

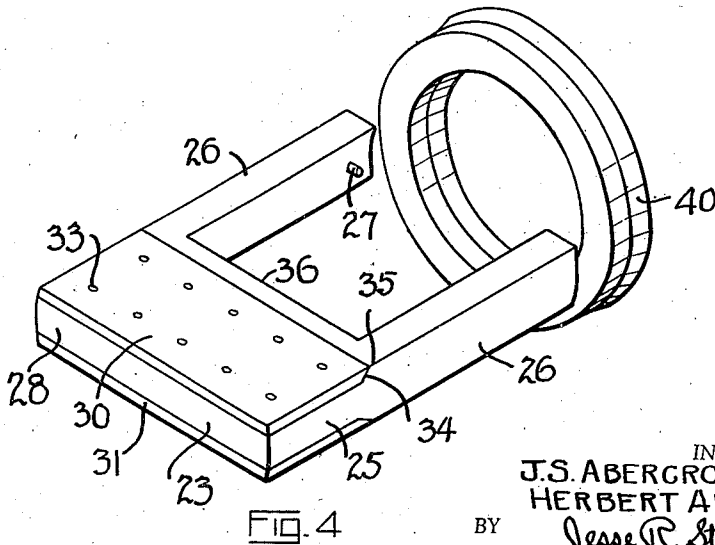
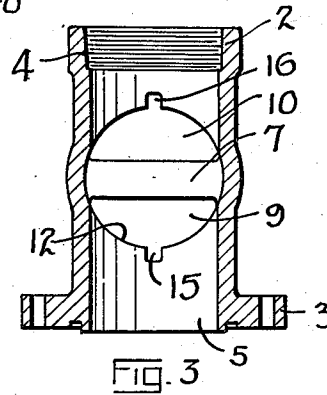
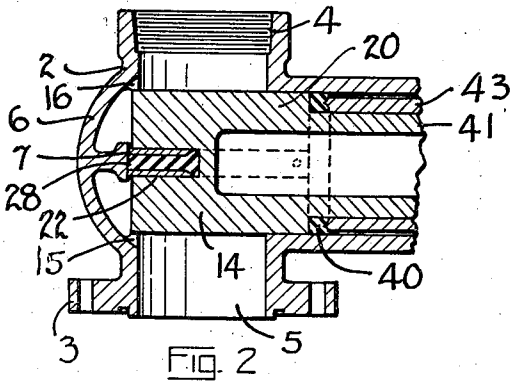
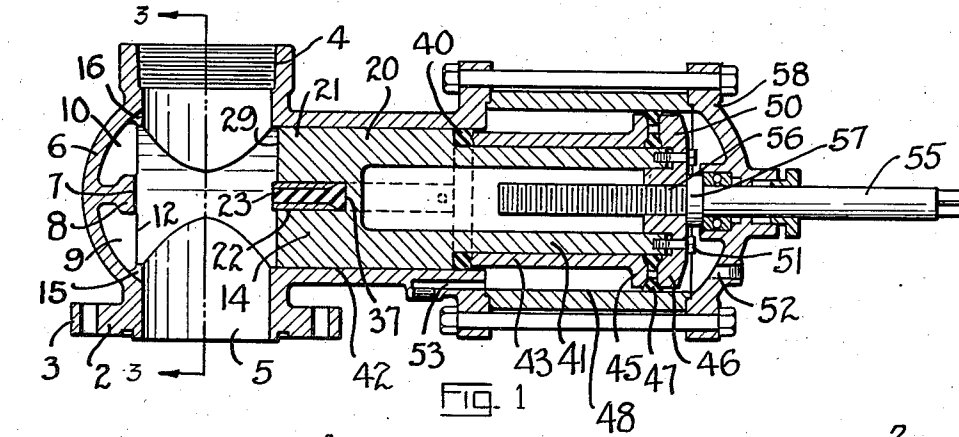
June 20, 1939.

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2,162,990

DRILLING VALVE

Filed Feb. 4, 1936



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2,162,990

DRILLING VALVE

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Application February 4, 1936, Serial No. 62,267

3 Claims. (Cl. 251—28)

The invention relates to an improvement in drilling valves and particularly that type of valve which is positioned on a well head during the drilling operation in order to completely close the passage when such closure is desired.

In the drilling of oil and gas wells where considerable pressure is encountered, and the drilling is carried on by the rotary method where slush and mud is continuously circulated down through the drill stem and upwardly through the well bore, it is necessary to maintain the well head in condition so that the well may be completely closed off regardless of whether a string of pipe is in the hole or not. Blowout preventers have been designed to close about a pipe when it is disposed in the well bore, and the present valve is designed to close this same well bore in event there is no pipe present in the well.

The valve of the type herein disclosed must be capable of completely shutting off the passage even when it is filled with abrasive drilling fluid and must maintain a seal against enormous pressures.

It is one of the objects of the present invention to devise a drilling valve which can be closed to effect a complete seal.

Another object of the invention is to provide a drilling valve wherein the sealing face is positioned adjacent the center of the ram so that it will not be affected by the cutting action of the abrasive material when the valve is being closed or opened.

Another object of the invention is to provide a circular ram having a central outstanding sealing seat which is arranged to abut against a corresponding similarly disposed seat in the valve housing so that such outstanding seat will be cleansed by the flow of fluid at the time of sealing.

Another object is to reduce the velocity of the flow of fluid adjacent the area to be sealed as the valve moves to closed position so as to avoid damage to the sealing faces.

Still another object of the invention is to provide a circular ram for drilling valves which is arranged to cooperate with a transverse face in the valve so that the cutting action of the abrasives will occur on the portions of the ram where the most metal is present.

Another object of the invention is to provide a drilling valve wherein a choke is provided above and below the valve member as it moves to closed position in order to choke down the flow of fluid to avoid cutting of the sealing faces as the ram member moves to closed position.

Another object of the invention is to provide a

combination ram and piston for drilling valves which can be operated by fluid pressure.

Still another object of the invention is to provide a choke adjacent the seat of the ram member so that the wear will occur at a point adjacent the choking area.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawing wherein:

Fig. 1 is a vertical sectional view taken through a drill valve embodying the invention and showing the ram in retracted position so that the valve is open.

Fig. 2 is a section similar to Fig. 1 but showing the front end of the valve with the ram in closed position.

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1 and looking at the valve seat.

Fig. 4 is a perspective view of the packing members which are applied to the ram.

In Fig. 1 the valve housing is shown at 2 and is provided with a flange 3 whereby the valve is attached to its supporting structure. It may be applied directly to the casing or above or below any other piece of equipment which may be attached to the well. The connection 4 at the top is to receive any additional equipment such as the christmas tree assembly. The housing 2 is provided with a vertical passage 5 through which the fluid is to flow and through which the drilling operations are performed.

During the drilling operation the drill stem or other pipe may extend downwardly through this passage and, of course, this valve cannot be used when such a pipe passes through the housing. Under these circumstances a blowout preventer which will seal about the pipe is usually applied to the casinghead and the present valve is used to close off the well completely when there is no pipe in the well.

The passage 5 must be sealed completely in order that the valve be effective and in many instances this passage is full of abrasive fluid such as the slush or drilling mud used in the rotary method of drilling wells.

One of the periods when a valve of this type serves its most useful function is when a gas pocket or pressure formation has been encountered by the drilling bit and it is necessary to remove the bit and drill stem from the well. As the drill stem is raised from the hole naturally there is an upward flow to some extent of the drilling fluid with the drill bit and this action relieves the pressure caused by the weight of the

mud on the pressure formation, so that there is a tendency for the well to blow out because of the unbalancing of the pressures on the formation at this period.

5 As soon as the drill bit has been raised past the ram of this valve it is desirable to quickly close the ram in order to seal off the well. In some instances pressures of 1000 to 2000 pounds per square inch are encountered and must be sealed
10 off by this type of valve.

In view of the fact that it is an abrasive fluid which must be sealed off it seems apparent that there will be considerable cutting action by the abrasives when under high pressure. Instances
15 are known wherein the abrasive action of the fluid has cut away the ram or valve member to such an extent that a seal could not be obtained. It is with a view of providing a valve wherein the sealing area will be protected against cutting action and kept free of foreign matter at the time of seal-
20 ing that the present valve has been devised.

The housing 2 is provided with an offset area 6 which carries a transverse rib or sealing face 7 which is in the shape of a cross-bar or partition 8.
25 This partition is shown in section in Fig. 1 and in front elevation in Fig. 3. Above and below this partition are the chambers 9 and 10 respectively. These chambers are semi-circular in form as seen in Fig. 3. Where this off-set portion joins the
30 central passage 5 it is of a circular configuration to form an annular seat 12 as seen in Fig. 3. This seat is adapted to receive the end of the ram or valve member 14 which is also of circular configuration.

35 The circular seat 12 is broken at the top and the bottom by the recesses or ports 15 and 16 which lead into the chambers 9 and 10, respectively. It seems obvious that as the ram 14 moves into the seat 12 that these recesses 15 and 16 will be the
40 only outlet for any material from the passage 5. Thus any flow of fluid through the passage 5 will be greatly restricted and as the end of the ram 14 enters the seat 12 the flow will be directed in through the opening 15 upwardly through the
45 chamber 9 past the face 7 into the chamber 10 and out through the recess 16.

In other words, the entire flow is directed through the chokes 15 and 16 and the greatest velocity of the fluid will occur at these points so
50 that any cutting action due to this flow of fluid will therefore occur on the very top and very bottom of the ram 14 and closely adjacent the chokes 15 and 16. The fact that the chambers 9 and 10 are of greater capacity than the chokes or recesses
55 causes a retarded flow therethrough and across the sealing face 7 so that such face will not be cut or injured. In this manner the ram cooperates with these recesses 15 and 16 to form the choke so that when the end of the ram has entered the seat
60 12 and before a seal is formed when the flow of fluid would normally be the greatest it is in fact choked to such an extent that the cutting action on the face 7 will be materially reduced or eliminated.

65 The chokes 15 and 16 also allow the escape of fluid from the chambers 9 and 10 as the ram member moves into the seat 12 to effect closing of the valve. The fact that the seat 7 is outstanding prevents the accumulation thereon of any debris
70 or other foreign matter which might interfere with the sealing of the valve. As the packing face approaches the seat the flow is not completely cut off and such remaining flow flushes or washes the sealing faces of the seat and the packing at the
75 time they come in contact to form the seal. Thus

no foreign matter may interfere with the seal and the reduced flow due to the chokes is insufficient to cut the sealing faces.

The ram 14 is of particular construction and is a different invention claimed in detail in the
5 copending application of Herbert Allen, Serial No. 62,246 filed February 4, 1936, which application discloses the same ram construction as here disclosed in combination with a blowout preventer.

This ram is formed with a body portion 20
10 which has a head 21. This head has a transverse slot 22 which receives a packing 23. This particular form of packing is best seen in Fig. 4 and includes the body portion 25 and the extending arms 26 thereon. These arms extend along the
15 sides of the head 21 and have pin projections 27 which are received in corresponding recesses in the body 20 of the ram member. This packing 23 will be of resilient material so that it can be snapped into position and as seen in Fig. 1 the
20 contact faces thereof project beyond the face 29 of the end of the ram. The packing 23 carries the upper plate 30 and lower plate 31 which may be attached thereto by having the openings 33 filled with the resilient material which makes up the
25 packing. These plates 30 and 31 may be beveled at 34 to abut against the thickened portion 35 of the packing. The rear 36 of this body 25 abuts against the end 37 of the recess 22 so that the packing is confined on three sides and only the
30 face 28 thereof is exposed. As the ram moves forwardly the face 28 engages the face 7 to form a seal. As pressure is applied to the ram the packing material being resilient will be compressed and the additional movement of the ram will tend to
35 drive the packing body forward between the plates because the resilient material is confined by the ram and the housing and its only avenue of escape is to flow forwardly. In this manner any additional pressure applied to the ram will then tend
40 to increase the sealing action by causing the resilient material to flow forwardly against the face 7.

In order to form a seal around the periphery of the ram 20 the annular packing 40 is slipped over the shank 41 of the ram to form a seal with the
45 inside of the ram cylinder 42. A retainer sleeve 43 is next slipped over the shank 41 in order to confine the packing 40 which is preferably of the lip type. When the ram moves to closed position pressure on the head of the packing causes com-
50 pression of the areas 28 so that they will abut the ring 40 to form a seal therewith.

The ram 20 is in fact a combination ram and piston because the rear end of the sleeve 43 has an enlarged flange 45 which cooperates with a cap
55 46 to retain a packing 47. This packing forms a seal with the bore 48 of the housing and it will be noted that this bore 48 is larger in diameter than the bore 42 so that a unit pressure applied to the piston 50 will effect a greater unit area pressure
60 on the ram 20. The cap 46 is held in position by suitable screws 51.

A fluid pressure inlet 52 is arranged to allow pressure to be applied to the piston end of the ram
65 in order to move it to closed position while the passage 53 allows the pressure to be applied to the opposite side of the piston to open the ram.

A stem 55 is threaded at 56 through the piston
70 50 so that the stem will slide with the piston. When, however, it is desired to lock the piston and ram in closed position the stem 55 will be unscrewed until the shoulder 57 thereon engages the end 58 of the cylinder 48. This serves as a stop
75 for further outward movement of the stem and

serves to lock the ram and piston in closed position.

While a circular ram has been shown and described, it is contemplated that the ram may be flat or of other configuration as circumstances may require.

Broadly the invention contemplates a drilling valve wherein a choke arrangement is provided to restrict the flow at an area which is spaced away from that portion of the valve where the seal is formed. Because of the circular formation of the ram 20 the greatest amount of metal is present at the top and bottom to provide wearing surfaces and in view of the fact that the flow between the sealing faces 27 and 28 is materially restricted, it has been found in practice that these faces are always in proper condition to form an adequate seal and have not been cut or destroyed by the abrasive action of the fluid as the ram moves to closed position.

What is claimed is:

1. A valve comprising a housing having a passage therethrough, a hollow cylindrical extension on said housing transversely of said passage, a ram in said extension for movement transversely of the passage, an outstanding packing on said ram, an offset in the wall of said housing opposite said cylindrical extension, a transverse partition in said offset, said partition having an outstanding sealing face adapted to be contacted by said ram in sealing engagement, and an annular seat in said offset coaxial with said ram and adapted to receive the end of said ram preliminary to seal-

ing engagement of the ram with said transverse partition, said annular seat having recesses above and below said partition to increasingly throttle the flow of fluid through the passage after the ram enters the annular seat and said packing approaches sealing engagement with the sealing face.

2. In combination a valve housing having a passage therethrough, a chamber transversely of said body, a ram in said chamber, an offset in the wall of the housing opposite said chamber, a seat in said offset adapted to receive the end of the ram, and a transverse partition in said offset, said partition having a sealing face to sealably engage the ram after the ram enters said seat, said offset having recesses above and below said partition whereby increased throttling of fluid through the passage takes place after the ram has entered the seat and as the ram approaches sealing engagement with the transverse partition.

3. A valve comprising a housing having a passage therethrough, a chamber transversely of said housing, a ram in said chamber, a valve seat in the wall of said housing opposite said chamber to receive the end of the ram, said seat having recesses adjacent the top and bottom thereof, and a transverse rib within said valve seat for sealing engagement with said ram after the end of the ram enters the seat so that said recesses reduce the rate of flow and cleanse said rib at the time of sealing.

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