Nov. 3, 1953

G. E. FAILING

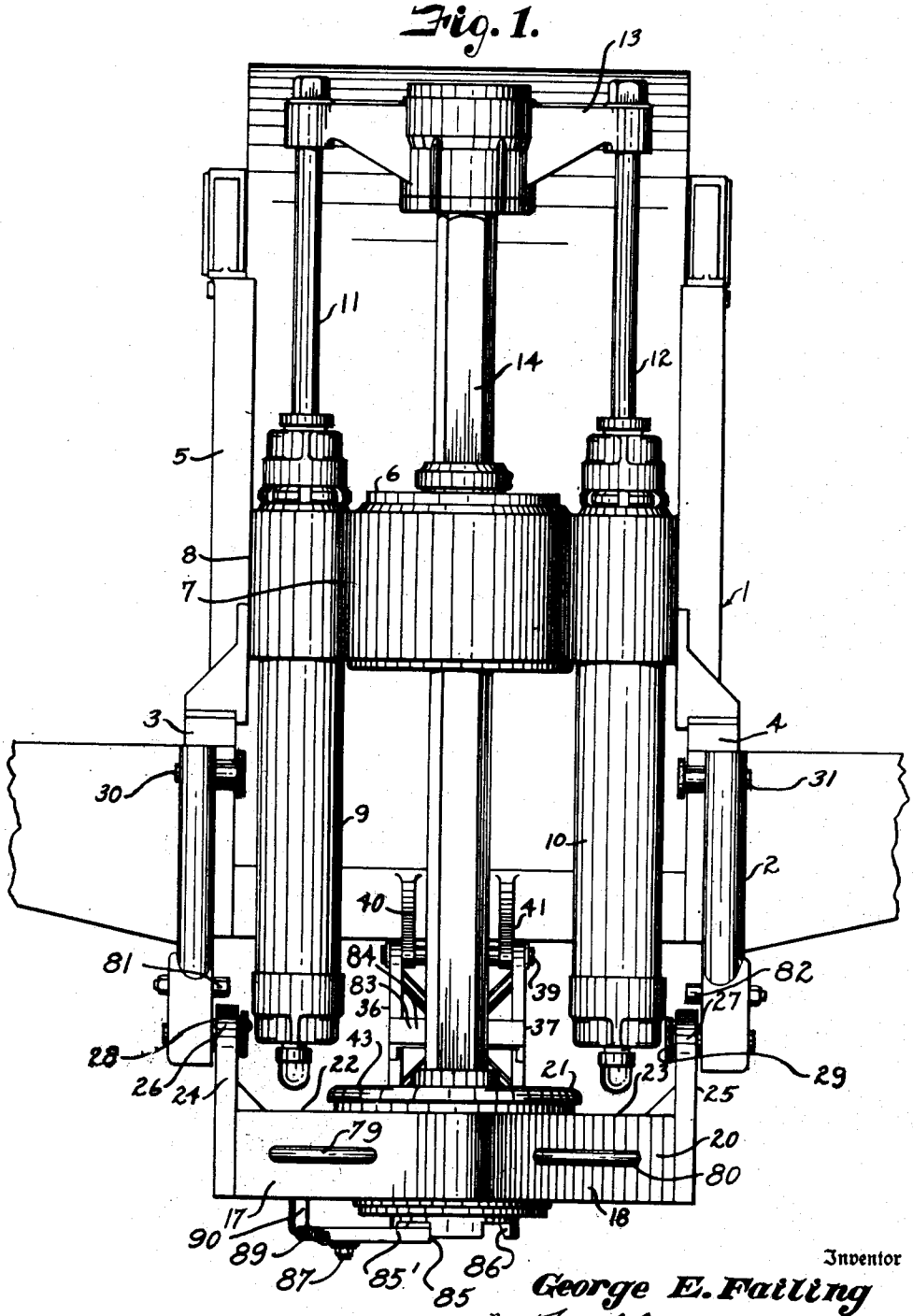
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BREAKOUT TABLE

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4 Sheets-Sheet 1

Fig. 1.



Inventor

George E. Failing

By Fishburn & Mullendore

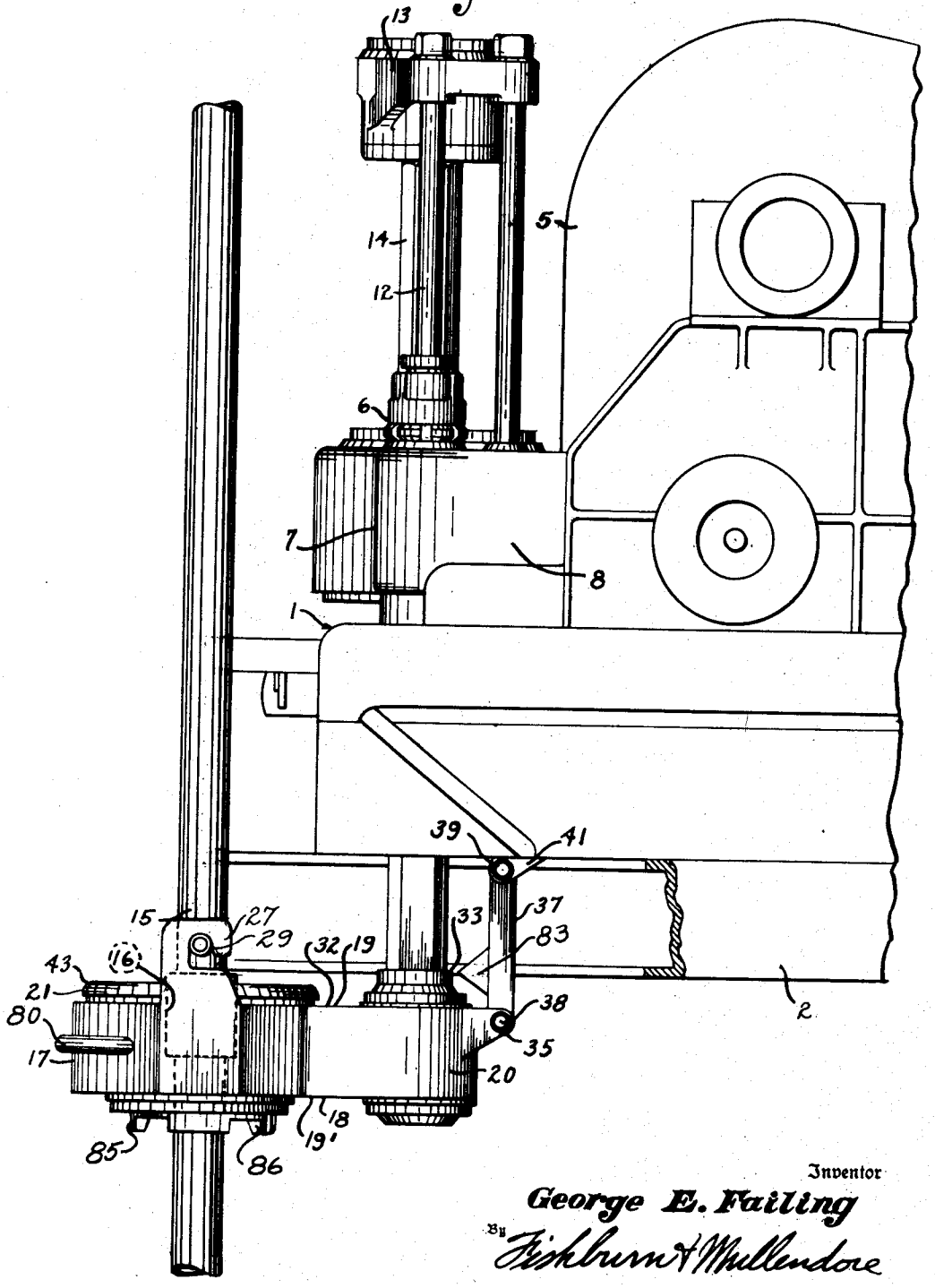
Attorneys

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BREAKOUT TABLE

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Fig. 2.



Inventor

George E. Failing

By Fishburn & Mullendore

Attorneys

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BREAKOUT TABLE

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Fig. 4.

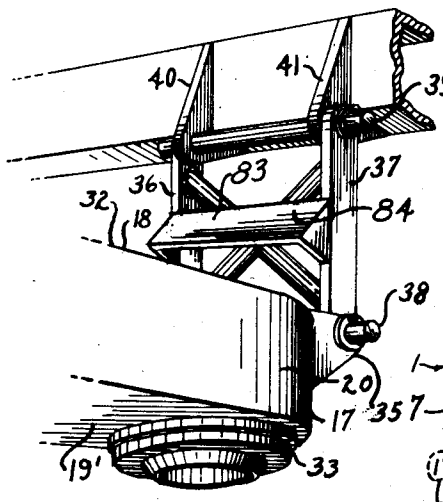
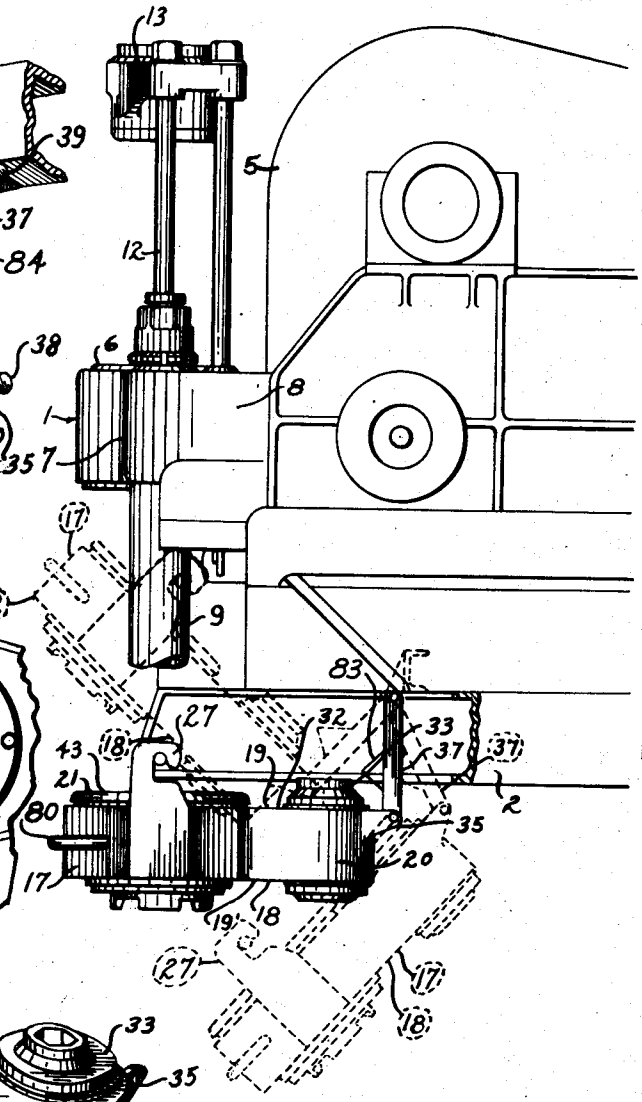


Fig. 3.



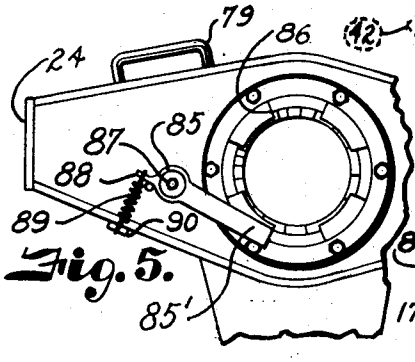
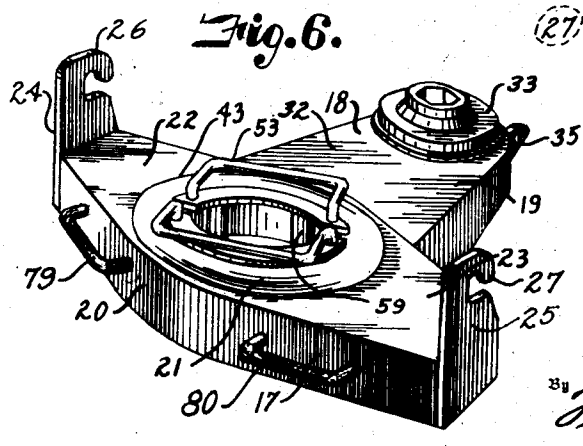


Fig. 5.

Fig. 6.



Inventor

George E. Failing

By Fishburn & Mullendore

Attorneys

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BREAKOUT TABLE

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Fig. 7.

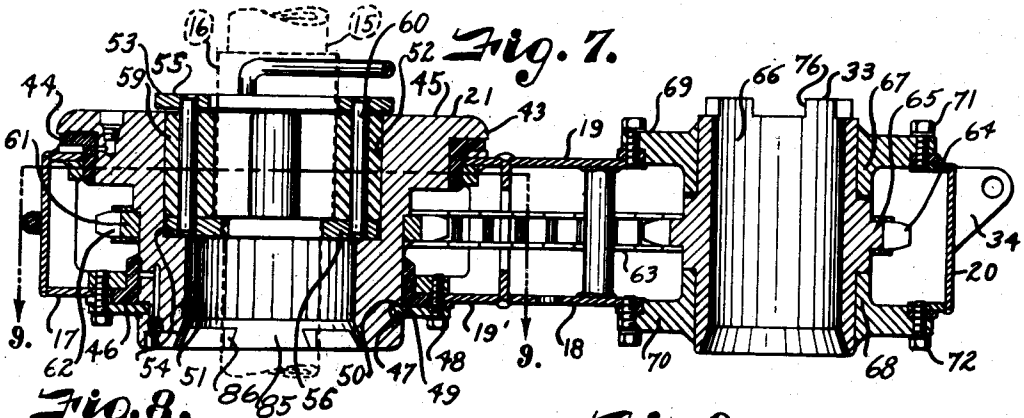


Fig. 8.

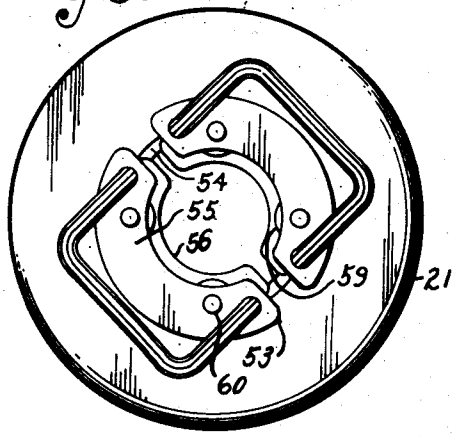


Fig. 9.

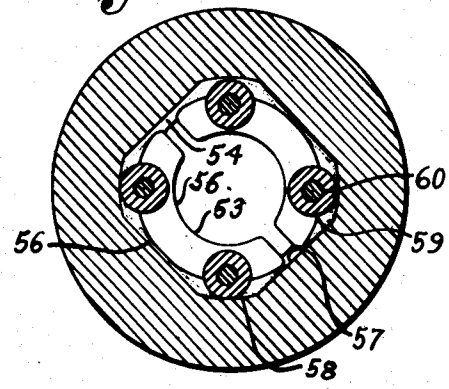


Fig. 10.

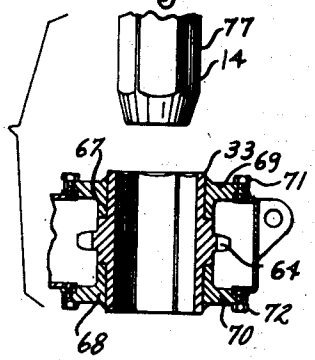


Fig. 11.

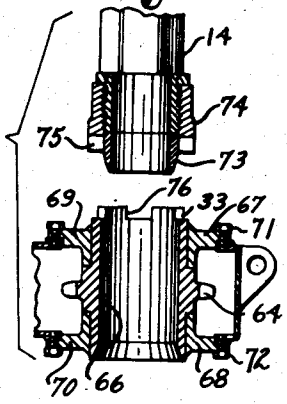
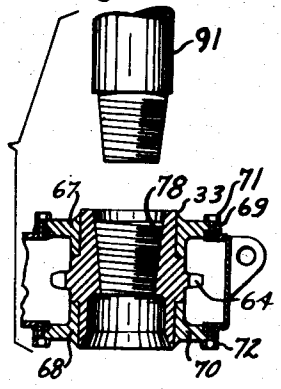


Fig. 12.



Inventor

George E. Failing.

By Fishburn & Mullendore

Attorneys

Patented Nov. 3, 1953

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UNITED STATES PATENT OFFICE

2,657,908

BREAKOUT TABLE

George E. Failing, Enid, Okla., assignor to The George E. Failing Supply Company, Enid, Okla., a corporation of Oklahoma

Application September 3, 1949, Serial No. 113,973

7 Claims. (Cl. 255—35)

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This invention relates to a breakout table used in conjunction with a portable drilling rig for disconnecting stands of drill pipe when pulling drill pipe from a bore hole, the principal object being to provide a breakout table adapted for operation under power of the drilling head.

Other objects of the invention are to provide a breakout table that forms a unitary part of a portable drilling rig and which is adapted to be moved from a transport position, for road clearance, to a drilling position, and from a drilling position to an out-of-way position when running in casing or other objects into the bore hole too large to pass through the breakout table; to provide the breakout table with hooks adapted to engage studs on the drilling rig for retaining the breakout table in its drilling and transport position; to provide a breakout table that serves as a spider when raising or lowering a drill pipe into the bore hole; to provide the breakout table and rotary thereof with a ratchet adapted to hold the pipe when the kelly is unthreaded therefrom; to provide a breakout table that can be used as an auxiliary drive of the Kelly rod of the drilling rig, and to provide the breakout table with a support for the Kelly rod when the breakout table is in transport position.

In accomplishing these and other objects of the invention, I have provided improved structure, the preferred forms of which are illustrated in the accompanying drawings wherein:

Fig. 1 is an end view of a portion of a portable drilling rig equipped with a breakout table embodying the features of the present invention, the table being shown in drilling position.

Fig. 2 is a side elevational view of the portion of the drilling rig illustrated in Fig. 1, the drilling head being shown in retracted position with a Kelly rod connected in driving relation with the breakout table.

Fig. 3 is a similar side elevational view but showing the drill head in drilling position, the respective carrying and out-of-way positions of the breakout table being shown in dotted lines.

Fig. 4 is a similar perspective view particularly illustrating the hinge mounting of the breakout table.

Fig. 5 is an underneath plane view of a part of the breakout table showing the ratchet for locking the rotary member of the table when the kelly is to be unthreaded from the drill pipe.

Fig. 6 is a perspective view of the breakout table.

Fig. 7 is an enlarged longitudinal section particularly illustrating the drive connection between the turntable of the breakout and the drive rod of the drill head.

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Fig. 8 is a plan view of the rotary element particularly illustrating the drill pipe gripping slips.

Fig. 9 is a cross section through the slips illustrating the drill pipe gripping rollers of the slips.

Figs. 10 and 11 show sectional views of different forms of driving connections between the drive rod of the drill head and the driving member of the breakout table.

Fig. 12 is a sectional view of the driving member adapted for connection with the threaded end of a kelly rod when a kelly rod is used in connection with the drill head.

Referring more in detail to the drawings:

1 designates the rear portion of a portable drilling rig, including a platform-like frame 2, carrying spaced guide rails 3 and 4 slideably mounting a drill head 5 and whereon the drill head is moved from a drilling position to a retractive position. In a rig of this character the frame 2 is usually mounted on a motor vehicle chassis and the rear end of the drill head projects from the rear of the chassis to carry a drill pipe rotating mechanism 6 that is supported vertically between the guide rails 3 and 4 on the chassis, as best shown in Figs. 1 and 2. In the illustrated instance, the mechanism 6 includes an extension 7 of the frame 8 of the drill head and mounts laterally spaced hydraulic cylinders 9 and 10 in which are reciprocably mounted piston rods 11 and 12 interconnected by a cross head 13.

Rotatably mounted in the cross head 13 is a kelly or drive rod 14 which is preferably of polygonal cross section for sliding rotary connection with a suitable rotating mechanism housed within the frame extension, and which effects rotation of the drive rod or kelly while the cross head is being supported in stationary position or while the cross head is being moved under reciprocation of the piston rods, as when applying pressure to the drill bit on the lower end of the drill pipe 15.

The lower end of the rod 14 is suitably threaded to connect a chuck (not shown) but which is adapted to grip the drill pipe to exert a downward thrust thereon. The drill pipe 15 includes a plurality of sections that are connected together by tool joints 16, so that the drilling string may be increased in length progressively with progress of the drill bit by adding additional sections or stands of drill pipe, and the sections may be disconnected when the drill pipe is being pulled from the bore hole as when changing drill bits or for other reasons well known to those skilled in the drilling art.

In carrying out the present invention a breakout table 17 is used to uncouple the stands of drill pipe and the power is applied to the breakout table from the drive or kelly rod of the drill head as now to be described.

The breakout table 17 is best illustrated in Fig. 6 and includes a substantially hollow T-shaped body 18, including upper and lower plate portions 19 and 19' conforming to the contour of the table and which are connected around the marginal edges thereof by vertical plate or wall portions 20, as best shown in Figs. 6 and 7.

Supported by the body 18, substantially in the center of the head of the T-shaped formation, is a rotary element 21 as shown in Fig. 6. The lateral portions 22 and 23 of the body 18 on the respective sides of the turntable are provided with upstanding lugs 24 and 25, having hooks 26 and 27 adapted to engage studs 28 and 29 when the breakout table is in drilling position or studs 30 and 31 when the breakout table is in transport position as later described.

The rearwardly extending portion 32 of the T-shaped body carries a rotatory driving member 33 which is in a position to register with the drive or kelly rod 14 when the drill head is in retracted position as shown in Fig. 2.

Projecting from the rear end of the frame are laterally spaced ears 34 and 35 which are pivotally connected to suspension links 36 and 37 by a cross pin or shaft 38. The upper ends of the links 36 and 37 are pivotally connected with the ends of a cross pin or shaft 39 that is carried by ears 40 and 41 on the supporting frame 2, as best shown in Figs. 1 and 3. The breakout table is thus adapted to be supported in horizontal position below the supporting frame of the drill head as shown in full lines Fig. 3 or to be swung upwardly into carrying position as shown by the upper dotted lines 42 with the hooks 26 and 27 engaged with the studs 30 and 31, or the breakout table may be swung downwardly and rearwardly from over the bore hole so that it is out of the way when pulling casing or performing other operations incidental to drilling.

The rotary element 21 includes a flange or table portion 43 that is rotatably mounted in a bearing ring 44 inset within an opening of the plate portion 19. Depending from the flange or table portion 43 of the turntable is a sleeve 45 of reduced diameter, and which is rotatably supported in a bearing ring 46 that is supported within an opening in the lower plate 19'. The rotary element 21 is restrained from axial movement in the bearing rings 44 and 46 by plate members 47 that are secured to the under side of the plate 19' by fastening devices 48, and which have portions 49 engaging in an angular groove 50 in the sleeve portion of the turntable. The member 21 is provided with an axial bore 51 through which the drill pipe 15 is adapted to be extended when the breakout table is in drilling position. The bore 51 has an upper counterbore 52 to contain a set of slips 53 that set upon a shoulder 54 formed by the bottom of the counterbore. The slips include upper and lower arcuate plates 55 and 56 provided with longitudinal recesses to mount rollers 59 which are supported on pins 60 having their ends supported by the plates 55 and 56 to engage flat sides 57 within the rotary element 21 and effect movement of the rollers into a gripping contact with a drill pipe's tool joint when the turntable is rotated as later described. Encircling the sleeve of the turntable is a sprocket ring 61 having teeth 62 engaged by an endless chain 63 operating over teeth 64 of a sprocket 65 that is formed on the driving member 33, as best shown on Fig. 7.

The driving member 33 includes a sleeve-like body 66 that is rotatably mounted in bearings 67 and 68 that are carried by disc-shaped plates 69 and 70 closing upper and lower openings in the plates 19 and 19' and which are secured in position by fastening devices such as cap screws 71 and 72.

In the form of the invention shown in Fig. 7 the sleeve-like body has an inner diameter to receive a pilot 73 that is secured through a sleeve 74 with the threaded end of the drive rod when the drive chuck is removed therefrom. The sleeve 74 is provided with depending lugs 75, which are adapted to engage with similar lugs 76 that are formed on the upper end of the sleeve of the driving member as best shown in Figs. 7 and 11.

The driving member shown in Fig. 10 is similar to the driving member shown in Figs. 7 and 11 except that it is provided with a bore having cross sectional shape corresponding to a driving pilot 77 which in the instance illustrated is of octangular shape and conforming to the octangular shape of the drive rod.

In the driving connection shown in Fig. 12, the driving member is provided with an internal threaded socket 78 having threads corresponding to the threads on the lower end of the kelly rod 91 or an extension that is adapted to be connected thereto.

The breakout table is provided at the front thereof with handles 79 and 80 by which the table may be lifted into and out of its respective positions and to facilitate its engagement with the supporting studs. In order to prevent disengagement of the hooks when in drilling position bolts 81 and 82 may be passed through suitable openings in the frame at points directly over the hooks after they have been engaged with the studs 28 and 29. A support 83 is provided for the kelly or drive rod 14 when the breakout table is in transport position. This support comprises a cross bar 84 that connects the links 36 and 37.

To facilitate uncoupling of the Kelly or drive rod 14, the turntable has a ratchet 85 that is adapted to engage lugs 86 (Fig. 5) depending from the rotary element 21, the ratchet comprising a pawl 85' pivoted to the underside of the breakout table on a stud 87. The pawl has a tail portion 88 for connecting a spring 89 which has its other end connected to a lug 90 on the breakout table.

Assuming that the breakout table is constructed and assembled as described it is mounted on a portable drilling rig below the frame thereof by attachment of the links as shown. The breakout table is moved to the upper dotted line position as shown in Fig. 3, and supported by engagement of the hooks 26 and 27 with studs 30 and 31. This position of the breakout table gives ample road clearance while the drill is being transported from one drilling site to another.

When the drill rig is set up for drilling of a bore hole, the hooks are withdrawn from the studs 30 and 31 so that the breakout table may be lowered to a horizontal position as shown in full lines, Fig. 3, where the hooks are engaged with the studs 28 and 29. In this position the slips may be removed and the drill pipe operated by extending it through the turntable, or the

slips may be left in position and used as a spider in supporting the drill pipe when additional stands are coupled therewith.

When the drill head is in drilling position the drive rod is, of course, located directly over the axis of the turntable and the rotating mechanism of the drilling head is used in rotating the drive rod to effect rotation of the drill pipe.

When it becomes necessary to remove the drill pipe from the bore hole, as when changing bits or the like, the drill or kelly rod is raised above the breakout table and the slips are inserted in the rotary member 21 so as to support the drill pipe for disconnection of the drive rod. This is effected by rotating the kelly or drill rod in a direction to effect unthreading thereof while the drill pipe is held from rotation by the ratchet 85.

After disconnection of the driving rod, the drilling head is moved to retracted position with the drive rod registering with the driving member 33 of the breakout table. The threaded end of the drive rod is then connected with the driving member by any one of the types of connections as illustrated in Figs. 10 and 11, depending upon the connection which is used. The drill head is thus out of position so that the drill pipe may be withdrawn from the bore hole by means of the usual elevator, derrick and tackle mechanism not shown. When the first stand of the drill pipe passes the turntable the slips are caused to engage the drill pipe and the drilling mechanism is placed in operation to rotate the drive or kelly rod 14, which effects rotation of the drive member 33, sprocket 34, chain 63, and sprocket 62 to rotate the turntable in a direction to effect unthreading of the stand of drill pipe from the drill pipe gripped in the turntable, a suitable tong (not shown) having been applied to the stand of drill pipe to hold the stand from rotation while the drill pipe in the well is being rotated by the drive rod.

After disconnection of the stand of drill pipe the elevator is again recoupled with the projecting end of the drill pipe and another stand is withdrawn through the turntable so that the next tool joint may be similarly disconnected. The operations will be continued in like manner until the last stand of drill pipe has been removed from the bore hole.

When running casing or other objects too big to pass the opening in turntable the hooks 26 and 27 are disengaged from the studs 28 and 29 and the breakout table is dropped to the lower dotted line position shown in Fig. 3. In this position the breakout table is clear of the bore hole and casing or the like and may be run through or withdrawn from the bore hole as desired.

From the foregoing it is obvious that I have provided a breakout table that is of simple construction, and which is adapted for operation under power of the drive rod so as to eliminate the necessity of the usual catheads or other devices required in breaking the joints of drill pipe.

What I claim and desire to secure by Letters Patent is:

1. In combination with a drilling rig having a portable frame, a drill head movable on the frame to and from drilling positions and having a drive rod and rotating means for the drive rod, a breakout table including a body member supported by said frame, a rotary member rotatable in said body member and having drill pipe gripping means for effecting rotation of a drill pipe when gripped thereby, a driving member rotatable in the body member in registry with said drive rod when the drilling head is moved out of drilling position, a removable driving connection between the drive rod and the driving member, and a driving connection between the driving member and the rotary member.

2. In combination with a drilling rig having a portable frame, a drill head movable on the frame to and from drilling position and having a drive rod and rotating means for the drive rod, a breakout table including a body member, a driving member rotatable in the body member, links pivotally connecting the body member with the frame at an end thereof nearest the driving member, hooks connecting the opposite end of the body member with the frame and releasable to shift the body member downwardly on said links and out of drilling position, a drill pipe rotating member rotatable in the body member and having drill pipe gripping means for effecting rotation of a drill pipe when gripped thereby, said driving member being in registry with the drive rod when the drilling head is moved out of drilling position, a removable driving connection between the drive rod and the driving member, and a driving connection between the driving member and the drill pipe rotating member.

3. In combination with a drilling rig having a portable frame, a drill head movable on the frame to and from drilling positions and having a drive rod and means for rotating the drive rod, a breakout table including a body member, a driving member rotatable in the body member, means pivotally connecting the body member with the frame at an end thereof nearest the driving member, releasable means connecting the opposite end of the body member with the frame and releasable to shift the body member downwardly on said pivot means and out of drilling position, a drill pipe rotating member rotatable in body member and having drill pipe gripping means for effecting rotation of a drill pipe when gripped thereby, said driving member being in registry with the drive rod when the drilling head is moved out of drilling position, a removable driving connection between the drive rod and the driving member, and a driving connection between the driving member and the drill pipe rotating member, said frame having engaging means above said drilling position of the body member and adapted to be engaged by said releasable means when the body member is swung upwardly on said pivot means to provide road clearance.

4. In combination with a drilling rig having a portable frame, a drill head movable on the frame to and from drilling position and having a drive rod and means for rotating the drive rod, a breakout table including a body member, means for movably supporting the body member for movement to and from a position below the drill head, a drill pipe rotating member rotatable in body member and having drill pipe gripping means for effecting rotation of a drill pipe when gripped thereby, a driving member rotatable in the body member in registry with the drive rod when the drilling head is moved out of drilling position, a removable driving connection between the drive rod and the driving member, and a driving connection between the driving member and the drill pipe rotating member.

5. In combination with a drilling rig having a portable frame, a drill head movable on the frame to and from drilling position and having a drive rod and means for rotating the drive rod, a breakout table, means for supporting the breakout table from the frame, a drill pipe rotating mem-

ber rotatably carried by the breakout table and having drill pipe gripping means for effecting rotation of a drill pipe when gripped thereby, a driving member rotatably carried by the breakout table in registry with the drive rod when the drilling head is moved out of drilling position, said drive rod having a removable driving connection with driving member, and a driving connection between the driving member and the drill pipe rotating member.

6. In combination with a drilling rig having a portable frame, a drill head movable on the frame to and from drilling positions and having a drive rod and means for rotating the drive rod, a breakout table including a body member supported by said frame, a drill pipe rotating member rotatable in body member, a driving member rotatable in the body member in registry with the drive rod when the drilling head is moved out of drilling position, said drive rod having a removable driving connection between the drive rod and the driving member, a driving connection between the driving member and the drill pipe rotating member, and slips carried by the drill pipe rotating member and adapted for automatic engagement with a drill pipe upon rotation of the drill pipe rotating member.

7. In combination with a drilling rig having a portable frame, a drill head movable on the frame to and from drilling position and having a drive rod and means for rotating the drive rod, a breakout table including a body member, means for supporting the body member below the drill head, a drill pipe rotating member rotatable in body member and having drill pipe gripping means for effecting rotation of a drill pipe when gripped thereby, a ratchet connection between the drill pipe rotating member and the body member to effect unthreading of the drive rod from the drill pipe when the drive rod is rotated in one direction, a driving member rotatable in the body member in registry with the drive rod when the drilling head is moved out of drilling position, a removable driving connection between the drive rod and the driving member, and a driving connection between the driving member and the drill pipe rotating member.

GEORGE E. FAILING.

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