

drill rod sections S carried by the drill rod rack 61 are retained in position by the radially extending arms 86 and the depending retainer elements 102, as described hereinabove.

It will thus be seen that as each drill rod section carried by the drill rod rack 61 is moved into axial alignment with the driven head 31 it is positioned to drill a hole while extending through the drill rod rack 61. That is to say, the drill rod rack 61 is merely rotated to position the drill rod sections sequentially beneath the driven head 31, thus eliminating the necessity of having to swing the entire drill rod rack inwardly and outwardly relative to the driven head 31 each time a drill rod section S is changed.

From the foregoing, it will be seen that I have devised improved drilling apparatus for drilling a hole into the earth. By providing the apparatus wherein the drilling operation takes place while the drill rod section remains in the drill rod rack, I not only greatly reduce the time and effort required to change the drill rod sections, but also the apparatus for supplying the drill rod sections is extremely simple of construction, economical of manufacture and eliminates the necessity of the drill operator being present adjacent the hole being drilled. This is especially true in view of the fact that my improved breaker unit permits the breaking operation to be accomplished by remote control means.

While I have shown the apparatus the as drilling a vertical hole into the earth, it will be apparent the the frame 18 may be moved to other angular positions relative to the supporting pins 17 to drill holes in selected angular positions.

While I have shown my invention in several forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof.

What I claim is:

1. The combination with drilling apparatus having an elongated frame supporting a transmission unit for longitudinal movement therein with the transmission unit operatively connecting a longitudinally extending polygonal drive shaft to a driven head disposed to be threadedly connected to one end of an adjacent drill rod section extending in axial alignment therewith with the other end of the drill rod section being threadedly connected selectively to another drill rod section and a drill bit for drilling a hole into the earth, the improvement comprising:

(a) a drill rod rack mounted for rotation about an axis within said elongated frame and adapted to carry a plurality of angularly spaced drill rod sections with said drill rod sections being movable sequentially into axial alignment with said driven head upon rotation of said drill rod rack to selected angular positions about said axis so that as each drill rod section carried by said drill rod rack is moved into axial alignment with said driven head it is positioned to drill a hole while said drill rod section and said driven head move through said drill rod rack, and

(b) a breaker unit carried by the end of said elongated frame adjacent the hole being drilled into the earth and in axial alignment with said driven head for breaking the joint selectively between said driven head and a drill rod section, between drill rod sections and between a drill rod section and a drill bit.

2. The combination as defined in claim 1 in which said breaker unit comprises:

(a) a transverse frame member carried by said elongated frame,

(b) an annular member mounted for rotation within an opening through said transverse frame with there being a centrally disposed opening through said annular member for passing a drill rod section therethrough,

(c) a movable member carried by said annular member and adapted for movement selectively to a position inwardly of said annular member and to a position outwardly thereof,

(d) means urging said movable member toward said position outwardly of said annular member,

(e) there being a recess in said transverse frame member disposed to receive and limit rotation of said movable member upon rotation of said annular member to position said movable member opposite said recess, and

(f) at least one releasable latch element carried by said annular member and disposed to engage a locking recess in the drill rod section which passes through said annular member to restrain rotation thereof.

3. The combination as defined in claim 2 in which said movable member is a pawl-like catch pivotally mounted on said annular member and spring means is interposed between said pawl-like catch and said annular member to urge said pawl-like catch toward a position outwardly of said annular member.

4. The combination as defined in claim 2 in which said releasable latch element comprises a piston-like dog mounted for movement in a cylinder toward and away from said locking recess and fluid supply means communicates with said cylinder to supply fluid thereto and exhaust fluid therefrom so that said piston-like dog is moved selectively toward and away from said locking recess.

5. The combination as defined in claim 1 in which said drill rod sections carried by said rack are supported by means comprising:

(a) a support member adjacent one end of said rack, (b) angularly spaced passageways through said support member for receiving said drill rod sections,

(c) at least one movable catch member carried by said support member adjacent each said passageway therethrough and adapted to move from an outer position to an inner position in engagement with a locking recess in a drill rod section extending therethrough to thus support the drill rod section, and,

(d) resilient means urging said movable catch member inwardly into engagement with said locking recess.

6. The combination as defined in claim 5 in which oppositely disposed movable catch members are carried by said support member at opposite sides of said passageway and releasable means holds said catch member in said outer position until a drill rod section is inserted through said passageway.

7. The combination as defined in claim 6 in which said releasable means holding said catch members in said outer position comprises:

(a) a transverse member of a length to span the distance between said catch members while said catch members are in said outer position,

(b) an arm connected at one end to said transverse member,

(c) means pivotally connecting the other end of said arm to said support member so that said transverse member is moved from a position between said