May 30, 1939. J. C. CIZEK 2,160,472

WELL CASING EXTRACTOR

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Fig. 1.

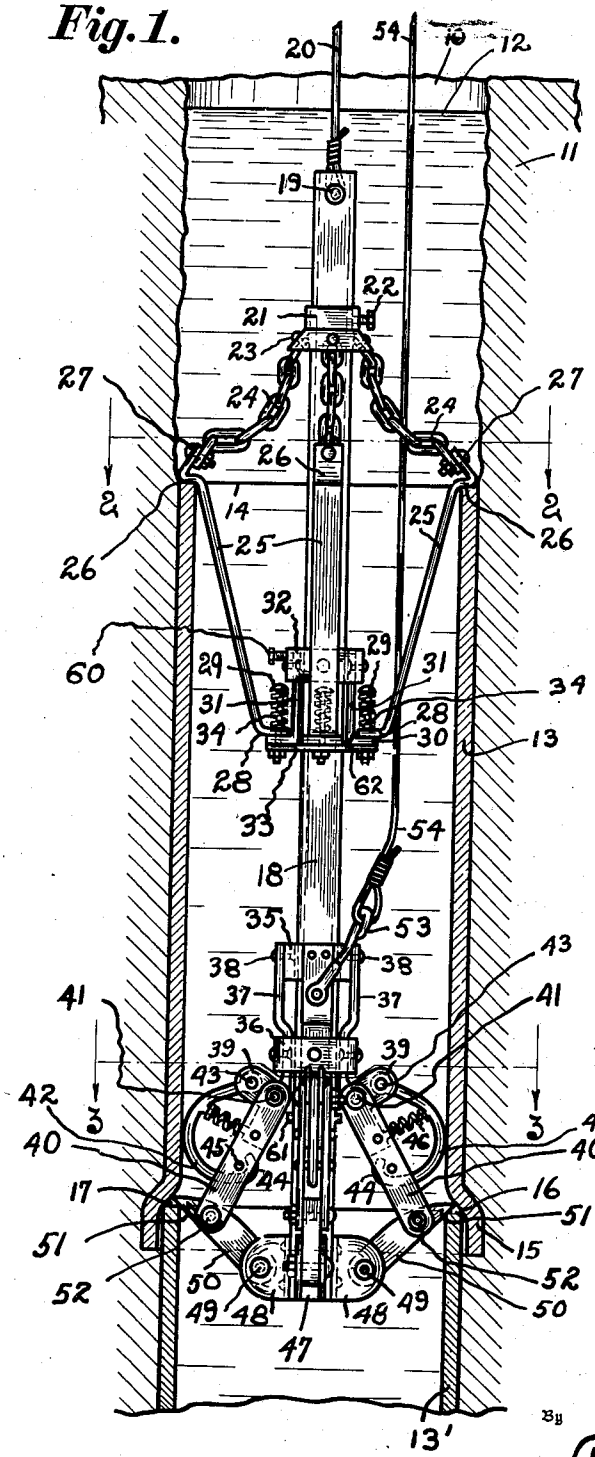


Fig. 2.

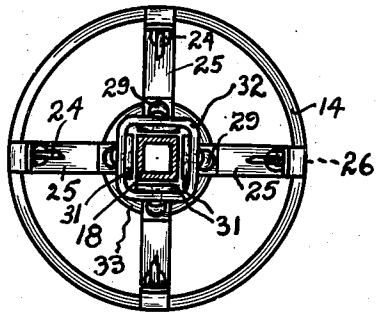
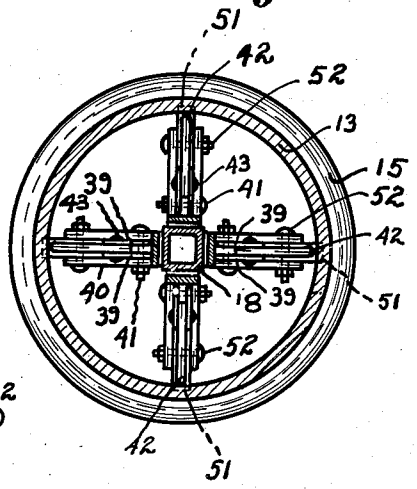


Fig. 3.



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WELL CASING EXTRACTOR

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5 Claims. (Cl. 294—97)

This invention relates to grapples generally and more particularly to well casing removers.

It is an object of the present invention to provide a device which may be readily engaged with the inner annular walls of the bells of well casing pipes formed of clay, tile, cement or the like.

Another object of the invention is to provide a device which may be readily adjusted to accommodate the various diameters of bells for insuring that the gripping fingers of the device expand outwardly a predetermined distance for gripping contact with said bells.

A further object of the invention is to provide flexible spacing members and flexible guides for insuring that said gripping fingers become centered and each evenly contact the bell of a tile during a removal of the latter, whereby pressure is evenly distributed at a plurality of spaced apart portions of said bell and that said tile is extracted from the bore in alignment with the latter for preventing breakage of tiles during said extraction.

A still further object of the invention is to provide a device which may be lowered into the bore of a well for extracting tile therefrom in instances where there is standing water in said bore and clear vision prevented, said device being so arranged that it will automatically center itself properly for engagement with tiles in said bore in instances where the tiles are not of true circular contour in plan.

Other and further objects and advantages of the invention will be understood from the following detailed description thereof reference being had to the accompanying drawing in which:

Figure 1 is a side elevation of the new device shown in an operative gripping position with respect to a tile well-casing, the latter being illustrated in section.

Figure 2 is a transverse section of the new device taken on line 2—2 of Figure 1.

Figure 3 is a view similar to Figure 2 taken on line 3—3 of Figure 1.

Conventionally wells are lined with baked clay tile such as is often employed for sewer piping. Also said well linings are frequently formed of cement, being provided with an outwardly flanged bell at one end and an oppositely disposed plain end, said linings being valuable, comparatively heavy and massive, especially when of large diameter.

Subsequent to digging and building a well, the latter often becomes dry, disused or abandoned for various reasons and it has been the conventional practice heretofore to either let valuable tile well bore linings remain in the well for lack of means of readily extracting it or for the reason that numerous devices heretofore employed for removing well linings injure the latter to such an extent that an extraction operation is not profitable and the present invention contemplates the provision of devices for obviating the undesirable practices of the prior art.

Referring now to the drawing for a more particular description 10 indicates a well bore vertically disposed in the ground 11 which in the present illustration contains water standing therein as indicated at 12. The bore 11 is provided with sleeve liners 13 and 13', each having a plain upper end 14 and an outwardly flared bell 15 at the lower end thereof. The liners are placed or stacked in the bore 11 in vertical alignment, the plain ends 14 of the liners being received within and abutted against the bell of a next adjacent liner, said bells having a diameter sufficient for causing the interior annular walls of the main body portions of the liners to align as shown in Figure 1.

The plain ends of the liners are provided with end edges 14 disposed at a right angle to their walls, as shown in Figure 1, the bell ends being provided with a curvature indicated at 16, whereby a slight space 17 is provided between a plain end and the curved portion 16 of a next adjacent bell, said space 17 extending annularly and horizontally and being taken advantage of during the extraction of liners by means of the instant device.

The new device includes an elongated, preferably hollow shaft 18 which, as best shown in Figure 2 is of square shape in cross section having at its upper end a transversely disposed bolt 19 to which a flexible rope or cable 20 is attached or a similar means for raising and lowering the shaft and adjunct parts longitudinally of the bore 11, the latter often being two hundred feet or more in length.

A slidable collar 21 encircles the shaft 18 and is provided with a set screw 22 for locking the collar selectively with respect to the length of the shaft. The collar 21 is provided with preferably four outwardly and downwardly flared portions, each having a bolt or detent 23 for attaching flexible members or chains 24 thereto, the lower ends of said chains each being secured to a spacing or centering member 25 for the upper end of the shaft 18. The members 25 are formed of strap iron having outwardly bent portions 26 adjacent their upper ends for snugly abutting the perimetrically disposed upper edges 14 of the

liners for purposes later described, said irons having their upper ends bent from their off-set portions 26 toward the collar 21 for attachment to the chains 24 by a suitable means such as the bolts 27, as shown in Figure 1, or by welding the chains to the members 25 as indicated in Figure 2.

The lower ends of the members 25 are bent towards each other as at 28 and provided with apertures for the reception of bolts 29, said lower ends normally resting upon shelves 30, the latter being outwardly disposed from the vertically disposed spacing plates 31, said bolts 29 also passing through the shelves 30.

The spacing plates 31 are secured to and between an upper guide band 32 and a lower platform 33, the latter together with the band 32 being slidably disposed about the shaft 18, said bolts 29 also extending through said platform. The spacing plates 31 abut the sides of the shaft 18 and provide an elongated bearing surface for normally holding the upper ends of the centering irons 25 evenly with respect to each other in normal position.

The lower ends of the bolts 29 are provided with nuts and between the heads of said bolts and the inwardly turned lower ends of the spacing irons 25 springs 34 are provided for disposing the centering irons 25 in a normal position and permitting the latter to have swinging movement, at times. The irons 25 and their adjunct parts provide a plurality of flexible members disposed outwardly from and inclinedly with respect to the shaft 18 for purposes later described.

Slidably disposed upon the elongated shaft 18 adjacent the lower end thereof a guide sleeve is provided which includes an upper-collar 35, a lower collar 36 and spacing members 37 therebetween. The upper-collar 35 abuts against the shaft 18. The spacing members 37 are secured preferably to the outer surface of the upper collar by any suitable means such as welding or the rivets 38, and extend downwardly, being bent inwardly and disposed in abutting relation against the shaft 18. The lower-collar 36 encircles the lower portions of the spacing members 37 and is suitably secured thereto as shown in Figure 1.

The lower ends of the spacing members 37 extend below the lower collar 36 and each thereof is provided with spaced apart oppositely disposed ears 39, as best shown in Figure 3, said ears preferably being formed integral with their respective spacing member. To and against the outer side surface of each ear 39 a link 40 is pivotally secured by means of pins 41 which extend through the upper ends of the links and respective pairs of ears as best shown in Figure 3.

Between the outer ends of each pair of ears 39 a centering rod 42 is pivotally mounted upon a pin or bolt 43, the latter extending through the rods and said ears. The centering rods are arcuate in plan and their free lower ends are provided with hooks 44, as best shown in Figure 1. It will be noted that each of the centering rods or arms 42 is biased into engagement with the casing wall. The hooks 44 engage with transversely disposed detent-pins 45, at times, said detent pins being disposed transversely of each pair of links 40 for limiting an outward movement of the centering rods 42 away from the shaft 18 while permitting said rods to move towards said shaft. Said rods are normally urged outwardly at all times for contact with a liner of the bore by means of springs 46 disposed between the rods and the links 40.

At the lower end of the elongated square shaft 18 upon each of the four sides thereof, a shoe 47 is secured by means of rivets, welding or the like. Each shoe is provided with a pair of outwardly disposed spaced apart shoe-ears 48 and between each pair of shoe-ears a pivot pin or bolt 49 is provided for a pivotal mounting of a finger 50. The fingers are swingable toward and away from the shaft 18 and the outer free ends 51 of each finger terminate in a comparatively acute end or chisel edge, as shown in Figure 1. Each finger 50 extends between one of the pairs of links 40 and is pivotally connected adjacent the chisel edge thereof to the lower ends of said links by a pin or bolt 52 extending therethrough. Said links and fingers form toggles having the resilient centering means or rods 42 operatively associated therewith.

As thus described it will be understood that since the guide sleeve including the lower collar 36 thereof is longitudinally slidable upon the shaft 18 and the shoes 47, are stationary on said shaft, when the lower collar 36 is moved away from the shoes 47, the outer free ends of the fingers of the toggles are thereby drawn towards the shaft 18. An actuating means for causing said guide to slide is provided which includes a hook 53 secured to the guide for moving the latter away from said shoes in conjunction with a flexible cable or rope 54, the latter extending upwardly of the bore 11 of the well to the surface of the ground 10 for simultaneously actuating the plurality of toggles radially disposed about the lower end of the shaft 18.

In operation, the length of a tile or sleeve liner 13 being known, the set screw 22 carried by the collar 21 is caused to lock the latter upon the shaft 18 in a manner so that when the device is lowered into the bore of the well by means of the cable 20, the off-set portions 26 of the centering-irons 25 will rest upon the plain upper edges 14 of the upper tile 13 within the bore while at said time the ends 51 of the fingers 50 will be slightly below the heretofore mentioned space 17 provided between the lower bell end of said tile and the plain end of a tile next below the tile to be removed. The rope 54 is held taut during lowering of the device into said bore, causing the ends 51 of the fingers to be maintained away from the wall of the tile 13 at said time. During the lowering of the device for engagement with a tile, the rope 54 being taut, the centering-rods 42 engage against the interior annular wall of the tile 13 and slide downwardly along said wall for centering the lower end of the shaft 18, together with the fingers 50 and adjunct parts at the lower end of the shaft. The spacing-irons 25 perform a similar function at said time at the upper end of the shaft 18. It will be noted that the members 25 converge towards each other downwardly whereby they are adapted to gradually engage with the upper end edge 14 of the tile for centering the shaft 18, said gradual engagement eliminating the possibility of cracking the tile at said time.

As soon as the off-set portions 26 of the spacing-irons 25 engage with the upper edge 14 of the tile the operator immediately has cognizance thereof since the cable 20 becomes slack together with the chains 24, the weight of the shaft 18 and adjunct parts being then carried by the upper edge 14 of the tile and at this time the rope 54 is permitted to become slack also for permitting the lower guide collar 35 to move towards the shoes 47 for causing the chisel edge of the free ends of

the fingers 50 to move outwardly and engage the inner annular wall of the lower tile 13' and at a point just below or closely adjacent to the annular space 17 heretofore mentioned. During said outward movement of the fingers 50, the springs 46 cushion the contact of the fingers 50 with the wall of the tile 13' for preventing cracking of the latter.

At this time, the cable 20 is initially drawn gradually upward by a winch or the like and as soon as said chisel edges are moved upwardly slightly they engage in the space 17 and against the bell of the tile 13, said springs 46 again cushioning the contact. The winch is now operated for causing the tile to be moved upwardly of the bore 10. During said upward movement, it will be noted that the spacing-irons or members 25 maintain the upper end edge 14 of the tile in alignment with said bore whereby said upper edge 14 does not unduly engage with the earthen wall of the bore. The tile is, accordingly, removed in vertical alignment and medially of said bore, thus obviating an undue application of stresses which would crack the tile. The centering-irons 25, moreover, cooperate with the fingers 50 and centering-rods 42 to maintain the tile in axial alignment with the bore 11 at all times during the upward movement of the tile 13 through said bore. During a lowering of the shaft into the tile 13 the rope 54 is held taut for keeping the fingers away from the tile for preventing a chipping of the latter, the resilient centering-rods at said time preventing a swaying of the shaft for a similar purpose. The process, just described, is repeated for the removal of the tile 13' and the other tiles forming the well lining.

The lower ends of the centering-irons 25 being loosely mounted by means of the resiliency of the springs 31 insure that the off-set portions 26 of the spacing members 25 will engage the perimetrical end edge 14 of the tile 13 in instances when said edge 14 is not of a true circular shape in plan and this is of advantage since generally tiles are used in wells which are somewhat initially defective. In other words, well tiles are primarily made for sewer pipe purposes and when used for sewers are laid horizontally and when the bells and ends 14 are not truly circular they leak excessively unless packed or cemented together. This packing and cementing is hard of accomplishment in instances where the ends of the tile are not of true circular shape, whereby only properly shaped tiles are preferably used for sewer purposes and the defective tiles are sold for placement in wells so that a large proportion of well tile is defective in shape. It will be noted that the present invention provides means for extracting imperfectly as well as perfectly shaped tile from well bores, in instances where said bores are crooked as well as straight. The device of the present invention is adapted to remove tiles which are square or hexagonal in plan as well as tiles of oval shape or round.

It will also be noted that by substitution of fingers 50 of shorter or longer length that the several diameters of well casing liners may be handled advantageously.

A set screw 60 is provided on the upper guide band 32 preferably whereby, the length of the casing 13 being known, the distance between the outwardly bent portions 26 of the members 25 and the ends 51 of the fingers 50 may be regulated so that said ends will engage in the space 17 as above described.

A detent or stop consisting of a bolt 61 is transversely disposed through the shaft 18 below the ears 39 as shown in Figure 1 for preventing said ears from moving toward the lower end of the shaft 18 too far and for preventing the lower ends of the links 40 together with the outer ends of the fingers 50 from spreading too far outwardly whereby tendency to crack the casing is obviated.

The extreme ends 62 of the lower portions are disposed slightly away from the spacing plates 31 so that the members 25 may have slight turning movements on their pivotal bolts 29 while at the same time excessive turning is prevented by the corners of said ends striking against said plates, whereby the bent portions 26 of the members 25 are maintained approximately equi-distantly spaced apart.

It is obvious that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims.

What is claimed is:

1. In a tile extractor, a rigid shaft, a guide slidably disposed adjacent one end of said shaft, a plurality of toggles radially disposed about said end having pivotal connections to and between said end and guide, said toggles provided with comparatively acute outwardly disposed portions adapted to move away from said shaft correspondingly with respect to a sliding movement of said guide for engaging the inner wall of a tile adjacent one end of the latter, actuating means for causing said guide to slide, resilient means associated with the toggles for centering said end of the shaft with respect to said end of the tile during said engagement, a plurality of flexible members carried by said shaft adjacent the other end thereof and radially disposed outwardly and inclinedly from said shaft, said members being adapted to engage the other end of said tile for centering the other end of said shaft, and means for raising and lowering the extractor longitudinally of the bore of a well.

2. In a well casing extractor, a rigid shaft, fingers pivoted to the lower end of said shaft and directed upwardly and outwardly to engage the lower portion of a casing section when said shaft is raised, a collar slidably mounted on said shaft above said fingers, a plurality of outwardly extending centering members yieldably secured to said collar and adapted to have their outer ends engage the wall of the well bore as said extractor is lowered in the well, said outer ends being provided with shoulder portions to engage the top of the casing section to be removed and terminate the lowering movement of said extractor, and means for securing said collar in any adjusted position on said shaft whereby the distance between the centering members and the fingers may be adjusted to conform with the length of the well casing sections.

3. In a well casing extractor, a rigid shaft, fingers pivoted to the lower end of said shaft and directed upwardly and outwardly to engage the lower portion of a casing section when said shaft is raised, a plurality of centering arms pivotally mounted on said shaft adjacent said fingers, means biasing each of said arms outwardly into engagement with the interior wall of the casing, further centering means above said first named centering means, said further centering means comprising a plurality of independently movable members adapted yieldably to engage the upper

end of the casing section to be removed, and means for adjustably securing said further centering means to said shaft whereby the distance between said further centering means and the fingers may be adjusted to conform with the length of the well casing sections.

4. In a well casing extractor, a rigid shaft, fingers pivoted to the lower end of said shaft and directed upwardly and outwardly to engage the lower portion of a casing section when said shaft is raised, centering means comprising a plurality of independently movable members adapted yieldably to engage the upper end of the casing section to be removed, and means for adjustably securing said centering means to said shaft whereby the distance between said centering means and the fingers may be adjusted to conform with the length of the well casing sections.

5. In a well casing extractor, a rigid shaft, fingers pivoted to the lower end of said shaft and directed upwardly and outwardly to engage the lower portion of a casing section when said shaft is raised, a collar freely slidable on said shaft slightly above said fingers, links connecting said collar to the fingers adjacent their outer ends, means for raising said collar with respect to said shaft to hold said fingers in retracted position during the lowering of said extractor, a plurality of centering arms pivotally secured to said collar outside of said links, and biasing means between each centering arm and the adjacent link for biasing said arm outwardly into engagement with the interior wall of the casing and for retarding the outward movement of the link and its associated finger.

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