

of which is shown in phantom at 5 in FIGS. 2 and 5) having an internally threaded lower end portion and suspended above the drill bit. When the bit 3 is rotated in one direction, a threaded connection between the threaded pin (shown in phantom at 7) at the upper end of the bit and the drill string 5 is effected. Conversely, when the bit is rotated in the opposite direction, a threaded connection between the bit 3 and the drill string 5 is broken (i.e., disconnected).

As shown in FIGS. 1 and 2, the bit breaker 1 comprises a bottom 9 engageable by the bottom of the drill bit for supporting the bit in the Kelly drive, and a top 11 having a generally circular opening 13 therein through which the bit may be lowered into engagement with the bottom 9 of the bit breaker and raised to remove the bit from the bit breaker. Side walls 15 extend between the bottom and top, with the side walls being of a height such that, with the bit supported on the bottom 9 of the bit breaker, the body portion of the bit is at the level of the top 11. As shown in FIGS. 1 and 4, the bit 3 at its body portion has three relatively large vertically extending projections with the nozzles 23.

As shown in FIGS. 1 and 2, with bit 3 in the bit breaker 1 and the stop members 29 in extended position, one of the projections 17 is received in the recess 37 and one of the projections 21 is received in the recess 39. The stop member thus holds the drill bit against rotation relative to the bit breaker, so that upon rotation of the Kelly drive, the bit breaker 1 and the drill bit 3 rotate along with it. With the stop members 29 in retracted position, as shown in FIGS. 4 and 5, the drill bit 3 may be lowered through the opening 13 into engagement with the bottom 9 of the bit breaker or raised through the opening to remove it from the bit breaker.

The securing means 24 further comprises a pair of lock means 41, one for each stop member, for selectively locking the stop members in their extended positions, thereby preventing retraction of the stop members when the drill bit is rotated. Each lock means 41 includes a fixed lock member 43, comprising a length of steel strip, secured to the top 11 of the bit breaker outwardly of the stop member, and a movable lock member 45 comprising a length of bar stock having a handle or knob 47 secured thereto. The fixed lock member 43 is engaged by the stop member 29 when in retracted position.

Means 49 on the fixed lock members 43 mounts the movable lock members 45 for pivotal movement between a locking position in which the movable lock member is between the stop member 29 and the fixed lock member 43, and an unlocking position in which it is spaced from the stop member. In its locking position, the movable lock member engages the respective stop member for holding it in extended position and, in its unlocking position, leaves the stop member free to be moved to its retracted position. The means 49 for pivotably mounting the movable lock member comprises a pair of U-shaped brackets 51 secured at their ends to the side of the fixed lock member 43 to form vertically extending slots S, and a generally U-shaped swing arm 53 having fingers at its upper ends secured to the movable lock member and a generally horizontal central reach 55. The central reach 55 of the swing arm or ridges 21 associated with the nozzles 23 of the bit. The bit breaker further has means 24 engageable with the projections 17, 21 on the bit for selectively securing the bit in fixed annular position in the opening 13.

The top, bottom and side walls of the bit breaker are formed of metal plate, such as low-carbon steel plate, and are secured together as by welding. The top 11 is so sized and configured as to fit in the socket of the Kelly drive with the outer edge margin of the underside of the top 11 bearing on the shouldered portion of the Kelly drive. A pair of handles 25 is secured to the top at opposite sides thereof to facilitate handling of the bit breaker. The bottom 9 is suspended beneath the top 11 via sides 15 when the bit breaker is in the Kelly drive for supporting the drill bit 3 over the well bore. An opening 27 is provided in the bottom 9 for drainage of fluids from the bit breaker.

The means 24 for selectively securing the bit in the opening comprises a pair of plate-like stop members 29 slidably mounted on the top 11 adjacent the opening 13 at opposite sides thereof. Each stop member is positioned in a track formed by a pair of parallel angles 31 secured to the top with one leg of each angle extending vertically and the other leg extending horizontally toward the other angle. A handle 33 is secured to each stop member 29. The handle, together with a strip 35 secured to the angles 31, constitute means for retaining the stop member in the track in an inward direction. Each track extends generally radially with respect to the opening 13, and thus guides the respective stop member 29 for movement radially inwardly and outwardly relative to the opening between an extended position (see FIGS. 1 and 2) and a retracted position (see FIGS. 4 and 5). In its extended position, the stop member engages the side of the drill bit in the opening and, in its retracted position, it is spaced from the opening. One of the two stop members 29 at its bit engaging face has a recess 37 corresponding to the drill bit projections or ridges 17 associated with the roller cutters 19. The other stop member at its bit engaging face has a recess 39 corresponding to the projections or ridges 21 associated and the brackets 51 together constitute a pin and slot arrangement providing lost motion for the movable lock member. This enables the movable lock member 45 to be pivoted past the fixed lock member 43 and moved down into locking position between the fixed lock member and the stop member.

An alternative construction of the movable lock member, designated 45A, for enabling the bit breaker to be used for bits of different sizes within a range of sizes is shown on FIGS. 6 and 7. The lock member 45A is similar to the lock member 45 except that it has a pair of blind end threaded bores 57 for enabling shim plates 59 of varying thickness to be detachably secured thereto by screws 61. The movable lock member 45A is thus made adjustable in its dimension as measured from its stop member engaging face to its fixed lock member engaging face for holding the stop member in different extended positions, one for each different bit size. Accordingly, by changing the shim plates 59 the bit breaker 1 may be adapted to receive bits of different sizes.

It will be observed from the foregoing, the improved bit breaker of this invention is usable not only for conventional tri-cone drill bits having recesses at their lower ends between adjacent roller cutters, but also for drill bits, such as extended nozzle drill bits shown for example at 3 in FIGS. 2 and 5, having no recesses at their lower ends. In addition, the bit breaker of this invention, because of its adjustability feature, is usable with drill bits of different sizes within a range of size.