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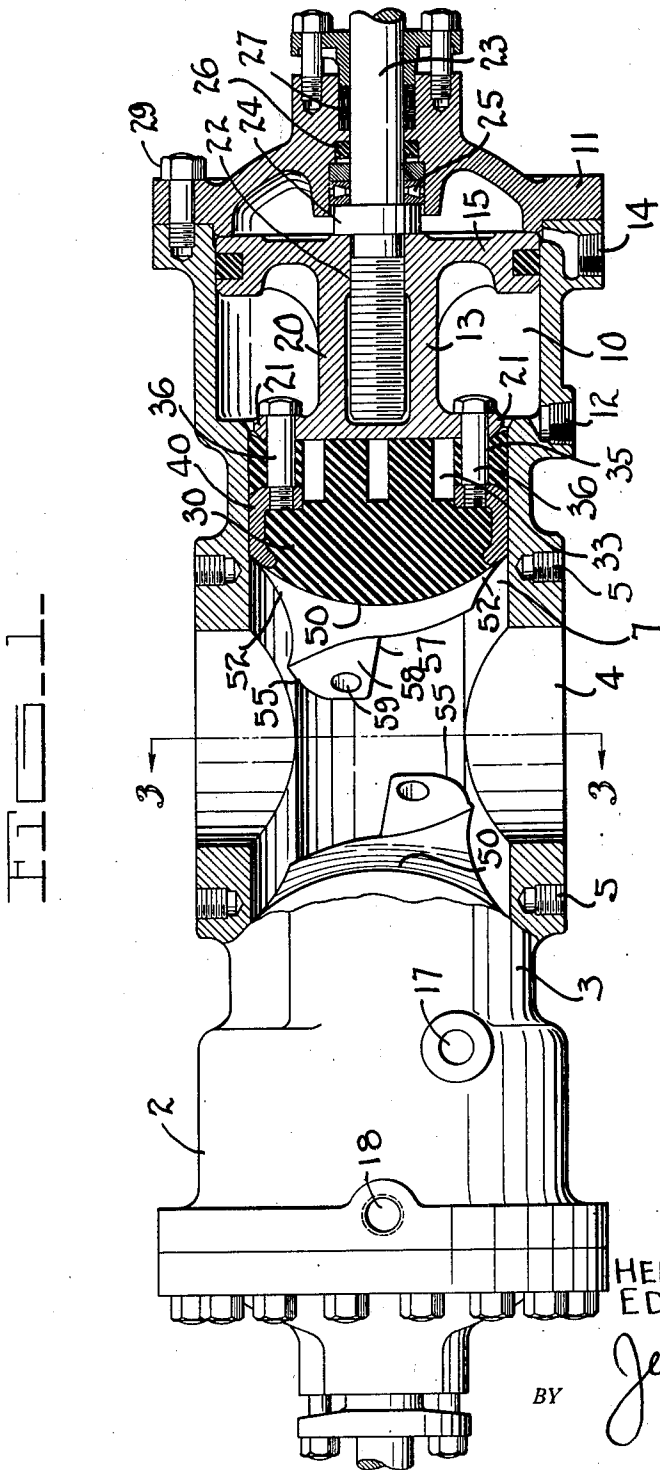
H. ALLEN ET AL

2,278,050

WELL HEAD CLOSURE

Filed June 7, 1938

3 Sheets-Sheet 1



HERBERT ALLEN
ED. L. LOREHN.
INVENTORS

BY

Jesse R. Stone
Lester B. Clark
ATTORNEYS.

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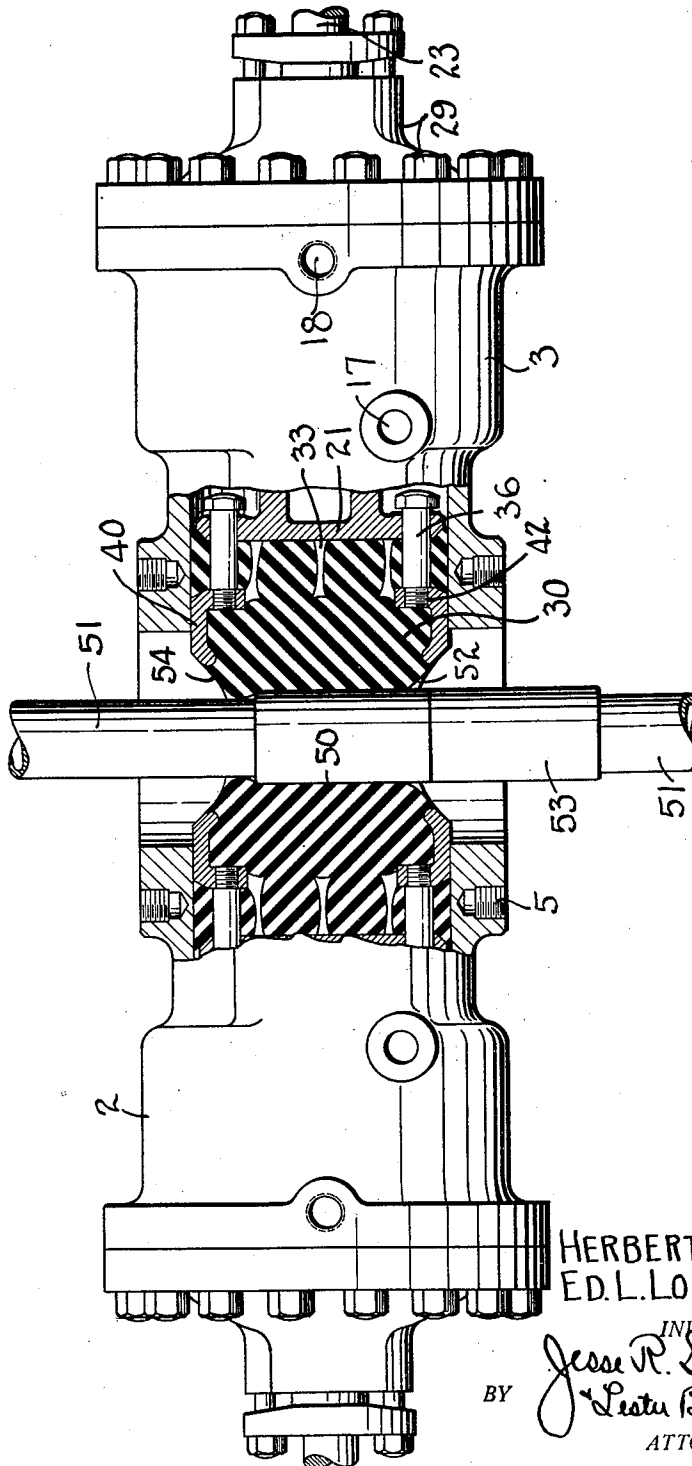
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FIG. 2-



HERBERT ALLEN
ED. L. LOREHN.

INVENTORS

BY

Jesse P. Stone
Lester B. Clark.
ATTORNEYS.

March 31, 1942.

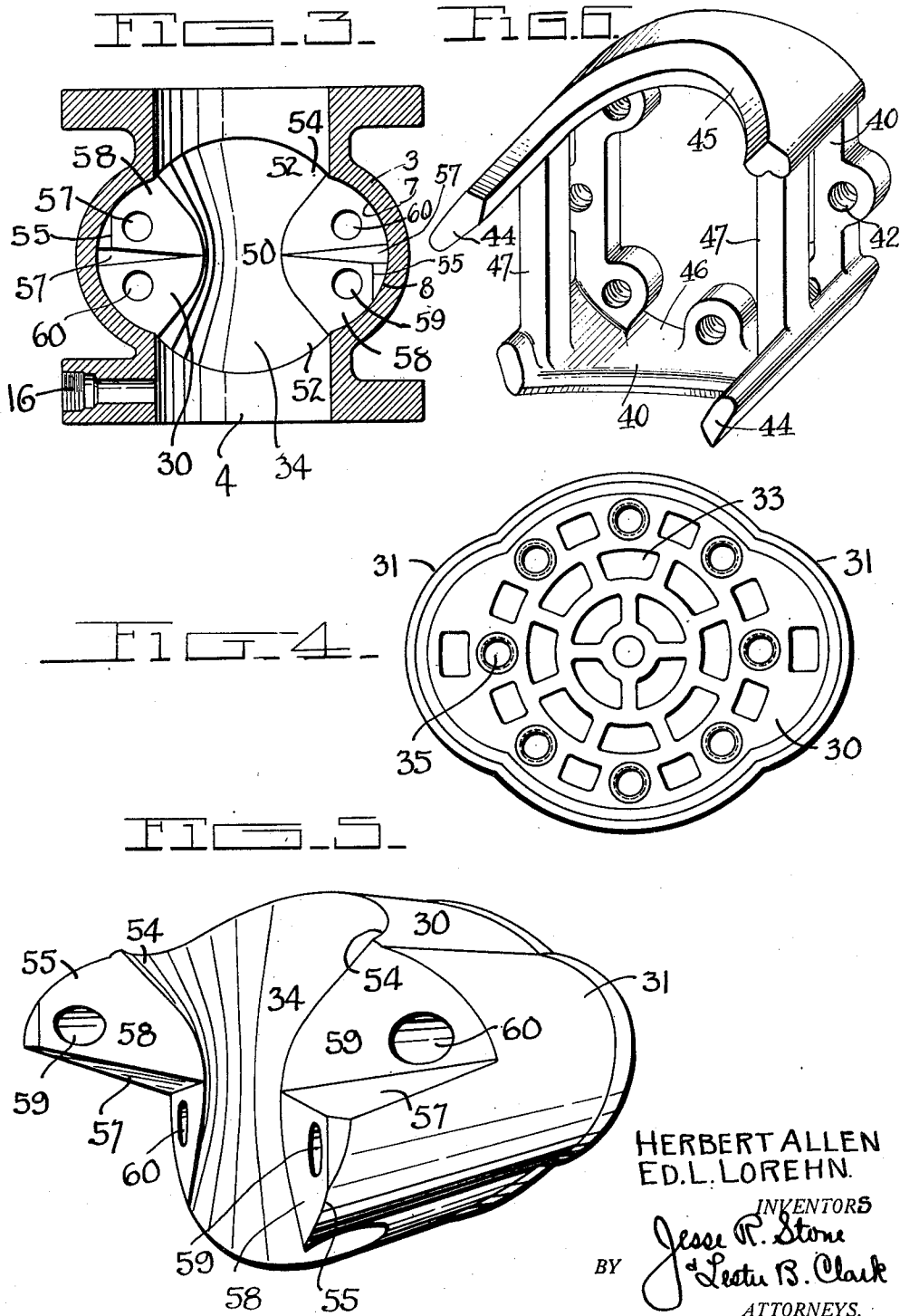
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UNITED STATES PATENT OFFICE

2,278,050

WELL HEAD CLOSURE

Herbert Allen and Edmond L. Lorehn, Houston,
Tex., assignors to Cameron Iron Works, a corporation of Texas

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5 Claims. (Cl. 251-159)

The invention relates to a well head closure device which is particularly adapted to maintain a seal while some member, such as a string of pipe or other device, is moved longitudinally in the well bore.

In many wells the drilling or producing operation must be carried on while the pressure in the well is confined. The movement of pipe sections which are connected together by couplings is difficult because of the enlarged diameter of the coupling. The present invention directs itself to the provision of a device which will maintain a seal with the well head and about a member movable in the well bore while permitting the passage of couplings or other enlargements upon the member being moved.

Another object of the invention is to provide a resilient sealing body for well closure devices wherein a pressure applied thereto will be distributed uniformly throughout the member to obtain a uniform sealing action.

Another object of the invention is to provide a resilient sealing member with a curved surface which will be deformed by engagement against the part with which a seal is being effected so as to cause displacement of the sealing material.

A still further object of the invention is to provide a pair of resilient sealing members which will interfit with each other and about an object in the well bore so as to distribute a uniform pressure in maintaining a seal about the object and with the well closure housing.

Another object of the invention is to provide a resilient sealing device which will permit the passage of enlargements on a string of pipe while maintaining a seal about the pipe.

It is also an object of the invention to provide a blowout preventer ram which will have a predominant pressure from the well bore tending to move it to closed position.

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

Fig. 1 is a side elevation with certain parts in section and showing the ram members in open position.

Fig. 2 is a similar side elevation with the members closed about a string of pipe and illustrating a pipe coupling as passing through the sealing members.

Fig. 3 is a section taken on the line 3-3 of Fig. 1 and looking at the contacting face of the ram member.

Fig. 4 is a rear elevation of one of the resilient sealing members.

Fig. 5 is a perspective view of one of the resilient sealing members.

Fig. 6 is a perspective view of the metal reinforcing skeleton which supports the resilient sealing member.

In Fig. 1 the blowout preventer housing is illustrated generally at 2 and includes the main body portion 3, which has the vertical passage 4 therethrough which is to be positioned in alignment with the well bore. Suitable openings 5 will receive attaching bolts so that the housing may be affixed to the casing head.

A transverse chamber 7 intersects the passage 4 and extends through the housing 3 on each side of the central passage. Particular attention is directed to the peculiar shape of this transverse chamber 7, as best seen in Fig. 3. Such configuration has been provided in order to accommodate a larger body of sealing material at the sides of the passage 4 so as to assist in maintaining a seal. It will be noted that the side wall 8 of the housing 3 bulged outwardly so as to provide a generally elliptical shape in cross section for the chamber 7. These bulged portions also tend to hold the resilient portion of the ram against vertical displacement.

The end of each chamber is enlarged to form a piston chamber 10 and the ends of the housing 3 are closed by the end plates 11.

A suitable opening 12 is provided at the inner end of the chamber 10 to receive a pipe by which pressure may be applied to the inner end of the chamber to move the ram 13. A second opening 14 is provided at the outer end of the chamber to receive a pipe to apply pressure to effect closing of the ram 13. The pipes which are connected to these openings may or may not be connected to the well bore by means of the opening 16 seen in Fig. 3. It is preferable, however, that the pipe entering the opening 14 shall be connected to the well bore so that any pressure occurring in the well bore will also be available on the back side of the piston 15 and will tend to move the ram 13 to closed position. It should be noted that the area of the piston 15 is greater than the forward end of the ram so that there would be an available differential pressure tending to close the ram. In this manner the ram would automatically move to closed position when the differential pressure exceeded the frictional resistance necessary to move the ram.

The lefthand side of Fig. 1 shows an opening 17 on the inner end of the chamber 10 and an-

other opening 18 on the outer end thereof. Suitable connections may be made at these openings to apply steam, mud or other pressure to accommodate the ram 13. This pressure may be used either independently or simultaneously with the well pressure which may be applied to the openings 12 and 14. The ram 13 includes the body portion 20 which is in the nature of a spool having the enlarged piston 15 on one end and the outstanding flange 21 on the inner end. The rear of the body is threaded at 22 to receive the spindle 23 by which the ram may be moved inwardly by rotation of the spindle. The spindle has an enlargement 24 thereon to abut against an anti-friction bearing 25 which is carried in the end plate 11. A pressure backing 26 may be positioned about the spindle in the end plate to prevent leakage and in addition a stuffing box 27 may also be provided about the spindle. The end plate is held upon the housing by the bolts 29.

The resilient sealing member is in the form of a body of rubber or other suitable material and is best seen in perspective in Fig. 5. This body 30 is substantially elliptical in cross section so as to fit within the chamber 7. The main portion of the body is generally cylindrical on each side thereof, as seen in Fig. 4.

The rear of this body is provided with a plurality of recesses 33 which extend into the body a substantial distance as seen in the section of Fig. 1. These recesses are provided so that when pressure is applied to the face 34 of the body it will be capable of yielding under such pressure. These recesses 33 may be filled with cork or other compressible substance or particles of cork may be distributed in the body of rubber so as to afford an elasticity to feed the rubber forward in event of wear and to maintain a seal.

A plurality of openings 35 are arranged to receive the attaching bolts 36 by which this resilient body is held upon the flange 21 of the ram 13.

In order to suitably reenforce the body 30 a frame 40 has been provided and is seen in perspective in Fig. 6. This frame includes a base 41 which carries the openings 42 through which the bolts 36 are arranged to pass. This frame, as seen in Fig. 1, is spaced from the flange 21 by the rear portion of the body 30 and the body 30 is molded therein so that the frame is floating with the body and is movable relative to the flange 21. It should be noted that the bolts 36 are slidable in the flange 21 so that when the resilient material is compressed the frame may move toward the flange 31 as seen in Fig. 2.

This frame is of peculiar construction because of the configuration of the body 30. On opposite corners of the frame are forwardly extending fingers 44 which extend forwardly in the body to reenforce the ears 55 thereon. On the opposite corners these arms are of lesser length so that they will not interfere with the movement of the ram. It should be noted that the top 45 and the bottom 46 are cut away at the sides to leave an open area which is spanned by the post 47.

As above noted the body 30 is molded upon the frame so that it may be fixed to the flange 21 by the bolts 36.

The forward face 34 of the ram body is curved at 50 on a vertical arc, as seen in Fig. 1. Thus when the body is moved toward a pipe such as 51 in Fig. 2 the central portion of the arc 50 will be the first to contact the pipe. Continued

movement of the ram member to force the resilient body 30 against the pipe, however, will cause displacement of this central face so that the upper and lower portions of the arc 50 gradually move against the pipe. In this manner the base and the top 52 of the arc 50 will always be spaced away from the pipe, as seen in Fig. 2, so that when an enlargement or coupling 53 is moved to the elevation of the sealing member the rubber of the sealing member will not be pulled along with the coupling because the coupling will engage this curved portion 52 and will thus move into the central part of the sealing member, as shown in Fig. 2.

The top and bottom of this arc 50 are also cut away at the sides as at 54 so that when the two resilient sealing members are moved into engagement they will cooperate together to form a beveled socket at both the top and the bottom of the seal.

In order that the sealing members will form a positive seal at the sides of the housing the lobe portions 31 have been provided to furnish an abundance of resilient material and on the forward faces these lobes are cut away to provide the ears 55. Each body portion has two of these ears on opposite corners, and the ears are arranged to be complementary to the corresponding ear on the opposite sealing member. Each ear has an inclined face 57 which is arranged to slide into contact with the similarly inclined face 57 on the opposite ram, so as to form a transverse seal and each ram has a forwardly inclined face 58 which will cooperate with a similar face 59 on the body of each ram at the base of the ear. It seems obvious that these ears will interfit with each other as seen from the construction in Fig. 5.

Each of the ears is provided with a recess 59 in order to provide resiliency and there are also openings 60 in the body which extend to the forward portion thereof.

In actual operation as the members are moved to closed position the ears will interfit with each other and be forced firmly into engagement.

The inclined faces 57, 58 and 59 will abut with each other and as continued movement of the rams is had then these parts will tend to apply a pressure to each other and this pressure will be distributed uniformly throughout both of the resilient bodies 30. Of course, the arc face 50 will be pressed about the pipe 51 to maintain a seal. The periphery of the body 30 and the lobes 31 will be pressed against the inside faces of the chamber 7 of the housing 3 and in every direction the pressure will be uniform due to the resilient nature of the body 30.

If the pipe 51 is moved in the well bore if a coupling or other enlargement 53 arrives at the elevation of the sealing members it will be guided into the sealing members by the inclined faces 52 and 54 and will cause additional compression of the resilient body 30. This additional compression is possible due to the provision of the recesses 33 and, as seen in Fig. 2, these recesses have become constricted due to this additional pressure caused by the enlargement 53.

When the blowout preventer or stripper is positioned on the well bore and the pipe in the opening 14 connected to the well bore, then any pressure occurring in the well bore will be available in the chamber 10 behind the piston 15. The size of this piston will be so designed that if a pressure above a predetermined amount occurs in the well bore then the differential pressure will

automatically close the ram and the greater the pressure in the well bore the greater will be the tendency of the ram member to form a seal.

If it is desired to move the ram by other pressure it may be applied through the opening 18 or the ram may be closed manually by manipulation of the spindle 23.

Where the ram is merely held in closed position by the differential pressure in the well the whole ram member may yield when a coupling is to be passed. On the other hand, the ram can be locked in closed position by manipulation of the spindle 23.

Broadly the invention contemplates a stripper or blowout preventer for well heads wherein the closure may be accomplished automatically or mechanically and wherein an abundance of sealing material is provided at the sides of the closure in order to maintain a seal and further wherein a uniform pressure is applied to all of the parts due to the resiliency of the sealing body.

What is claimed is:

1. A ram construction for well strippers comprising a metal skeleton frame, a body of resilient material molded into and about said frame, said resilient material including a lobe portion at each side of the frame, each of said lobe portions having a forwardly extending ear, the body of material being recessed and convexly contoured between said ears.

2. A resilient ram member for stripper heads including a metal skeleton having upper and lower portions, struts connecting said portions, a pair of outward projections from the ends of a diagonal across the front of the skeleton, and a body of resilient material carried by said skele-

ton and having outwardly extending ears encasing said projections.

3. A resilient ram member for stripper heads including a metal skeleton having upper and lower portions, struts connecting said portions, a pair of outward projections disposed on the ends of a diagonal across the front of the skeleton, and a body of resilient material carried by said skeleton and enclosing said projections said body having a convexly curved surface intermediate said projections.

4. A stripper head for wells including a housing, lateral chambers therein, said chambers being substantially circular in cross section with a lobe portion at each side thereof, a ram in each chamber, a resilient sealing member on each ram of a configuration to fit and slide in said chamber, a recessed surface on the front face of said member, between said lobes so that an increased body of resilient material is provided by said lobes.

5. A stripper head for wells comprising a body having a through passage and opposed chambers laterally thereof, each of said chambers communicating with said passage and comprising a substantially circular central portion and a lobular enlargement at each side thereof, opposed rams movably fitting in said chambers, each of said rams including a pair of complementary ears projecting forwardly from the lobular portion of the ram so that the opposed ears move into interfitting relation and form a substantially circular opening within said passage, and means for moving said rams toward and from each other.

HERBERT ALLEN.
EDMOND L. LOREHN.