March 23, 1954 J. C. CURTIS ET AL 2,673,071

ROCK DRILL

Filed June 7, 1946

2 Sheets-Sheet 1

Fig. 1.

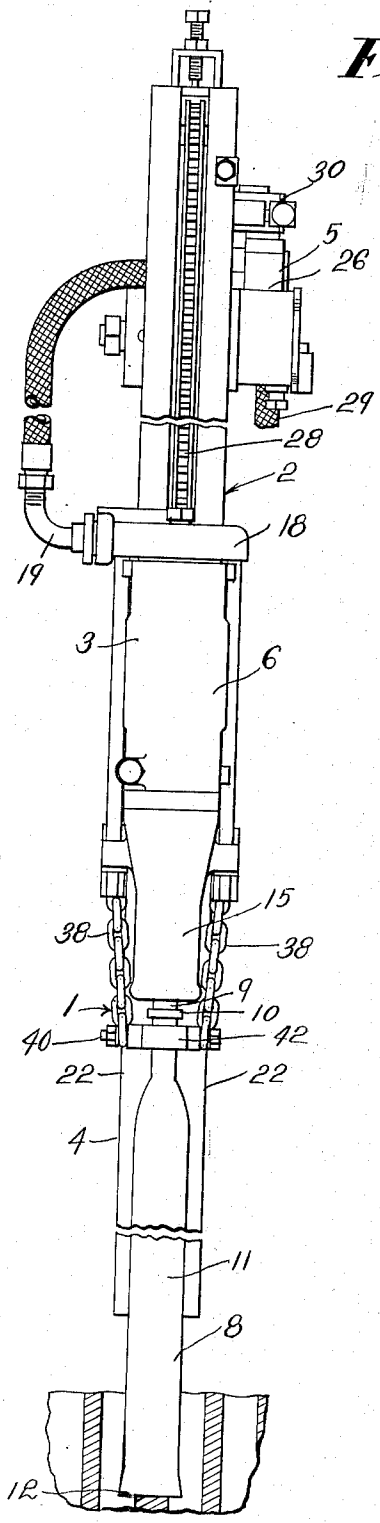
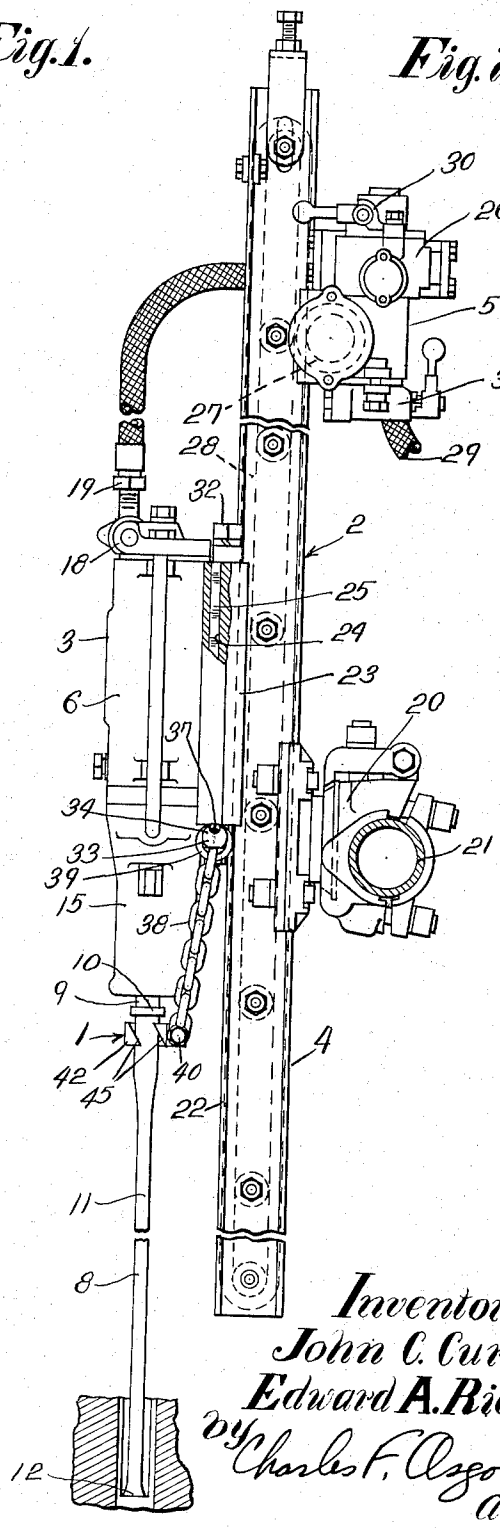


Fig. 2.



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2 Sheets-Sheet 2

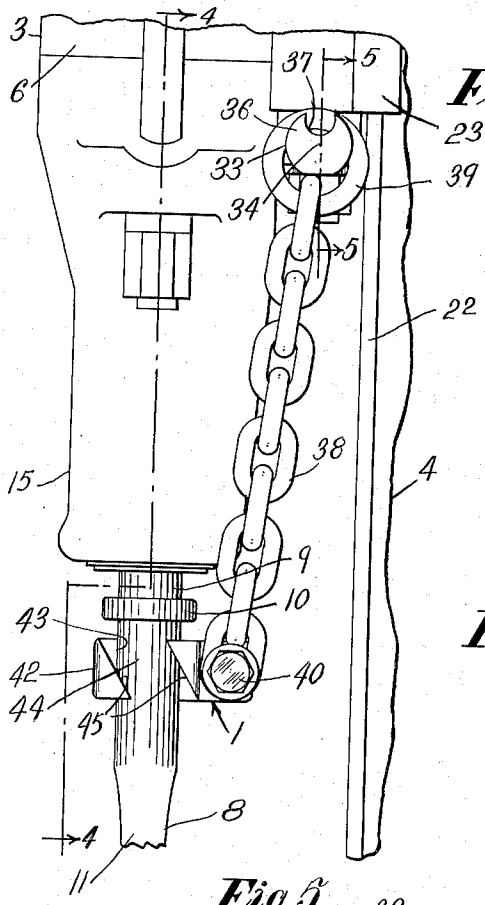


Fig. 3.

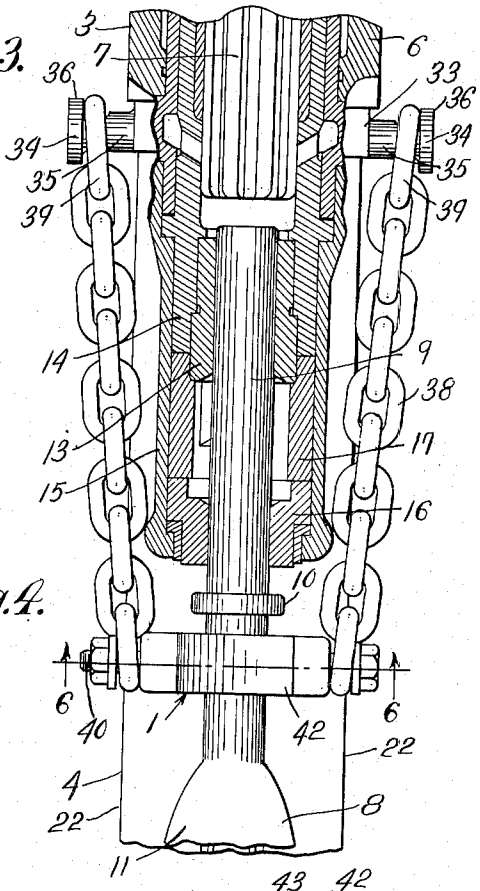


Fig. 4.

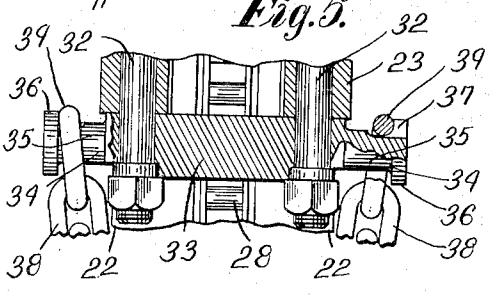


Fig. 5.

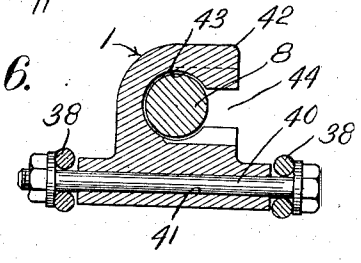


Fig. 6.

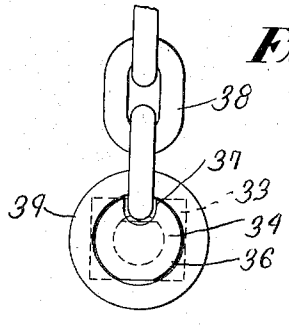


Fig. 7.

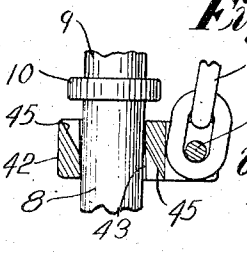


Fig. 8.

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2,673,071

UNITED STATES PATENT OFFICE

2,673,071

ROCK DRILL

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Application June 7, 1946, Serial No. 675,198

3 Claims. (Cl. 255—36)

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This invention relates to rock drills and more particularly to an improved steel pulling attachment for the broaching steel of a hammer rock drill of the mounted broaching type.

In hammer rock drills of the mounted broaching type, such as are employed in the formation of a slot in a rock formation, the drill is initially operated to drill a series of parallel, closely spaced holes in the rock formation with an ordinary drill steel; and after the drilling operation, a broaching steel is substituted for the drill steel and the drill is operated to break away the narrow partitions of rock between the parallel drill holes, thereby to form a continuous slot. During the broaching operation, the broaching steel frequently becomes badly stuck in the rock formation, and it is necessary to apply considerable force to the steel to effect its release. Various known devices have been devised to effect pulling of a stuck broaching steel and the present invention contemplates improvements over such known devices.

It is accordingly an object of the present invention to provide an improved steel puller attachment for a mounted rock drill of the broaching type whereby a stuck broaching steel may be effectively released. Another object is to provide an improved steel puller attachment for rock drills which may be readily attached to the drill and is effectively locked in position at its points of attachment. Yet another object is to provide an improved steel puller for a hammer rock drill of the mounted type wherein the steel puller is attached to the drill at a novel location in an improved manner. A further object is to provide an improved steel puller which is attached to the sliding support or so-called cradle of "slab back" of the rock drill so that when the drill feeding means is reversed, the steel puller is retracted so that the rearward pull of the feeding means on the "slab back" is imparted directly to the stuck steel. Still another object is to provide an improved steel puller which is attached to the sliding support or cradle on which the drill hammer motor is mounted so that when the sliding support or cradle is retracted, the puller acts to release the stuck steel wholly independently of the drill hammer motor. Still another object is to provide an improved steel puller attachment which may be attached to the mounting for the drill hammer motor, thereby obviating the necessity of a special hammer motor design. A still further object is to provide an improved broaching steel puller having novel features of construction. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

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In the accompanying drawings there is shown for purposes of illustration one form which the invention may assume in practice.

In these drawings:

Fig. 1 is a front elevational view of a hammer rock drill of the mounted broaching type in which an illustrative form of the improved steel puller is embodied.

Fig. 2 is a side elevational view of the rock drill and steel puller shown in Fig. 1.

Fig. 3 is an enlarged fragmentary side view of the forward portion of the rock drill shown in Fig. 2 and illustrating features of the improved steel puller.

Fig. 4 is a view in longitudinal section taken substantially on lines 4—4 of Fig. 3, with parts in full.

Fig. 5 is a transverse sectional view taken substantially on line 5—5 of Fig. 3.

Fig. 6 is a detail cross-sectional view taken substantially on line 6—6 of Fig. 4.

Fig. 7 is a detail view illustrating the manner of releasing the side chains of the steel puller from the cross strap.

Fig. 8 is a detail sectional view showing the puller plate in steel gripping position.

In this illustrative embodiment of the invention the improved steel puller attachment, generally designated 1, is shown associated with a hammer rock drill of the mounted broaching type, generally designated 2. The rock drill may assume various forms, but is herein generally similar to that disclosed in the John C. Curtis Patent No. 2,338,625, patented January 4, 1944.

The rock drill generally comprises a drill hammer motor 3, a drill supporting and guiding frame 4, and drill feeding means 5. The drill hammer motor is of a conventional design and comprises a motor cylinder 6 containing a usual fluid actuated reciprocable hammer piston 7 (the forward portion of which is shown in Fig. 4) for delivering impact blows to the shank of a usual broaching steel 8. The steel shank is designated 9 and is round in cross section and has a collar 10, and the flat steel body 11 is of rectangular cross section and terminates in a front cutting end 12. The steel shank is received and slidingly supported in the bore of a chuck bushing 13 carried in a chuck sleeve 14 contained in a front chuck housing 15 suitably secured to the front end of the motor cylinder. The steel shank extends forwardly from the chuck housing through a front ring 16 also sup-

ported within the chuck housing, and this ring abuts a sleeve 17 arranged within the chuck housing between the ring 16 and the chuck sleeve, as shown in Fig. 4. A rear head block 18 is secured to the rear end of the motor cylinder and has connected thereto a suitable fluid supply connection 19 through which pressure fluid may be conducted to the motor cylinder. Since the hammer motor does not per se enter into the present invention and may assume various forms, further description thereof is unnecessary other than to state that when pressure fluid is supplied through the connection 19 to the motor cylinder, the hammer piston 7 is reciprocated to actuate percussively the broaching steel.

The drill supporting and guiding frame 4 is mounted on a conventional saddle mounting 20 secured to a suitable horizontal bar 21, and has longitudinal guides 22 for slidingly supporting a drill support or so-called cradle or "slab back" 23, and the sliding drill support or cradle has longitudinal guideways 24 (Fig. 2) parallel with the frame guideways for slidingly receiving lateral guides 25 on the sides of the motor cylinder 6 of the drill hammer motor. Mounted on the guide frame 4 is a reversible fluid actuated feeding motor 26 of a conventional design for driving a feed sprocket 27 which engages a feed chain 28 suitably guided for circulation on the guide frame and suitably attached to the sliding drill support or cradle 23, all in the manner fully described in the patent above referred to. Pressure fluid may be conducted to the feeding motor through a supply hose 29 under the control of a conventional reversing valve 30 and to the hose connection 19 under the control of a conventional throttle valve 31. Thus the sliding drill support 23 and the drill hammer motor carried thereby may be fed back and forth along the guideways of the guiding frame 4 toward and from the work as desired.

Now referring to the improved steel puller attachment 1, it will be noted that secured as by parallel side bolts or side rods 32, 32 to the front end of the sliding drill support or cradle 23 is a cross member or cross strap 33 having projecting cylindric ends 34 provided with reduced portions 35 forming annular end flanges 36, the latter being grooved or notched at 37 at their rear sides. Flexible side elements or side chains 38 have large annular end links or rings 39 which may be placed over the flanged ends of the cross strap 33, and the notches 37 permit the passage of the adjacent connected links of the chain past the end flanges into the annular spaces provided by the reduced end portions, and when in connected position, the chains may be swung forwardly to bring the adjacent links out of registry with the notches to lock their attached ends onto the projecting ends of the cross strap. Thus a sort of bayonet type lock is provided for the rear chain-ends. The other ends of the side chains are secured to a cross bolt 40 which passes through a transverse opening 41 in a hook-shaped puller or retainer member or plate 42 to provide a pivotal mounting for the latter. The puller plate has a laterally open recess 43 for receiving the shank of the broaching steel in the manner shown. The open side 44 of the recess has parallel inclined sides 45 so that the puller plate must be tilted to bring the inclined sides 45 into parallelism with the sides of the steel shank prior to the removal of the puller plate laterally from the steel shank, thus providing a lock to prevent accidental displacement of the

puller plate from the steel when it is in operative steel pulling and retaining position as shown in Fig. 3. During the broaching operation, the steel puller remains attached to the broaching steel and the steel collar 10 may engage the puller plate which then serves as a steel retainer to prevent unintentional ejection of the steel shank from the drill chuck. Thus by tilting the puller plate on the cross bolt with respect to the steel shank from the position shown in Fig. 3, the steel puller may be readily detached from the broaching steel, and by swinging the side chains rearwardly to the position shown in Fig. 7 to permit the passage of the adjacent end links connected to the end rings through the slots 37, the side chains may be readily detached from the projecting ends of the cross strap.

The mode of use of the improved steel puller attachment will be readily apparent from the description given. When the rock drill is set up with respect to the work in the manner shown in Figs. 1 and 2, the drill hammer motor may be operated to actuate percussively the broaching steel 8 to effect breaking away of the partitions of rock between the parallel drill holes to form a continuous slot in the rock formation in a well known manner, and the drill hammer motor may be fed back and forth along the guideways of the guide frame 4 by the feeding motor 26 during the broaching operation. The steel puller is at that time attached by the side chains 38 to the projecting ends of the cross strap 33 on the sliding drill cradle 23, with the puller plate 42 attached to the shank of the broaching steel in advance of the steel collar 10. At such time the broaching steel in free to reciprocate, and the steel collar, as the steel is fed downwardly toward the work, abuts the front end of the sleeve 16 in the front chuck housing of the drill hammer motor. In the event the broaching steel is driven forwardly for any reason, for instance during retraction of the drill or when the cutting end 12 of the steel penetrates a soft spot or cavity in the rock formation, the puller plate 42 serves as a retainer to prevent ejection of the steel shank from the drill chuck. During the broaching operation the broaching steel frequently becomes badly stuck and its release may be readily effected simply by reversing the feeding motor 26 to retract the sliding cradle or "slab back" 23 along the guideways of the guiding frame 4. As the drill cradle is retracted, the side chains 38 of the steel puller become taut and the puller plate 42 cants slightly so that the sides of the recess 43 firmly grip the steel body, and as the steel puller is retracted by the drill feeding means, a powerful pulling force is imparted to the steel to effect release thereof. Thus by attaching the steel puller to the drill cradle or "slab back" of the feeding means and by suddenly reversing the feeding motor, the drill cradle may be rapidly moved rearwardly relative to the drill hammer motor to cause a powerful and quick yank to be imparted to the steel with sufficient force to release even a badly stuck steel. When the steel puller is not in use, as for example during the hole drilling operation, it may hang down along the side of the drill guiding frame or may be completely detached from the cross strap 33 in an obvious manner. Under certain conditions the steel puller plate 42 may directly engage the steel collar 10 during the pulling operation instead of gripping the steel shank in advance of the steel collar. The steel puller may be read-

ily applied to a standard rock drill with a minimum of change and without special drilling motor parts. Other manners of use and advantages of the improved steel pulling attachment will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What we claim as new and desire to secure by Letters Patent is:

1. In a broaching type rock drilling apparatus, the combination comprising a guide frame providing a longitudinal guideway, a support guided on said guideway for movement forwardly and rearwardly therealong, said support providing a longitudinal guideway, a percussive tool mounted on said support-guideway for limited back and forth movement relative to said support and having a chuck for loosely receiving the shank of a broaching steel, means for moving said support along said frame-guideway to feed said tool toward the work and for retracting said tool, and a steel puller device connected to said support and engaging said steel whereby when said support is moved rearwardly by its moving means a sudden rearward pull may be imparted to said steel by said device independently of said percussive tool, said puller device including side chains connected to said support, a pivot bolt secured to the free ends of said chains, and a gripper plate pivotally mounted on said bolt and having a lateral recess spaced from and extending laterally in substantial parallelism with the pivot axis for laterally receiving the steel and adapted to tilt on its pivot when a rearward pull is imparted to said plate by said chains through said bolt as said support is retracted to cause opposed edges of said recess to grip the steel.

2. In a broaching type rock drilling apparatus, the combination comprising a guide frame providing a longitudinal guideway, a support guided on said guideway for movement forwardly and rearwardly therealong, said support providing a longitudinal guideway, a percussive tool mounted on said support-guideway for limited back and forth movement and having a chuck for loosely receiving the shank of a broaching steel, means for moving said support along said frame-guideway to feed said tool toward the work and for retracting said tool, and a steel puller device connected to said support and engaging said steel for pulling the steel rearwardly when said

support is retracted, said puller device including side chains attachable to said support and a steel gripping member secured to the free ends of said chains for gripping the steel when a rearward pull is imparted to said chains by said support, and means for attaching said chains to said support comprising a cross strap secured to the front end of said support and provided with projecting hooklike ends having annular outer flanges, said flanges being notched at their rear sides, and said chains having enlarged end rings which are placeable over the flanges to engage said rings with said hooklike ends, and said notches permitting the free passage of the adjacent links of the chains inwardly past said end-flanges, and said chains when engaged with said hooklike ends being swingable forwardly to bring said adjacent links out of registry with said notches thereby to lock the chains in position.

3. In a broaching type rock drilling apparatus, the combination comprising a support, a percussive tool mounted on said support and having a chuck for loosely receiving the shank of a broaching steel, and a steel retainer device connected to said support and engaging said steel for preventing ejection of the steel shank from the tool-chuck, said puller device including side chains attachable to said support, a steel gripping member secured to the free ends of said chains for gripping the steel, and means for attaching said chains to said support comprising a cross strap secured to the front end of said support and provided with projecting hooklike ends having annular outer flanges, said flanges being notched at their rear sides, and said chains having enlarged end rings which are placeable over the flanges to engage said rings with said hooklike ends, and said notches permitting the free passage of the adjacent links of the chains inwardly past said end-flanges, and said chains when engaged with said hooklike ends being swingable forwardly to bring said adjacent links out of registry with said notches thereby to lock the chains in position.

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EDWARD A. RICE.

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