inner face of the well casing, and the only purpose of the ring 37 is to hold the dogs 32 in inward position, until the tool has passed far enough into the well casing to permit the portions 35^a to engage the inner face of the well casing.

It will be noticed from an inspection of Fig. 1, that the portions 35^a of the dogs 32 extend below the ring 37, so that when the ring is resting upon the top of the well casing, the lower ends of the dogs will have entered the casing. While the members are in the above mentioned position, the spring 26 is under compression, and is held compressed by the dogs 32.

The shoulders 46^a of the stem bear against the ribs 34^a, and since the dogs 32 cannot move outward, the stem cannot move upward, and the spring 26 is held compressed.

When the tool passes below the bottom of the well casing, as shown in Fig. 3, the dogs 32 are no longer held in their inward position, and the spring 26 expands, driving the stem upward, and moving the wedges 14 upward, to cause them to extend the bits 15 beyond the outer surface of the casing 1. The upward movement of the stem causes the shoulders 46^a to press the lower ends of the dogs 32 outwardly, as shown in Fig. 4, so that the portions 35^a of the rib 35 are extended beyond the casing 1, as indicated in

Fig. 4. The spreading fingers 38 are expanded by means of the shoulders 47, and are retained in their outward or expanded position by the portion 29 of the stem. The inclines 46 of the stem pass upward between the portions 7 of the dogs 8, and spread the said portions 7, until the opening 6 of the stem is in register with the portions 7 of the dogs 8. As soon as this occurs, the spring 10 draws the lower ends of the dogs together, to cause them to engage the opening 6 to hold the stem in the position shown in Fig. 3. The tool is now ready for operation, the bits being held in extended position to underream the well casing, as shown in Fig. 3. The bits cannot move inward as long as the wedges are in the position of Fig. 3, and should the dogs 32 engage obstructions in the well hole below the casing, the wedges might be moved downward, to permit the bits to be pressed inwardly. The dogs 8, however, act as safety devices, to prevent any closing of the bits, that is to prevent any downward movement of the wedges.

When the tool is to be withdrawn from the well, it is drawn upward, until the portions 45 of the dogs 8 engage the bottom or lower end of the well casing. As soon as this occurs, the upper ends of the dogs 8 are moved inwardly, causing the portions 7 to release the opening 6 of the stem, and the dogs 8 are held in this position until they pass above the top of the well casing. A further upward movement of the tool causes the upper ends of the portions 35^a of the ribs 35 to engage the lower end of the well casing, and as the tool is moved farther upward, the said dogs 32 are moved downward with respect to the tool. The ribs 34^a of the dogs 32 are in engagement with the shoulders 48 of the stem, and as the dogs 32 are moved downwardly with respect to the tool, the stem is also forced downward, compressing the spring 26 and moving the wedges from between the bits and the wedge 43.

It will be noticed from an inspection of Fig. 4, that the lower ends of the dogs 32 are prevented from moving inward by the levers 38, and the levers are held in outward position by the spreading fingers 28. The said levers hold the dogs in outward position, until the upper ends of the portions 35^a of the ribs 35 are in engagement with the lower end of the well casing, and after the said upper ends of the said portions are engaged with the end of the well casing, the friction exerted will hold the dogs from inward movement. After the dogs 32 have been moved downwardly to the lower ends of the slots 33, the traction is relaxed slightly, after which the tool is again moved upward. The dogs 32 are now pressed inwardly, since they cannot move further downward with respect to the tool, and there is nothing to

prevent their inward movement, since they have passed below the levers 38. The wedges are far enough below the bits to permit the bits to swing inward, and to permit the entire tool to be withdrawn through the well casing.

It will be noticed that only the rib 35 of the dog 32 engages the slot 33, the main portion of the dog being inside of the casing. Should for any reason the said dog 32 become disengaged, the dogs 8 will hold the stem in upward position, that is, with the wedges between the bits and the web 43.

I claim:

1. A reamer comprising a tubular casing, oppositely arranged reamer bits at the lower end of the casing, said casing having: a transverse web between the bits, a wedge between each bit and the web for forcing the bit outwardly into cutting position, a stem in the casing, a resilient arm connecting each wedge with the stem, a spring acting normally to force the stem upwardly to extend the bits, said casing having oppositely arranged longitudinal slots intermediate its ends, a dog in the casing adjacent to each slot, each dog having a stop extending through the slot for engagement by the inner surface of the well casing to hold the dog in innermost position, or for engagement by the lower edge of the well casing to move the dog longitudinally of the tubular casing, each of the said dogs having a beveled transverse rib on its inner face, the stem having beveled shoulders at its upper end for engagement by the ribs when the dogs are in innermost position, and having shoulders below the first-named shoulders and offset outwardly therefrom for engagement by the lower ends of the dogs when the said dogs are in outermost position, a lever pivoted in the casing adjacent to each dog, and on the inner side thereof, spreading fingers on the stem for engaging the levers to move the dogs outwardly, and pivotally mounted auxiliary dogs for holding the stem in uppermost position, each of the said auxiliary dogs having a trip end extending through the casing for engagement by the well casing to trip the dogs to release the stem.

2. A reamer comprising a tubular casing, oppositely arranged reamer bits at the lower end of the casing, the outer faces of the bits being normally flush with the outer face of the casing, a wedge for forcing each bit outwardly beyond the outer surface of the casing, a stem slidable in the casing and to which the wedges are connected, a spring normally forcing the stem upward, a pair of oppositely arranged dogs in the casing, the casing having a slot adjacent to each dog, and the dog having a stop extending through the slot for engagement by the inner surface of the well casing to hold the dog in-

- wardly or for engagement by the end of the well casing to move the dog longitudinally of the tubular casing, the stem having inclined shoulders at its upper end for engagement by the dog when in innermost position, and having other shoulders offset outwardly from the first-named shoulders for engagement by the lower ends of the dogs when in outermost position to move the stem downwardly to release the bits from the wedges, spreading fingers on the stem for moving the dogs into outermost position, and a pair of auxiliary dogs for engaging the stem to hold it in uppermost position, each of the said dogs having a tripping end extending outside of the casing for engagement with the well casing to release the dogs.
3. A reamer comprising a tubular casing, oppositely arranged reamer bits at the lower end of the casing, the outer faces of the bits being normally flush with the outer face of the casing, a wedge for forcing the bits outwardly beyond the outer surface of the casing into cutting position, a stem connected with the wedge and slidable in the casing, a spring normally pressing the stem upward, a plurality of dogs in the casing, said casing having a longitudinal slot adjacent to each dog, and each dog having a stop extending through the slot for engagement by the inner surface of the well casing to hold the dog in innermost position or for engagement by the lower end of the well casing to move the dog longitudinally, said stem having a plurality of pairs of shoulders, one pair for engagement by the dogs when in innermost position to hold the stem in lowermost position, and the other pair for engagement by the dogs when in uppermost position to move the stem downward with the dogs, auxiliary dogs for holding the stem in uppermost position, and means in connection with the said auxiliary dogs for engagement by the well casing to release the said dogs, said auxiliary dogs being arranged at the top of the tubular casing, the stem having a transverse opening near its top for engagement by the dogs, and having its upper end beveled for engaging the dogs to spread the same, and spreading fingers on the stem for moving the first-named dogs to outermost position.
4. A reamer comprising a tubular casing, oppositely arranged reamer bits at the

lower end of the casing, the outer faces of the bits being normally flush with the outer face of the casing, a wedge for forcing the bits outwardly beyond the outer surface of the casing into cutting position, a stem connected with the wedge and slidable in the casing, a spring normally pressing the stem upward, a plurality of dogs in the casing, said casing having a longitudinal slot adjacent to each dog, and each dog having a stop extending through the slot for engagement by the inner surface of the well casing to hold the dog in innermost position or for engagement by the lower end of the well casing to move the dog longitudinally, said stem having a plurality of pairs of shoulders, one pair for engagement by the dogs when in innermost position to hold the stem in lowermost position, and the other pair for engagement by the dogs when in outermost position to move the stem downward with the dogs, auxiliary dogs for holding the stem in uppermost position, and means in connection with the said auxiliary dogs for engagement by the well casing to release the said dogs, the stem having means for moving the first-named dogs to outermost position.

5. A reamer comprising a tubular casing, a pair of oppositely arranged cutting bits at the lower end thereof, and normally flush with the outer surface of the casing, a longitudinally movable stem in the casing, means on the stem for extending the bits beyond the casing when the stem is moved upward with respect to the casing, a spring normally acting to force the stem upward to extend the bits, a dog slidable in the casing, said casing having a slot and the dog a rib extending through the slot for engaging the lower end of the well casing to move the dog downward when the tubular casing is moved upward, said dog having means for engaging the stem to move the stem downward with the dog, and a safety device comprising other dogs engaging the stem when in upward position, the casing being slotted adjacent to the last-named dogs, and each of the said dogs having a portion extending through the slot for engaging the well casing to operate the dogs to release the stem.

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Witnesses:

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