July 4, 1933. J. S. MITCHELL 1,916,278

OIL AND GAS WELL DRILLING APPARATUS

Original Filed Feb. 2, 1922 2 Sheets-Sheet 1

Fig. 1.

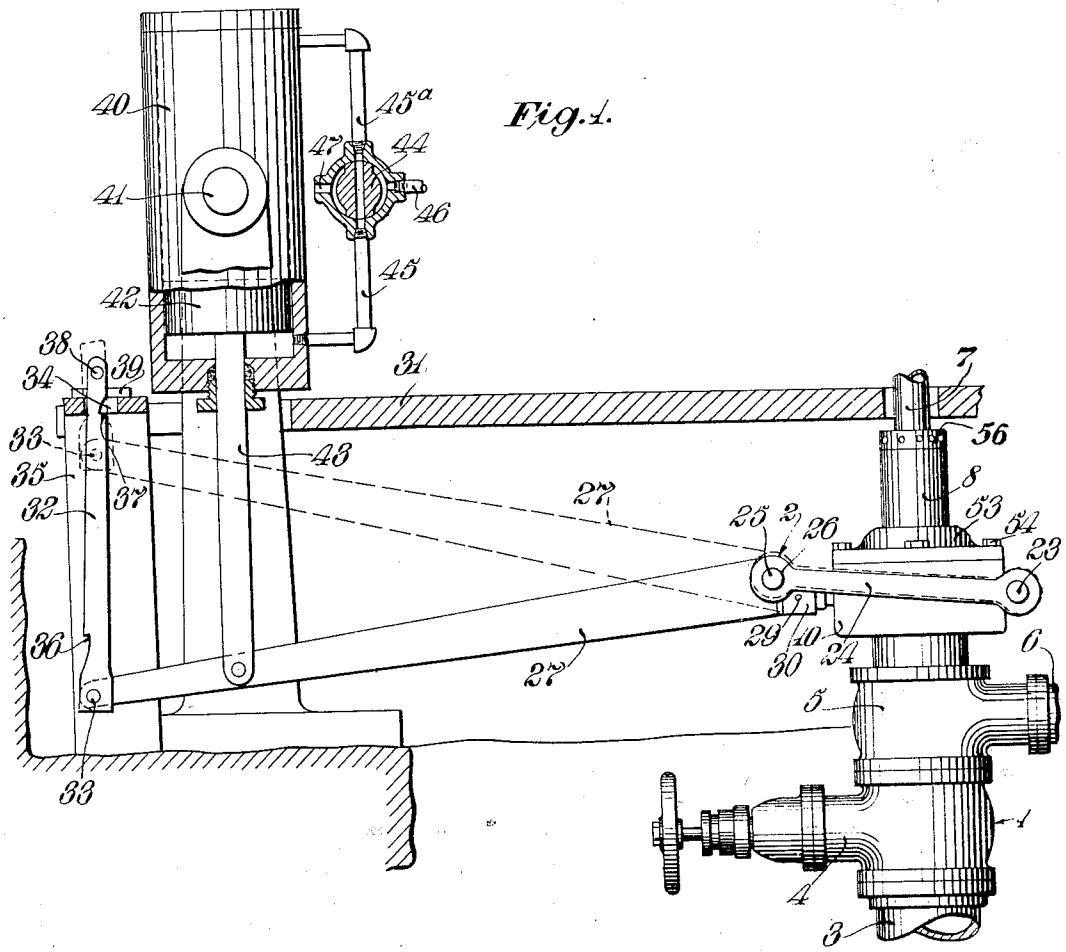


Fig. 4.

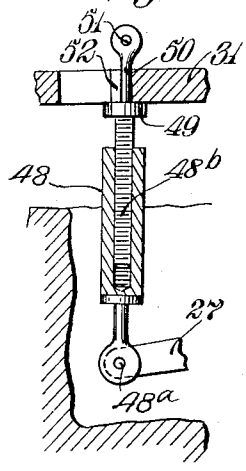
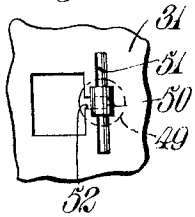


Fig. 5.



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OIL AND GAS WELL DRILLING APPARATUS

Original Filed Feb. 2, 1922 2 Sheets-Sheet 2

Fig. 2.

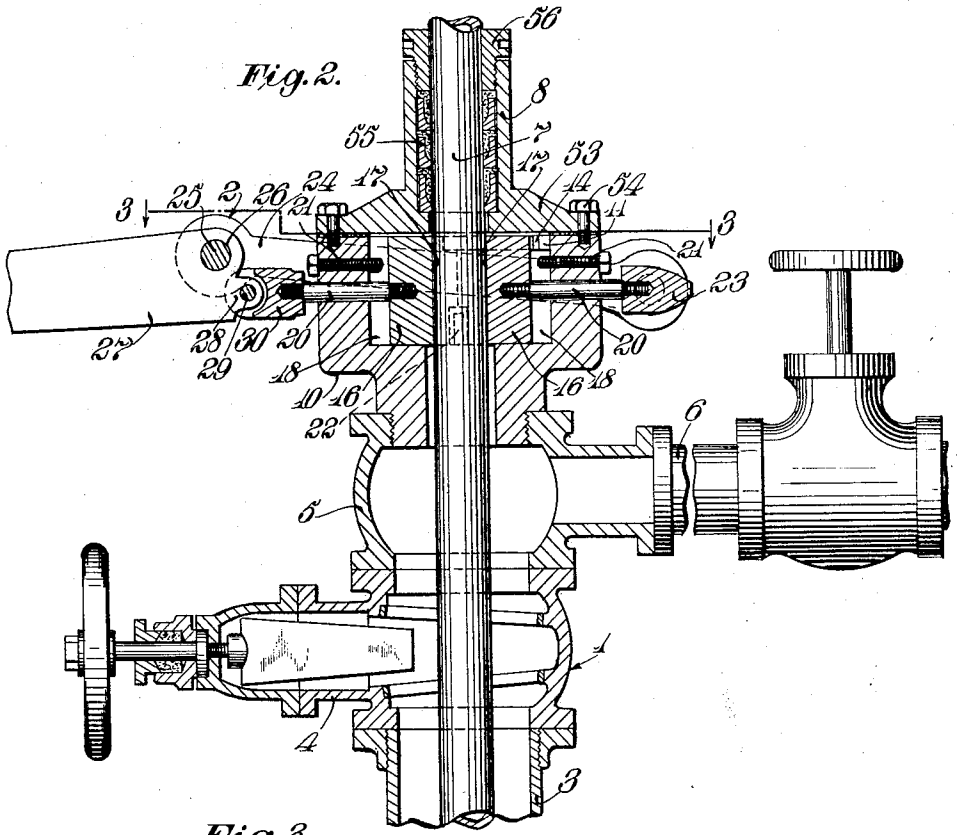
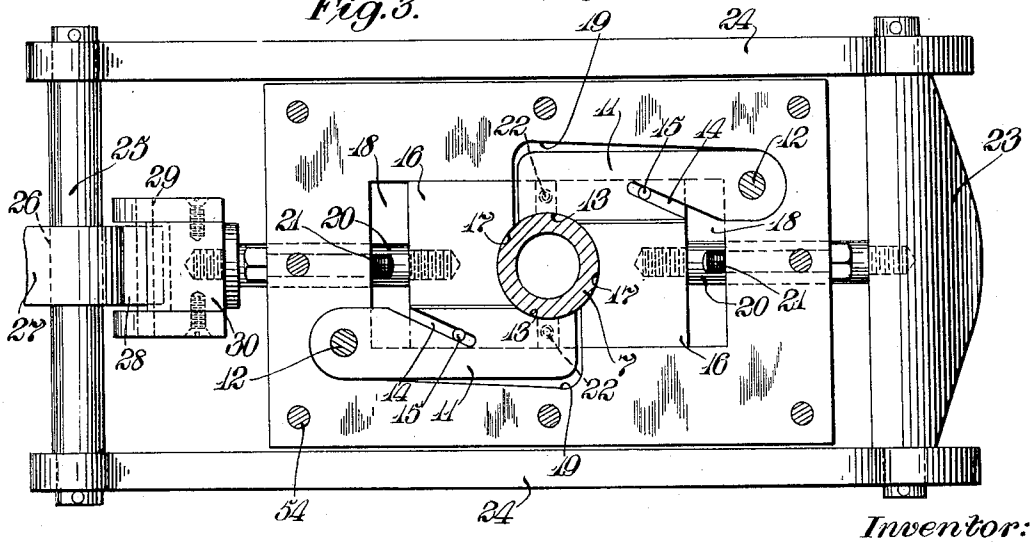


Fig. 3.



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Patented July 4, 1933

1,916,278

UNITED STATES PATENT OFFICE

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OIL AND GAS WELL DRILLING APPARATUS

Original application filed February 2, 1922, Serial No. 533,603. Divided and this application filed March 27, 1929. Serial No. 350,350.

This invention relates to oil and gas well drilling apparatus and more particularly to an improved rod line controlling mechanism for such an apparatus.

An object of this invention is to provide an improved rod line controlling mechanism. Another object is to provide an improved rod line clamping and braking mechanism having improved quick acting operating means therefor whereby a powerful clamping force may be applied to the rod line thereby to hold the same against axial movement especially when oil and gas pressures are encountered during drilling. A further object is to provide an improved rod line controlling mechanism associated with the oil seal and gate valve, or so-called oil saver, of an oil and gas well drilling apparatus. These and other objects and advantages of this invention will, however, subsequently more fully appear as the description proceeds.

This application is a division of a copending application, Serial No. 533,603, filed February 2, 1922.

In the accompanying drawings there is shown for purposes of illustration one embodiment and a modification thereof which the invention may assume in practice.

In these drawings,—

Fig. 1 is a side elevational view of the illustrative embodiment of the improved rod line controlling mechanism, parts being shown in section to illustrate details of construction.

Fig. 2 is a central longitudinal sectional view illustrating the oil saver and the improved rod line controlling mechanism associated therewith.

Fig. 3 is a transverse sectional view taken on line 3—3 of Fig. 2.

Figs. 4 and 5 are detail views illustrating a modified form of operating means for the braking and clamping mechanism.

In this illustrative embodiment of the invention there is shown an oil seal and gate valve, or so-called oil saver, generally designated 1 having embodied therein the improved rod line controlling mechanism generally designated 2. This oil saver is mounted at the top of the well casing 3 and comprises a flow controlling or gate valve 4 of any usual construction and connected through a T 5 with a suitable valve controlled pipe line 6. The rod line 7 is herein of the usual flush jointed type and passes through a stuffing box 8 carried at the top of the controlling mechanism 2 and downwardly through the controlling mechanism, the T 5, and gate valve into the well casing.

Now referring to the improved rod line controlling mechanism 2 it will be observed that the same comprises a clamping mechanism which is adapted to clamp the smooth outer periphery of the rod line 7, the same including an outer casing 10 having therein lateral clamping members 11 pivoted at 12 at their opposite ends and provided with gripping surfaces 13 adapted to grip the outer periphery of the rod line 7. As shown, these members 11 are interconnected through parallel slots 14 with pins 15 carried on cooperating slidable clamping members or blocks 16 disposed on opposite sides of the rod line and having surfaces 17 adapted to supplement the surfaces 13 and with the latter unite to form a gripping surface extending entirely around the rod line. As shown, these blocks 16 are adapted to be reciprocated in a suitable containing and guiding chamber 18 in the casing 10, the chamber 18 also being provided with cutaway portions or lateral recesses 19 to permit the free lateral swinging movement of the members 11 about the pivots 12. It will also be noted that the members 16 are connected to actuating members or rods 20 preferably suitably packed and operated by improved operating mechanism, hereinafter more fully described, to move the members 16 simultaneously toward the rod line or simultaneously away from the latter, the members 16 herein moving outward within adjustable limits established by suitable adjustable stop members 21, herein extending through the walls of the chamber 18 and adjustable from the exterior thereof, while the inward movement of the members 16 is limited by upstanding centering pins 22 carried on opposite sides of the chamber 18 in the casing 10.

Operatively associated with the two mem-

bers 20 is the improved clamp operating mechanism referred to above. While various types of operating mechanism may be used as desired, a cam type mechanism adapted simultaneously to exert a push and pull on the gripping members is herein illustratively shown. This mechanism includes a transverse member or cross head 23 to which one of the members 20 is rigidly connected and connecting members or links 24 pivotally connected to the ends of the cross head 23 and extending parallel to the casing 10 to the opposite end thereof. There the links 24 are pivotally connected to the reduced ends of a transverse member or cross head 25 on which is pivotally mounted at 26 an operating member 27 having a depending portion 28 pivotally connected at 29 to a suitable member 30 to which the adjacent member 16 is rigidly connected, the connection being such that when the member 27 is moved downward about the axis of the pivot 26 the members 30 and 23 are simultaneously moved towards each other in such a manner as to cause the reciprocable members 16 to grip the rod line 7 and through the movement of these members and the slot and pin connection 14, 15 cause the swingable members 11 also to grip the rod line, this movement being obviously reversed when the member 27 is moved upward about its pivot.

In practice it is found that the member 27 should be adjusted very quickly and powerfully under certain conditions and to this end there is provided improved means whereby an operator may operate the clamp not only quickly, but with sufficient power to bring about an effective rod gripping action. As shown herein, the member 27 is in the form of a long lever extending beneath the derrick floor or platform (indicated at 31 in Fig. 1) and having its outer end located at a considerable distance from the clamp so that relatively great leverage is obtained. Further, there is herein shown a raising and lowering member 32 for this lever 27 and this member is pivotally connected at 33 to the outer end of the lever and adapted to be moved upward or downward through a suitable opening 34 in a guide frame 35 herein disposed beneath the derrick floor. The member 32 is also herein equipped with notches 36 and 37 at its opposite ends whereby it may be held in different positions in the opening 34, the member 32 being raised and lowered by a suitable handle 38. By this mechanism the operator obviously may adjust the clamp into clamping position at will and when needed very quickly obtain a high maximum load acting to hold the rod line in any position, or, conversely, obtain a complete release if desired, the rod then being capable of being braked during upward or downward movement by the clamping mechanism. Attention is also directed to the fact that a pivoted latch 39 is provided which is adapted to swing in back of the member 32 and to lock the same in its up position, the construction thus being such that when it is necessary to apply the clamp quickly, kicking out of the latch will free the lever to move downwardly by gravity into such a position that the operator may instantly throw his whole weight upon the handle.

As it has also been found that it is necessary for the strength of the operator to be supplemented at times, there is provided improved supplementary power means for raising and lowering the lever 27, this means being so adapted as to permit manual raising and lowering of the lever whenever desired and the throwing in of the power means in any position to which the lever has been adjusted manually. As shown, this power means includes a swingable cylinder 40 attached to the frame 35 on a horizontal swivel 41 and carrying a piston 42 pivotally connected through a piston rod 43 to the lever 27 at a point adjacent its pivot 33. To control the movement of the piston 42 and yet permit the free operation of the manual operation there is provided suitable controlling mechanism. This herein assumes the form of a four-way valve 44 having communication through pipe connections 45 and 45^a with the opposite ends of the cylinder 40 and through passages 46 and 47 with the usual source of pressure supply and with the atmosphere, whereby when the valve is in different positions power may be supplied to actuate the piston and to permit the same to move freely in the cylinder as the lever 27 is manually operated. Through the use of this mechanism it will be evident that an operator may quickly cut in or out the power means whenever desired or utilize the same solely as conditions may require.

In Figs. 4 and 5 there is illustrated a modified form of clamp operating mechanism which it is found desirable to use under certain conditions and which may be used either with a manually operated mechanism or with a mechanism selectively manually or power operated, as herein described. This means includes mechanism whereby an operator, after manually releasing the lever 27, as by kicking out the latch 39, may increase the clamping action manually without or before resorting to supplemental power operated means. As shown in these figures, a member 48 is pivotally connected at 48^a to the lever 27 and is herein threaded to receive a threaded member 48^b which in turn carries a projection or flange 49 and a reduced portion 50 between the flange and a handle 51, which reduced portion extends through an opening in the derrick floor 31 and is receivable in a slot 52 in the edge of the derrick floor, whenever the projection 49 is beneath the slot and the member 27 is moved

in the proper direction about its pivot. By this means it will be observed that an operator after releasing the lever and pushing the same down, may by throwing the reduced portion into the slot, prevent upward movement of the lever and then while thus protected, by turning the handle 51, through the threaded connection between the parts of the member 48, depress the latter member and thereby further tighten the clamp.

Attention is next directed to the fact that the rod line or clamping mechanism above described is substantially fluid tight, the clamping members thereof when set effectually preventing upward passage of oil and gas around the rod line. It will further be noted that even when the clamp is open this mechanism is sealed by a suitable cover plate 53 held in position by a plurality of screws 54 and by the stuffing box 8, herein carried by this cover plate. Herein this stuffing box comprises a plurality of closely packed packing units 55 and a packing nut 56, the construction being such that while the rod may move freely through the stuffing box thus provided, this stuffing box will prevent the escape of oil or gas along the rod line in any position of the clamping means and more especially in the open position thereof.

In the use of the improved rod line controlling mechanism the same normally occupies its released position, in which it will be noted that the rod line may move freely through the clamp, during the drilling operation. Moreover, it will be evident that new rods may be added from time to time if desired and that the rod line may be lowered into the hole under the control of the clamp which then acts as a brake. Should subterranean oil or gas pressure then be encountered, the rod line controlling mechanism is also available for instant application to the rod line to hold the rod line securely against whatever pressure develops. Moreover, it will be observed that through the fluid tight packing box and the fluid tight clamp it is made impossible for the pressure to force fluid up around the rod line and that the fluid forced upward by this subterranean pressure is caused to be directed upward outside the rod line and into the well casing and T connection to the well discharge pipe 6 without flooding the derrick. Moreover, if, while the pressure continues, it is desirable to remove or substitute rods, this may be readily done, the rods then being raised as desired under the control of the clamp which may act as a brake, the clamp then being used at times to hold the rod line against movement through the oil saver. These and other uses of the improved rod line controlling mechanism will be clearly apparent to those skilled in the art.

As a result of the improved rod line controlling mechanism it is possible to control the movement of the rod line through the oil saver as desired, the improved controlling mechanism having quick acting and powerful operating mechanism whereby the rod line may be positively clamped or braked and held against movement. It will further be noted that by providing the improved clamping and braking mechanism having the clamping or gripping elements arranged in a novel manner disclosed it is possible to grip the rod line entirely around its exterior periphery. It will further be evident that although the rod line controlling mechanism is of an exceedingly simple construction it is possible to thereby apply an extremely powerful clamping force to the rod line and that the same is of an extremely rugged construction.

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

What is claimed is:

1. The combination with oil or gas well drilling mechanism including a drill rod, of clamping mechanism engageable with the rod including a casing, rod gripping members mounted in said casing and movable into engagement with the rod, cooperating gripping members mounted in said casing and movable by movement of said first mentioned members, and means mounted on said casing and operatively connected to said first mentioned gripping members for moving all of said gripping members into and out of rod gripping position.

2. The combination with oil or gas well drilling mechanism including a drill rod, of clamping mechanism engageable with the rod including gripping members movable into engagement with the rod and cooperating gripping members movable by movement of said first mentioned members, a casing enclosing said gripping members and in which the latter are guided, and means mounted on said casing and operatively connected to said first mentioned gripping members for effecting different degrees of separation of certain of said members and operative to move all of said members into and out of rod gripping position.

3. The combination with oil or gas well drilling mechanism including a drill rod, of a casing, clamping members guided in said casing for linear movement and engageable with opposite sides of the rod, cooperating clamping members mounted in said casing and having rod engaging surfaces on the opposite sides of the rod and between the por-

tions of the periphery thereof gripped by said linearly movable members, and means mounted on said casing and operatively connected to said clamping members for moving the latter into and out of clamping position.

4. The combination with oil or gas well drilling mechanism including a drill rod, of a casing, gripping members guided in said casing for linear movement and engageable with the rod for precluding movement of the rod in either direction, and operating means mounted on the casing and operable to effect movement of said linearly movable gripping members simultaneously in opposite directions to grip the rod.

5. The combination with oil or gas well drilling mechanism including a drill rod, of a casing, gripping members guided in said casing for linear movement and engageable with the rod for precluding movement of the rod in either direction, and operating means mounted on the casing and operable to move said gripping members to grip the rod and including lever mechanism, and operative connections between the same and each of said members.

6. The combination with an oil or gas well drilling mechanism including a drill rod, of gripping members engaging said rod and operating means therefor operable to move said gripping members to grip said rod, said means including a cross head connected to one of said gripping members, links connected to said cross head, and operative connections between said links and another gripping member.

7. The combination with an oil or gas well drilling mechanism including a drill rod, of gripping members engaging said rod and operating means therefor operable to move said gripping members to grip said rod, said means including a cross head connected to one of said gripping members, links connected to said cross head, and operative connections between said links and another gripping member including a cross rod and an operating lever thereon operatively connected to the other member.

8. The combination with an oil or gas well drilling mechanism including a drill rod, of gripping members engaging said rod, and operating means therefor operable to move said gripping members to grip said rod, said means including a cross head connected to one of said gripping members, links connected to said cross head, and operative connections between said links and another gripping member including an operating lever having a cam portion.

9. In a rod line controlling mechanism, a casing having a chamber therein through which the rod line is adapted to extend, rod line gripping members movably mounted in said chamber and including a reciprocable gripping member and a swingable gripping member cooperating therewith in the gripping of the rod line, said latter member being swingable in a plane transverse to the rod line axis, and mechanism for actuating said gripping members.

10. In a rod line controlling mechanism, a casing having a chamber therein through which the rod line is adapted to extend, rod line gripping members movably mounted in said chamber and including a reciprocable gripping member and a swingable gripping member cooperating therewith in the gripping of the rod line, said latter member being swingable in a plane transverse to the rod line axis and said members being so interconnected that movement of one of said gripping members is dependent upon movement of the other, and mechanism for actuating said gripping members.

11. In a rod line controlling mechanism, a casing having a chamber therein through which the rod line is adapted to extend, rod line gripping members movably mounted in said chamber and including a reciprocable gripping member and a swingable gripping member cooperating therewith in the gripping of the rod line, and operating means for said gripping members operable simultaneously to move said gripping members in directions to grip the rod line.

12. In a rod line controlling mechanism, a casing having a chamber therein through which the rod line is adapted to extend, rod line gripping members movably mounted in said chamber and including a reciprocable gripping member and a swingable gripping member cooperating therewith in the gripping of the rod line, and operating means for said gripping members operable simultaneously to move said gripping members simultaneously in directions to grip the rod line, said operating means including a single controlling means.

13. In a rod line controlling mechanism, a casing having a fluid tight chamber therein through which the rod line is adapted to extend, rod line gripping members in said chamber and movable into engagement with the rod line, and operating means for said gripping members operable simultaneously to move said gripping members simultaneously in directions to grip the rod line.

14. In a rod line controlling mechanism, a casing having a fluid tight chamber therein through which the rod line is adapted to extend, rod line gripping members movably mounted in said chamber, said members being so interconnected that movement of one of said gripping members is dependent upon movement of another, and mechanism for actuating said gripping members.

15. In a rod line controlling mechanism, a casing having a chamber therein through which the rod line is adapted to extend, rod line gripping members in said chamber and

movable into engagement with the rod line, a plurality of said gripping members having reciprocable movement while others have swinging movement, and pressure fluid operated mechanism for actuating said gripping members.

16. In a rod line controlling mechanism, a casing having a chamber therein through which the rod line is adapted to extend, rod line gripping members in said chamber and movable into engagement with the rod line, a plurality of said gripping members having reciprocable movement while others have swinging movement, and pressure fluid operated mechanism for actuating said gripping members including a cylinder, a piston reciprocable therein, and operative connections between said piston and said gripping members.

17. In a rod line controlling mechanism, a casing having a fluid tight chamber therein through which the rod line is adapted to extend, rod line gripping members in said chamber and movable into engagement with the rod line, and operating mechanism for said gripping members including lever mechanism and operative connections between the same and each of said members.

18. In a rod line controlling mechanism, a casing having a chamber therein through which the rod line is adapted to extend, rod line gripping members movably mounted in said chamber and including a reciprocable gripping member and a swingable gripping member cooperating therewith in the gripping of the rod line, and operating means for said gripping members including lever mechanism and operative connections between the same and each of said members.

19. In a rod line controlling mechanism, a casing having a fluid tight chamber therein through which the rod line is adapted to extend, rod line gripping members in said chamber and movable into engagement with the rod line, certain of said gripping members engaging opposite sides of the rod line while other gripping members engage surfaces on opposite sides of the rod line and between the portions of the periphery thereof gripped by said first mentioned members, and operating means for said gripping members.

20. In a rod line controlling mechanism, a casing having a fluid tight chamber therein through which the rod line is adapted to extend, rod line gripping members in said chamber and movable into engagement with the rod line, certain of said gripping members engaging opposite sides of the rod line while other gripping members engage surfaces on opposite sides of the rod line and between the portions of the periphery thereof gripped by said first mentioned members, and operating means for said gripping members operative substantially simultaneously to move said gripping members substantially simultaneously in opposite directions to grip the rod line.

21. In a rod line controlling mechanism, a casing having a chamber therein through which the rod line is adapted to extend, gripping members movably mounted in said chamber and engageable with the rod line, and operating means for said gripping members operable to move said gripping members to grip the rod line, said means including a cross head connected to one of said gripping members, links connected to said cross head, and operative connections between said links and another gripping member.

22. In a rod line controlling mechanism, a casing having a chamber therein through which the rod line is adapted to extend, gripping members movably mounted in said chamber and engageable with the rod line, and operating means for said gripping members operable to move said gripping members to grip the rod line, said means including a cross head connected to one of said gripping members, links connected to said cross head, and operative connections between said links and another gripping member including a cross rod and an operating lever thereon operatively connected to the other member.

23. In a rod line controlling mechanism, a casing having a chamber therein through which the rod line is adapted to extend, gripping members in said casing and movable into engagement with the rod line, and operating means for said gripping members operable to move said gripping members to grip the rod line including a cross head connected to one of said gripping members, links connected to said cross head, and operative connections between said links and another gripping member including an operating member having a cam portion.

24. In a rod line controlling mechanism, a casing having a chamber therein through which the rod line is adapted to extend, gripping members in said chamber and movable into gripping engagement with the rod line, and pressure fluid operated means for actuating said gripping members including a cylinder, a piston reciprocable therein, operative connections between said piston and said gripping members including a pivoted lever and cam mechanism operated thereby, and operator-controlled valve means for regulating fluid flow to said cylinder.

25. In a rod line controlling mechanism, a casing having a chamber therein through which the rod line is adapted to extend, gripping members in said chamber and movable into gripping engagement with the rod line, and pressure fluid operated means for actuating said gripping members including a pivoted cylinder, a piston reciprocable therein, operative connections between said piston and said gripping members including a pivoted lever connected to said piston and a

sliding cross head mechanism operated by said lever, and operator-controlled valve means for regulating fluid flow to said cylinder.

26. In a rod line controlling mechanism, a casing having a chamber therein through which the rod line is adapted to extend, rod line gripping members in said chamber and movable into gripping engagement with the rod line and including a plurality of swingable gripping jaws, and operating means for said gripping members including a plurality of slidable members operatively connected to said swingable jaws.

27. In a rod line controlling mechanism, a casing having a chamber therein through which the rod line is adapted to extend, rod line gripping members in said chamber and movable into gripping engagement with the rod line, a plurality of said gripping members being reciprocable while others are swingable, and power operated means for actuating said gripping members.

28. In a rod line controlling mechanism, a fluid tight casing in the form of a seal having a chamber through which a rod line is adapted to move in opposite directions, braking members in said chamber and arranged to grip the rod line and cooperate with said casing to preclude movement of the rod line in either direction through the casing, and pressure fluid operated means for actuating said braking members into and out of their gripping and released positions.

29. The combination with oil or gas well drilling mechanism including a drill rod, of a platform through which said rod passes, rod line braking means arranged beneath the platform and including braking elements arranged to grip the drill rod to preclude movement of the drill rod in either direction, and means for operating said braking means from the platform and including a brake controlling element located above said platform at a point remote from said braking means whereby an operator standing on the platform may manually control movement of the braking elements into and out of their rod gripping and released positions.

30. The combination with an oil or gas well drilling mechanism including a drill rod, of a platform through which said drill rod passes, clamping mechanism for said rod for precluding movement thereof in either direction and disposed below said platform and including an elongated operating lever, and means acting at or adjacent the distant end of said lever and operable from said platform for actuating said lever to apply or release said clamping mechanism.

31. The combination with oil or gas well drilling mechanism including a drill rod, of a platform through which said drill rod passes, clamping mechanism for said rod for precluding movement thereof in either direction and disposed below said platform and including an elongated operating lever, means acting at or adjacent the distant end of said lever and operable from said platform for actuating said lever to apply or release said clamping mechanism, and means for further operating said lever.

32. The combination with an oil or gas well drilling mechanism including a drill rod, of a platform, clamping mechanism for said rod for precluding movement thereof in either direction and disposed below said platform and including an elongated operating lever, and selectively operable manually or power operated means operable from said platform and acting on said lever for actuating the same to operate said clamping mechanism.

33. In a rod line controlling mechanism, a fluid tight casing in the form of a seal having a chamber therein through which a rod line is adapted to move in opposite directions, braking members in said chamber and arranged to grip the rod line and cooperate with said casing to preclude movement of the rod line in either direction through the casing, and means for actuating said braking members into and out of their rod line gripping and released positions.

34. In a rod line controlling mechanism, a fluid tight casing in the form of a seal having a chamber therein and a stuffing box mounted on said casing and through which and said casing a rod line is adapted to move in opposite directions, braking members in said chamber and arranged to grip the rod line and cooperate with said casing to preclude movement of the rod line in either direction through the stuffing box and casing, and means for actuating said braking members into and out of their rod line gripping and released positions.

35. The combination with an oil or gas well drilling mechanism including a drill rod, of clamping mechanism for said rod for precluding movement thereof in either direction and including rod clamping means, and means for operating said clamping means including an elongated operating lever, and means acting at or adjacent the distant end of said lever for actuating said lever to apply or release said clamping means, and means for further operating said lever.

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