Sept. 9, 1958 R. R. CROOKSTON ET AL 2,850,929

DRILL PIPE SPINNER

Filed July 6, 1954 5 Sheets-Sheet 1

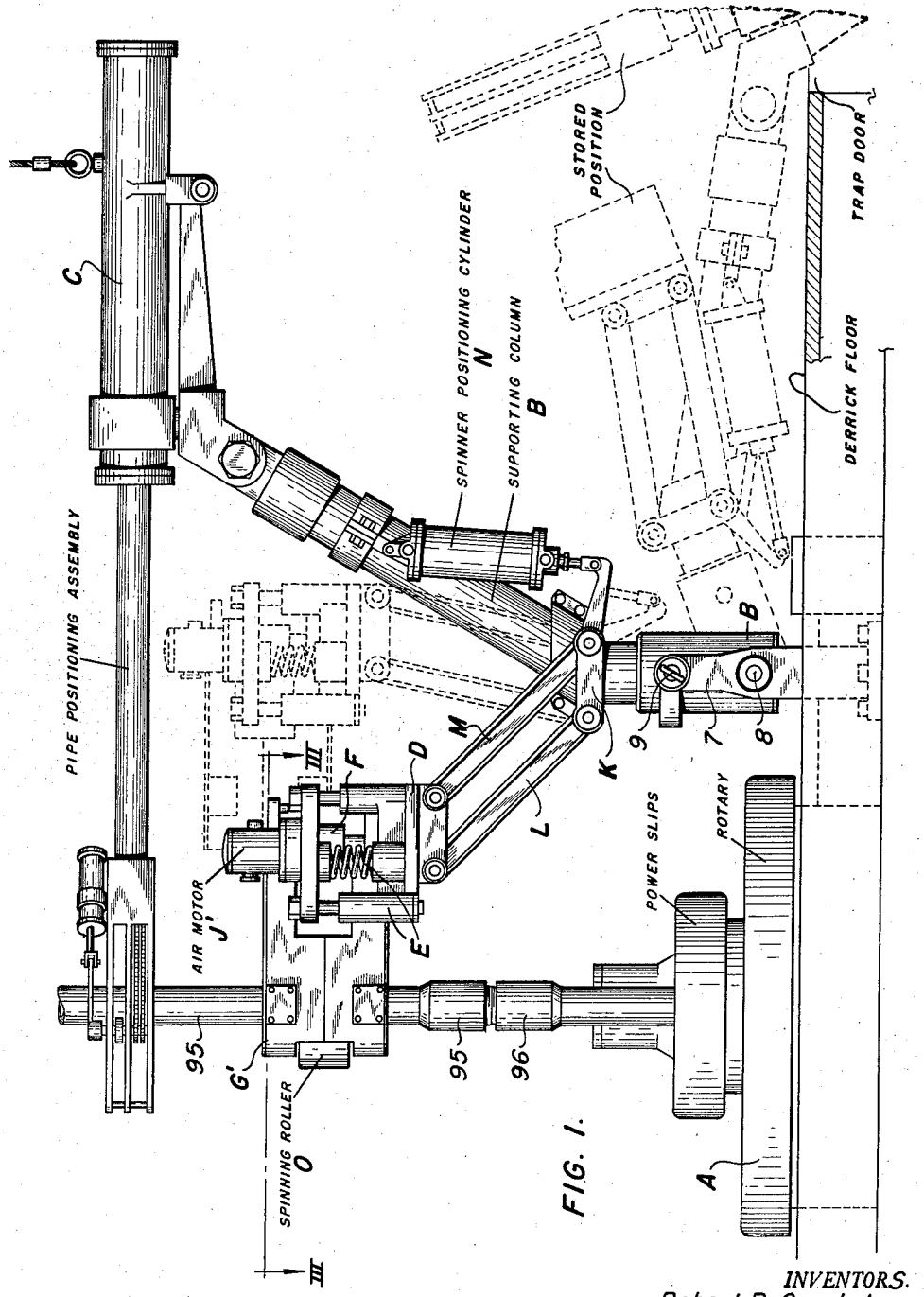


FIG. 1.

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DRILL PIPE SPINNER

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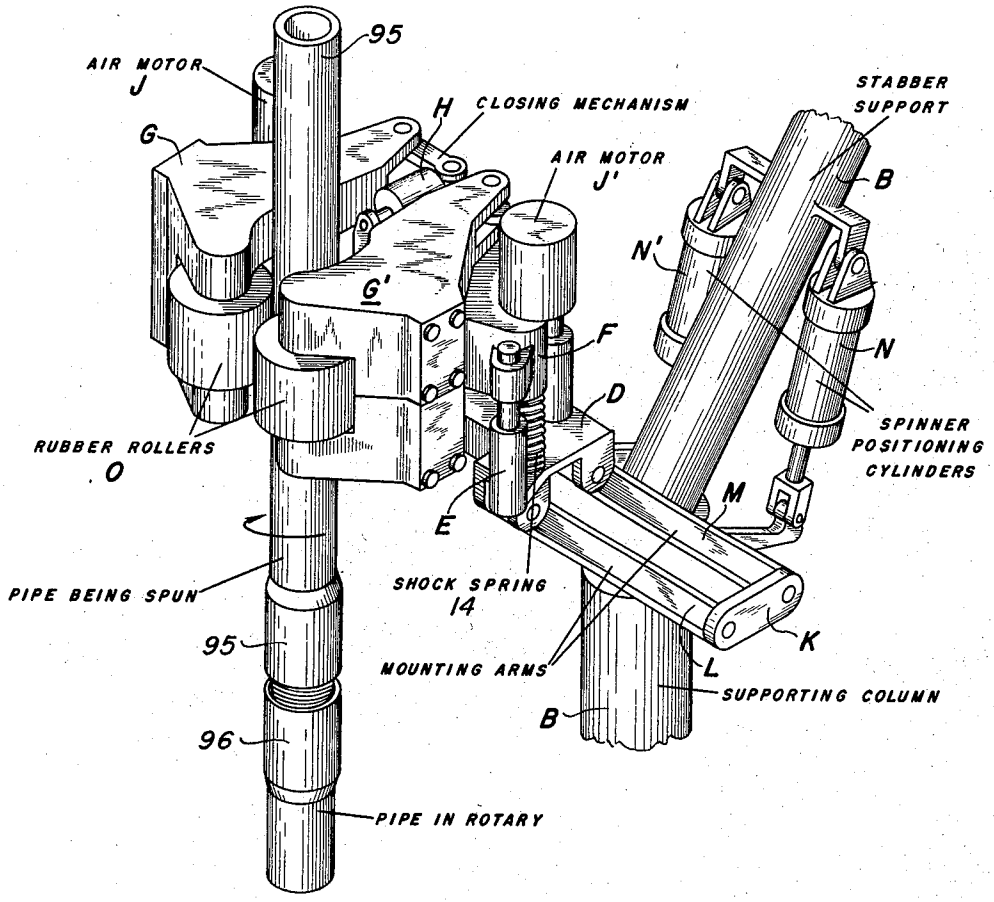


FIG. 2.

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DRILL PIPE SPINNER

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5 Sheets-Sheet 3

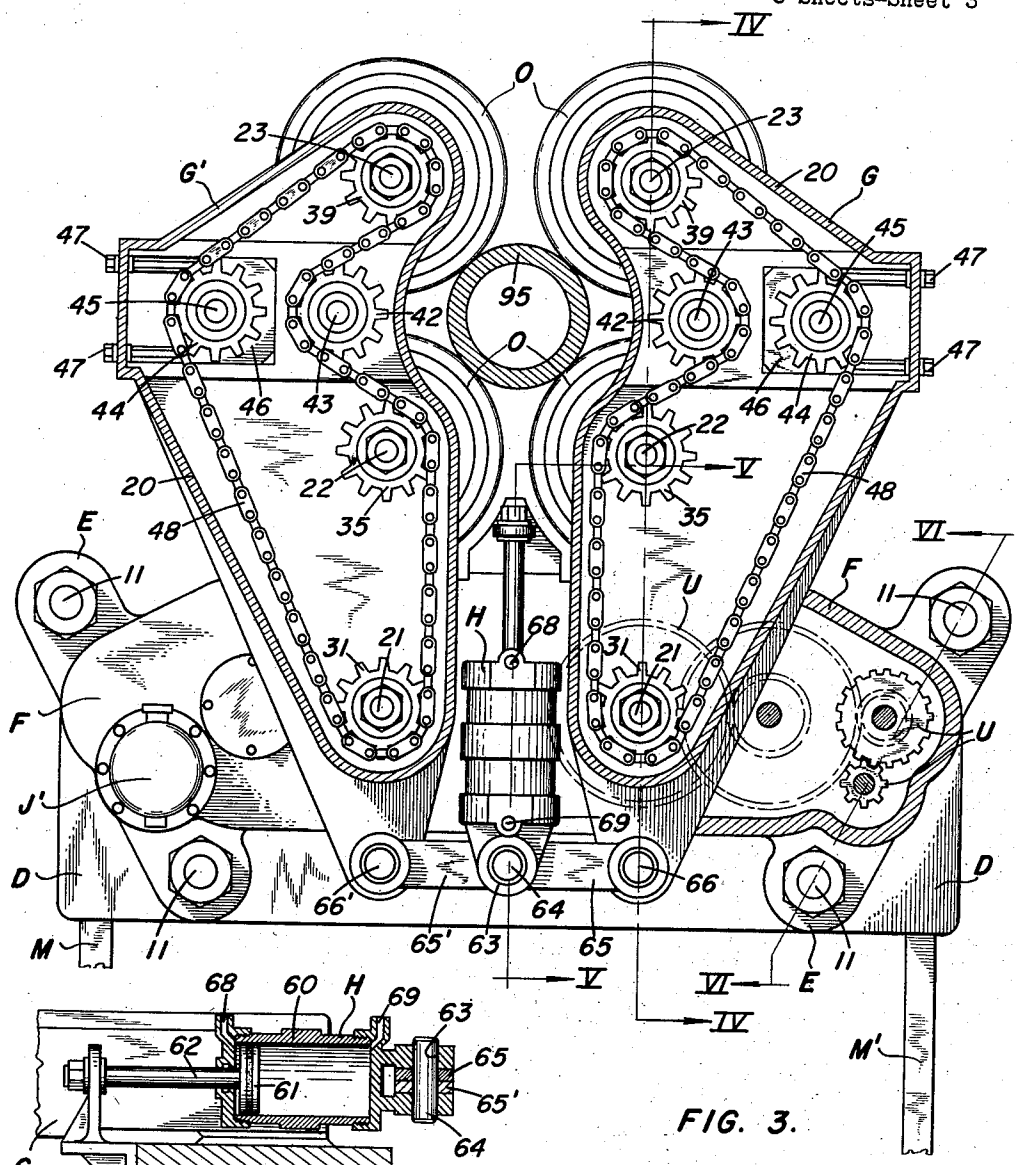


FIG. 3.

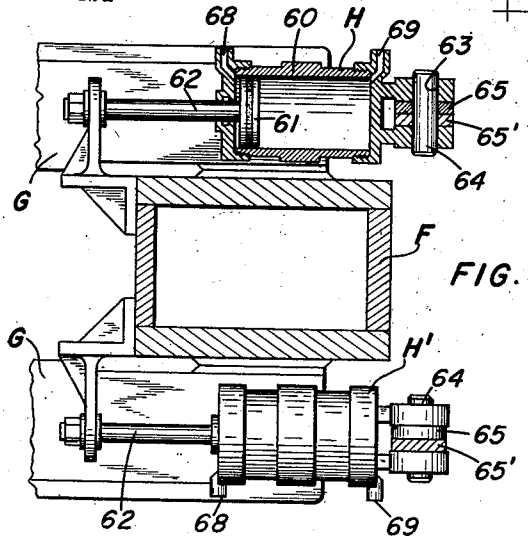


FIG. 5

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DRILL PIPE SPINNER

Filed July 6, 1954 5 Sheets-Sheet 4

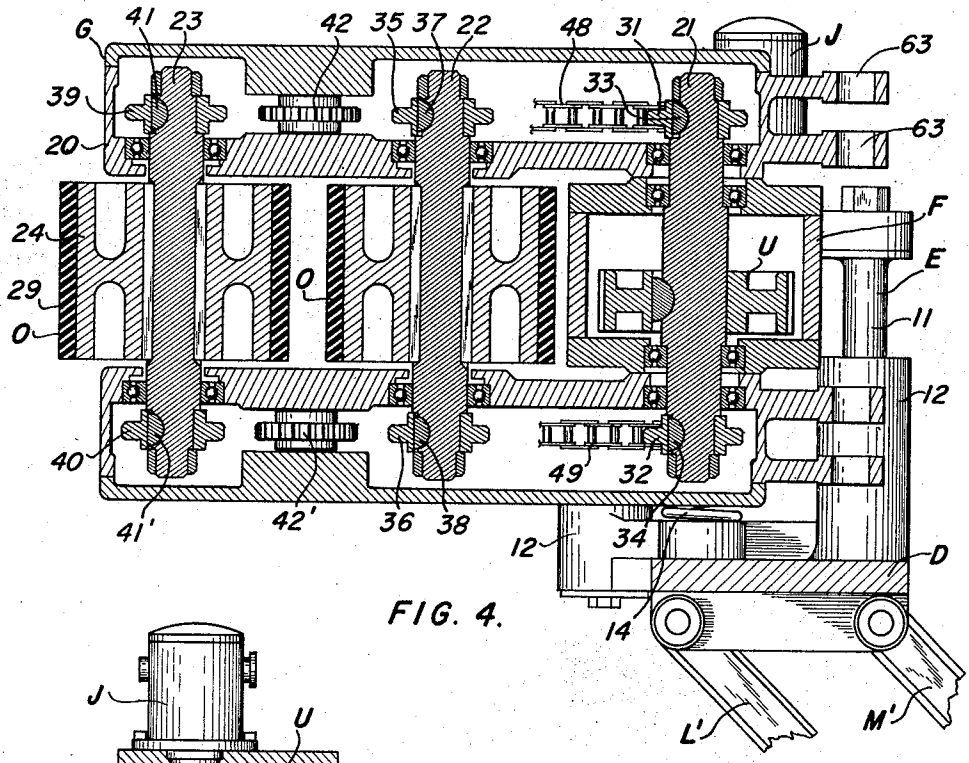


FIG. 4.

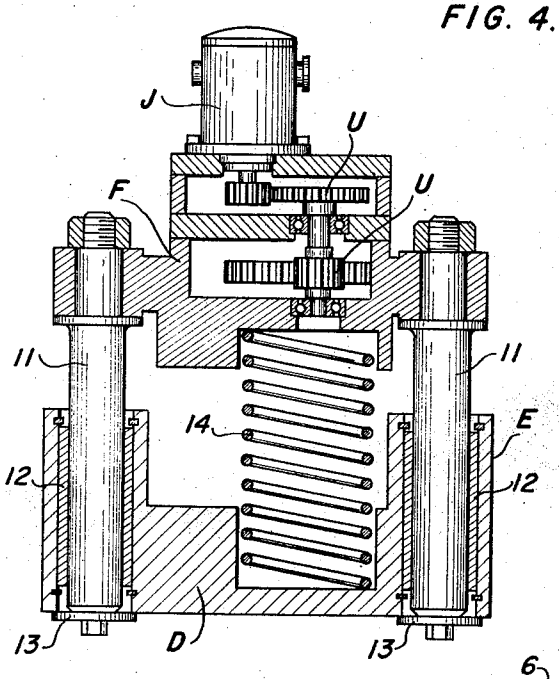


FIG. 6.

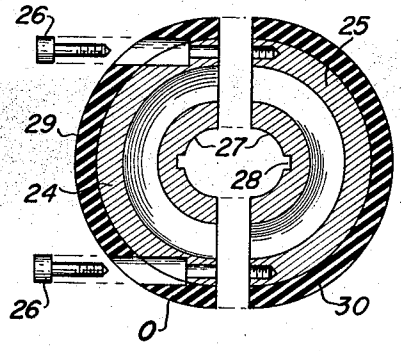


FIG. 7.

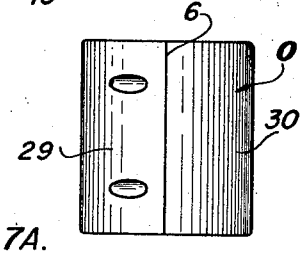


FIG. 7A.

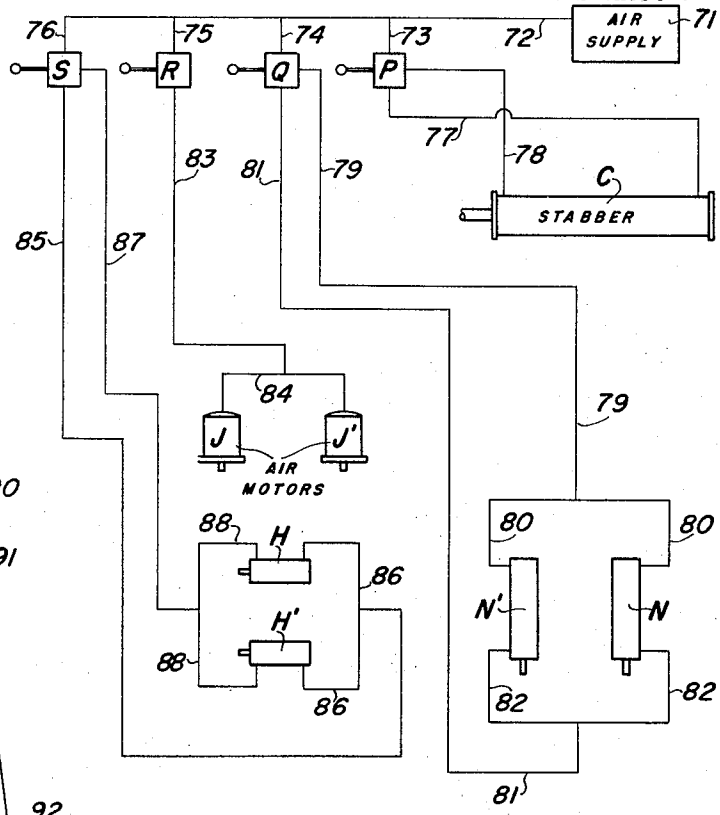
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DRILL PIPE SPINNER

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FIG. 8.



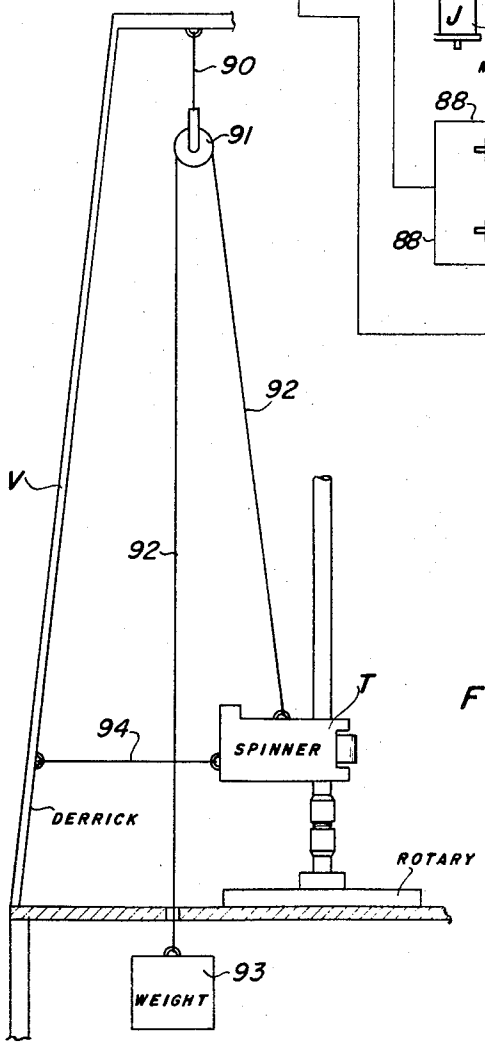


FIG. 9.

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United States Patent Office 2,850,929 Patented Sept. 9, 1958

2,850,929

DRILL PIPE SPINNER

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Application July 6, 1954, Serial No. 441,578

11 Claims. (Cl. 81—53)

This application is directed to a device particularly adapted for spinning stands of pipe in a drilling derrick.

In the drilling of boreholes by the rotary drilling method, the operation is carried out by the use of a drilling bit carried on the lower end of a string of drill pipe made up of sections of pipe connected together by screw threads. During the drilling operation it is necessary at intervals to remove the drill stem from the hole and then to return it to the hole that the actual drilling operation may be continued. The sections of drill pipe must be unscrewed when removing the drill stem from the borehole, and must be screwed together when returning the drill stem into the hole. When returning a stand of the drill pipe to the hole, it is conventional to spin it by means of several turns of chain or rope wrapped around the pipe with one end of the rope or chain connected to the cathead which supplies the power for spinning while the other end is held by an operator.

The present device is directed to a device adapted to perform the operation of spinning together vertical sections or stands of drill pipe.

Other objects and advantages of the present invention will be seen from the following description taken in conjunction with the drawing in which

Fig. 1 is in the form of an elevation showing an embodiment of the present invention;

Fig. 2 is an isometric view of a portion of the device shown in Fig. 1;

Fig. 3 is a view taken along line III—III of Fig. 1;

Fig. 4 is a view taken along line IV—IV of Fig. 3;

Fig. 5 is a view taken along line V—V of Fig. 3;

Fig. 6 is a view taken along line VI—VI of Fig. 3;

Fig. 7 is an exploded sectional view of one of the rollers of the assembly shown in Figs. 1, 2, 3, and 4;

Fig. 7–A is an elevation of the roller of Fig. 7;

Fig. 8 is a schematic view showing controls used with the embodiments of Figs. 1 to 7, inclusive; and

Fig. 9 is a schematic view showing another method for mounting the device of the present invention in the drilling derrick.

Turning now specifically to the drawing and first to the embodiment shown in Figs. 1 through 8, the rotary table A of a drilling derrick is shown with the upper end of the string of drill pipe **96** projecting therefrom with the threads of the lower end of a stand of drill pipe **95** engaged therewith in position so the threads may be spun up.

Rotary table A has a mounting bracket **7** secured adjacent thereto with post B mounted on the bracket as shown in Fig. 1. Post B is secured to mounting bracket **7** by means of a pivot **8** and spring biased catch **9**. Carried on the upper end of post B is a pipe stabbing assembly C. A suitable mechanism for use as pipe stabbing assembly C which is shown schematically is described and claimed in U. S. patent application Serial No. 368,191, entitled "Device for Positioning Pipe in a Drilling Derrick," filed July 15, 1953, in the name of Robert R. Crookston, now Patent No. 2,690,847. Mounted upon

post B is a spinning assembly in accordance with the present invention consisting of a base member D, shock absorber assembly E, gear housing F and a pair of arms G and G'. Power means H and H' are provided for pivotally moving arms G and G' on said gear housing F. Prime movers J and J' are carried by housing F.

Base member D is carried on post B by means of bracket K connected to said post B and carrying the two pairs of parallel mounting arms LM and L'M' (Fig. 4) to which base D is pivoted. Piston and cylinder assembly N is connected to mounting arm M and piston and cylinder assembly N' is connected to mounting arm M'.

As seen more clearly in Fig. 6, shock absorber assembly E consists of cylindrical vertically positioned members **11** secured to housing F and slidably arranged in the cylindrically shaped passages provided by sleeves **12** of base D. A cap **13** is secured to the lower end of each member **11** and limits the downward movement of housing F with respect to base D. A pair of springs **14**, **14** bias housing F away from base D with the upper end of each spring **14** fitting in a suitable cavity in housing F and its lower end fitting in a corresponding cavity in base D.

Power means H and H' are identical and the parts thereof are identified by identical reference characters. Each power means is a piston and cylinder assembly. As seen more clearly in Fig. 5, this assembly consists of a cylinder **60** with a piston **61** slidably arranged therein and connected to piston rod **62** which in turn is connected to housing F. Cylinder body **60** is provided with journals **63** for receiving pivot **64** which in turn is connected with link **65** which is connected to arm G by pivot **66** and link **65'** which is connected to arm G' by pivot **66'**. One end of cylinder **60** is provided with inlet port **68** for admitting a pressure fluid such as compressed air and the other end of the cylinder is provided with a corresponding port **69**.

A diagrammatic showing of a suitable control means for the embodiment of Figs. 1 through 7, inclusive, is shown in Fig. 8. In this figure pipe stabbing assembly C, prime movers J and J', power means H and H' and piston and cylinder assemblies N and N' are assumed to be operated by compressed air supplied from a suitable source of supply indicated by rectangle **71**. From air supply **71** compressed air passes to manifold **72**.

Another means for mounting the spinning assembly is shown in Fig. 9. In this figure the spinning assembly is designated as T. T will be understood to embrace the various elements D, E, F, G, G', H, H' and J, J' of the embodiment of Figs. 1 to 8. In the embodiment of Fig. 9 the structure is suspended in drilling derrick V by a suspending assembly which consists of a cable **90** from which is suspended a pulley **91** and which in turn supports a cable **92**, one end of which is attached to assembly T and the other end attached to a suitable balancing weight **93**. A snubbing line **94** extending substantially horizontally also is connected between the spinning assembly T and derrick V. The spinning assembly shown in Fig. 9 corresponds to the type of suspension means commonly used to suspend make up tongs in a drilling derrick as well known to the art.

The arms G and G' are similar and bear the same relationship as the right and left hands of a person. Details of construction are shown in Figs. 3 and 4. The corresponding parts of arms G and G' are designated by identical reference characters.

Each arm G and G' has a housing **20**. Housing **20** is pivotally attached to gear housing F through shaft **21**. Shafts **22** and **23** are mounted on housing **20**. Identical rollers O are mounted on shafts **22** and **23** of each arm G and G'.

The details of construction of a roller O are shown in

Fig. 7. As seen in this figure, semi-circular metal halves 24 and 25 are arranged to be secured together by cap screws 26. When the two members are secured together they define a central opening made up of curved surfaces 27 with key ways 28. A rubber sheet 29 is bonded to member 24 and rubber sheet 30 is bonded to member 25. When the two members 24 and 25 are fastened together to form a complete roller, the abutting edges of rubber portions 29 and 30 form vertical joints 6 extending the length of the roller. These rollers including the vertical joints serve to remove mud, water and other foreign material by what may be termed a squeegee action to improve the frictional contact when driving the pipe in the actual spinning operation.

Sprockets 31 and 32 are secured by keys 33 and 34, respectively, to the ends of shaft 21. Sprockets 35 and 36 are secured by keys 37 and 38, respectively, to the ends of shaft 22. Sprockets 39 and 40 are secured by keys 41 and 41', respectively, to the ends of shaft 23. On the upper side of housing 20 a fixed idler sprocket 42 is mounted for rotation on shaft 43 and an adjustable idler sprocket 44 is mounted for rotation on shaft 45 which in turn is carried by block 46 whose position is adjustable by cap screws 47, 47. The lower side of housing 20 has mounted thereon an idling sprocket 42' corresponding to sprocket 42 and a sprocket corresponding to sprocket 44 which, in order to simplify the drawing, has not been shown. An upper driving chain 48 is arranged around the sprockets carried by the upper portion of housing 20 and a corresponding driving chain 49 is similarly arranged around the sprockets at the lower side of the housing 20.

In arm G shaft 21 is arranged to receive power from prime mover J through train of gears U and in arm G' shaft 21 receives power from prime mover J' through a train of gears corresponding to train of gears U which for the purpose of simplifying the drawing is not shown. Thus, in arm G power from prime mover J is transmitted to shaft 21 and in turn by chains 48 and 49 to rollers O and similarly in arm G' power is transmitted from prime mover J' by means of chains 48 and 49 to rollers O.

Turning to Fig. 8, manually operated bleeder type valves P, Q, R, and S are connected to manifold 72 by branch lines 73, 74, 75, and 76, respectively. Valve P is connected to stabber assembly C through lines 77, 78. Valve Q is connected to the head ends of piston and cylinder assemblies N and N' through line 79 and branch lines 80 and to the piston rod ends through line 81 and branch lines 82. Valve R is connected to air motors J and J' through line 83 and branch lines 84. Valve S is connected to the head ends of power cylinders H and H' through line 85 and branch lines 86 and to the piston rod ends through line 87 and branch lines 88.

In using the controls schematically as shown in Fig. 8, it will be assumed that the post B is at its upright position with the spinning assembly in the position shown by dashed lines in Fig. 1. It will also be assumed that a stand of pipe 95 is to be added to the string of pipe 96 already in the borehole. The stabbing assembly C is placed in its extended position as shown in Fig. 1 by actuating valve P to supply compressed air to the head end. The lower end of stand of pipe 95 is shown with its threaded pin end stabbed into the box thread of the upper end of the string of drill pipe 96. It will be understood by one skilled in the drilling art that upon moving stand of pipe 95 from its racked position at the side of the drilling derrick (not shown in the drawing) into position at the center of the borehole, it strikes assembly C and its position is then controlled by the assembly C. The portion shown by dashed lines of the spinning assembly mounted on post B, as shown by full lines, is then moved to the position shown in full lines by actuating valve Q to supply compressed air to piston and cylinder assemblies N and N', the jaws G and G' being in their spread positions as they move to the left as shown in the drawing. Actuation

of valve S then supplies compressed air to assemblies H and H' which move jaws G and G' toward each other until rollers O are in contact with the drill pipe. Actuation of valve R supplies compressed air to motors J and J' to cause rotation of rollers O which in turn spin the drill pipe. The actuation of power means H and H' and prime movers J and J' may be varied at the convenience of the operator. For example, valve R may be opened after valve S so that the prime movers begin to spin rollers O after they are brought into contact with the pipe or alternatively valve R may be opened simultaneously with or prior to the time of opening valve S so that the rollers O are spinning at the time they are brought into engagement with the drill pipe 95 for spinning it. The drill pipe is spun until the joint is made up or shoulders. The prime movers J and J' may be stopped by the actuation of valve R before the device is disengaged from the drill pipe or alternatively may be allowed to continue to spin as the device is being disengaged. After the spinning operation is completed, the device is returned to its retracted position with valve S actuated to bleed air from units H and H' to cause jaws G and G' to move to their open position and valve Q actuated to return the assembly to the position shown in dashed lines and valve P then actuated to cause stabbing assembly C to retract.

In the usual drilling operations, when pulling a string of drill pipe and subsequently returning it into the hole, the spinning assembly will be used to spin the pipe only when going into the hole because it is usually more convenient to use the rotary table for spinning when coming out of the hole. When spinning a section of pipe to make a joint up, the drill pipe moves downwardly as the threads of the joint are made up and this downward movement of the drill pipe may be followed by the spinning assembly by the compression of springs 14.

After the entire string of pipe has been run into the hole, the supporting post B, with all the equipment supported thereby, may be swung back out of the way by applying a suitable control means such as a catline, not shown in the figure, and disengaging the spring biased catch 9 so that the post B pivots around pivot 8.

While specific embodiments of the present invention have been shown and described, it will be evident that various changes in size, shapes and proportions of various parts thereof may be made without departing from the scope of the invention.

The invention claimed is:

1. A pipe spinner comprising in combination, a housing member, a pair of bodies pivotally mounted on said housing member, spaced rollers mounted on each of said bodies with their axes parallel, each of said rollers provided with an outer covering of abutting sections of rubber, the abutting edges of which form vertical joints extending the length of said roller, means mechanically associated with each of said bodies for moving said spaced rollers toward each other for contact with a vertical section of drill pipe and for moving them away from each other out of contact with said vertical section of drill pipe, a power means mounted on each of said bodies mechanically connected with the rollers carried by the body on which it is mounted for rotating said rollers.

2. A spinning device comprising, in combination, a base member, a vertically movable housing member mounted on said base member for vertical movement with biasing means biasing it to an upper position, a pair of arms pivotally mounted on said housing member with each arm having a free end, power means associated with each of said arms arranged to force the free ends of said arms toward and away from each other, four substantially identical spinning roller members with a pair mounted on one of said arms and a pair mounted on the other of said arms so that said spinning rollers may all be brought into spinning contact with a section of drill pipe by moving the free ends of said arms toward each other,

each of said rollers provided with an outer covering of abutting sections of rubber, the abutting edges of which form vertical joints extending the length of said roller, a first prime mover mounted on the first of said arms mechanically associated with the pair of spinning rollers carried thereby for rotating each of said rollers in a predetermined direction, a second prime mover mounted upon the second of said pair of arms mechanically associated with the pair of spinning rollers carried thereby to rotate said spinning rollers in the same direction as the spinning rollers carried by the first arm.

3. A pipe spinner comprising, in combination, a mounting means, a plurality of rollers mounted on said mounting means with their axes vertical, each of said rollers provided with an outer covering of abutting sections of rubber, the abutting edges of which form vertical joints extending the length of said roller, first power means carried by the mounting means arranged to move said rollers toward one another for engagement with a drill pipe and away from one another for disengagement of the pipe and second power means carried by said mounting means mechanically associated with said rollers for rotating said rollers.

4. A pipe spinner comprising, in combination, a mounting means, two pairs of spaced rollers carried by said mounting means with the pair of rollers arranged for movement toward and away from each other, each roller consisting of two semi-cylindrical members with releasable means securing said two members together to form a cylinder with the outer curved portion of each member consisting of rubber secured to the remainder of the member so that each roller has two vertical abutting joints where the edges of the rubber portions meet, power means carried by the mounting means for moving said pairs of rollers toward and away from each other and second power means carried by the mounting means associated with said rollers for giving them rotative movement for spinning a pipe in contact with said rollers.

5. A pipe spinner for use in a drilling derrick comprising, in combination, a mounting means, lines attached to said mounting means adapted for hanging it in a drilling derrick, a pair of arms carried by said mounting means, a pair of vertically mounted rollers carried by each of said arms, the surface of each roller being covered with a rubber with at least one vertically extending joint extending the length of the roller, first power means carried by said mounting means arranged for moving said pairs of rollers on said arms toward and away from each other and second power means carried by said mounting means mechanically associated with said rollers for giving them rotative movement.

6. A pipe spinner comprising, in combination, a base member, a vertically movable housing means mounted on said base member with springs between said base member and said housing means for movably supporting said housing means, a pair of arms carried by said housing means with one end pivoted and the other end free, a pair of vertically mounted rollers oppositely mounted on said arms with the outer circumference of each roller provided with abutting sections of rubber, the abutting edges of which form vertical joints extending the length of said roller, a first power means associated with said arms for moving the free end of said arms toward and away from each other and second power means associated with said rollers for giving said rollers rotative movement.

7. A device in accordance with claim 6 in which cables are secured to said base member adapted to suspend it in a drilling derrick.

8. A device in accordance with claim 3 wherein the mounting means comprises a pivotal structural member, at least one pair of parallel mounting members pivotally

connected to said structural member, a base member pivotally connected to said mounting members, third power means carried by said structural member mechanically connecting with said mounting members for moving said base member toward and away from said pipe and a spring biased housing carried by said base member.

9. A device in accordance with claim 4 wherein the mounting means comprises a pivotal structural member, at least one pair of parallel mounting members pivotally connected to said structural member, a base member pivotally connected to said mounting members, third power means carried by said structural member mechanically connecting with said mounting members for moving said base member toward and away from said pipe and a spring biased housing carried by said base member.

10. A pipe spinner comprising a pivotal structural member, at least one pair of parallel mounting members pivotally connected to said structural member, a base member pivotally connected to said mounting members, a vertically movable spring biased housing mounted on said base member, a pair of arms pivotally mounted on said housing with each arm having a free end, first power means mechanically connecting with each of said arms arranged to move the free ends of said arms toward and away from each other, rotatable roller members mounted on each of said arms, each of said roller members provided with an outer covering of abutting sections of rubber, the abutting edges of which form vertical joints extending the length of said roller member, second power means carried by each of said arms mechanically connected with said roller members for rotating said roller members and third power means carried by said structural member mechanically connecting with said mounting members for moving said base member toward and away from said pipe.

11. A pipe spinner gripping member comprising a rotatable cylindrical roller adapted to engage the outer surface of a section of well pipe, said roller including two semi-cylindrical bodies connected along the longitudinal diameter, a first section of deformable elastic material covering one of said bodies, a second section of deformable elastic material covering said other of said bodies, each section of deformable material having a smooth outer surface, one edge of said first section of deformable material abutting one edge of said second section of deformable material to form a first separable joint, the other edge of said first section of deformable material abutting the other edge of said second section of deformable material to form a second separable joint, the edges of said deformable material of each joint being movable radially inwardly relative to each other when the joints contact the well pipe so that pressure is exerted first against one of the edges of each joint and then against the other of said edges whereby a squeegee action is effected on the well pipe upon rotation of said roller.

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