The invention relates to a ram or closure member for blowout preventers which will have a universal application in that it is adapted to close the passage through the blowout preventer, regardless of whether there is a pipe in the passage or not.

In the drilling and equipping of wells it is usual to provide on the casing head a closure member such as a blowout preventer so that the passage from the well may be closed off at will. In some instances a string of pipe such as the drill pipe or tubing may extend through the well head and, if so, it is of course necessary to have ram members in the blowout preventer which will form a closure about the pipe of the particular diameter which is then in the well bore and this of course necessitates the more or less frequent changing of the rams in the blowout preventer so that they will fit about the particular pipe which is then within the well bore. On the other hand, if there is no pipe in the well bore still a different type of ram may be used so that the rams will meet face to face and form a complete closure of the passage from the well bore. Thus, it is necessary to have different types or sizes of rams available so that they can be quickly changed when the size of the pipe is changed or when there is no pipe in the well. In some instances two blowout preventers have been used, one with flush type rams to close when there is no pipe in the well, and the other preventer to close about the particular size of the pipe, but even with such duplication of the blowout preventers it is still necessary to change the size of the ram when the size of the pipe is changed.

In view of the foregoing it seems obvious that a ram or valve member which would have universal application and would close the passage when no pipe was therein and which would also close about a pipe regardless of its size, would be of particular advantage, and it is with such universal application in mind that the present invention has been devised.

It is one of the objects of the invention to provide a sealing member in a blowout preventer ram which will adapt itself to varying configurations.

Another object of the invention is to provide a blowout preventer ram which will conform itself to the shape of an object against which it is impressed.

Another object of the invention is to provide in a blowout preventer a ram construction which is composed of a ram body carrying a resilient packing and a plurality of movable reinforcing metal fingers which are floating upon the resilient packing so that they may conform themselves to various configurations.

Still another object of the invention is to provide a universal type blowout preventer ram which will close the passage from the well bore, regardless of whether a pipe is present in the passage or not.

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 of a blowout preventer equipped with rams embodying the present invention.

Fig. 2 is a perspective view of one of the packing members.

Fig. 3 is a transverse sectional view through the preventer housing and the ram and showing the packing members as being engaged about a pipe within the well bore so as to show the movement of the fingers which is possible to provide a seal about a pipe.

In Fig. 1 the blowout preventer is indicated generally at 2 and comprises a housing 3 which will be attached by means of a flange 4 to the well head. The other fittings on the well head will be attached to the upper end 5 of the blowout preventer. A vertical passage 6 extends through the housing 3 and has the transverse chambers 7 and 8 at either side thereof. These chambers are closed at their ends by a bonnet 10, which carries a spindle 11, which is rotatably mounted in the bonnet. The packing 12 about the spindle forms a seal therewith and the collar 13 confined between the rings 14 serves to hold the spindle against longitudinal movement but permits rotation thereof. The inner end of this spindle 11 is threaded at 16 to be received in the threaded portion of the cap 17 of the blowout preventer ram 18. This cap is attached by means of bolts 19 to the body 20 of the ram and the inner end of the spindle projects into the recess 21 at the rear of the ram body when the ram is retracted, as seen in Fig. 1. The packing 22 is positioned between the end of the cap and the shoulder 23 on the ram body so as to form a seal along the chamber 8 to prevent leakage around the ram. The forward end of the ram is provided with a transverse slot or recess 25, which is arranged to receive the packing assembly 24. The forward face 27 of the ram may be curved as seen in Fig. 1. The recess or slot 25 also extends along the sides of the ram as seen at 28 in Fig. 3.
The packing assembly 26 is shown in perspective in Fig. 2 and comprises a body 30 of resilient material, such as rubber. This packing body has the legs 31 extending rearwardly therefrom at each side to fit in the recess 28 in the ram body. The rear face of the packing is curved at 32 to be received against the rear face 33 of the recess 28 so that pressure may be applied by the ram to the rear of the packing body. It will be noted that the body 30 has the thickened portions 34 on both the top and the bottom thereof and that these thickened portions merge into a relatively thin tongue 35. In this manner a depression is provided on both the top and the bottom face of the body 30 and the junction between the tongue and the thickened portion is defined by the beveled face 37.

As seen in Fig. 2 a series or set of fingers 40 have been provided which are disposed in a groove on the upper face 41 of the tongue 30. All of these individual fingers 42 are preferably of metal and they are arranged side by side in parallel relationship. The rear end of each finger is preferably beveled at 43 to cooperate with the bevel 37 on the resilient packing. As seen in Fig. 2, all of these fingers are of uniform width except the edge fingers, which may be curved to fit the configuration of the chamber 8.

The forward face 44 of the packing body 30 or the tongue 35 is smooth and preferably the front ends of the fingers and the face 44 will be flush with each other as seen in Fig. 2. A similar set of fingers 45 are provided on the base of the tongue and serve a similar purpose of reinforcing the tongue and confining the rubber resilient packing material.

It will be noted from Fig. 1 that the packing assembly projects a substantial distance out in front of the face 27 of the ram so that as the ram members are moved toward each other the packing assembly will be the first portion to contact with an object such as the pipe 45 as seen in Fig. 3. If there is no pipe in the passage 6 of the blowout preventer then the flash of the rams will come into contact with each other and the rotation of the spindle 14 will force the two passages of the two rams into contact with each other and provide a complete seal across the passage 6. It is seen obvious that the edge 46 of the packing will press against the side wall 47 of the passage 5, which is shaped to fit the rams, as seen in Fig. 1. Thus, any pressure applied by the packing assemblies against each other when there is no pipe in the well will result in a distortion or flowing of the resilient packing material so that any pressure applied will be transmitted to every portion of the packing. This distortion of the pressure is obtained because the fingers 40 tend to confine the packing and when the forward ends of the fingers abut each other they are then restrained against any further movement, but if additional pressure is applied to the rams and against the rear face 32 of the packing there will be a tendency to crowd the thickened portion 34 of the packing along the beveled faces 43 of the rear ends of the fingers and to crowd it into the tongue portions 35. In this manner pressure applied to the ram can be distributed throughout the area of the packing material because the packing is entirely confined by the housing, the ram body and the fingers 40.

In event there is any wear of the smooth face 44 of the packing this wear will be instantly and automatically compensated for due to the fact that the resilient material will flow forwardly and in fact will be forced to flow forwardly due to the fact that pressure is applied to it by the ram. It seems obvious that if no pipe is in the well that a complete seal can be obtained and any desired amount of pressure applied to the rams to maintain such seal.

In event there is a pipe in the well of any size whatever as the ram construction moves against the pipe naturally the center fingers will engage the periphery of the pipe first and in this manner will be prevented from any forward movement. Due to the curved configuration of the pipe, however, the fingers adjacent those in the center can move forwardly a little further, as seen in Fig. 3, and if pressure is continued to be applied to the ram the resilient nature of the packing body 30 will permit the fingers to follow the configuration of the pipe and the packing material will be distorted due to the fact that it flows about the rearward ends of the fingers and forwardly between them so that at the side portion where there is no pipe the resilient material and the fingers will both be crowded forwardly to form a complete seal. While there may be a few small areas of pipe not covered by the fingers due to the thickness thereof, these small areas will be insufficient to allow escape of the resilient packing material and a complete seal will in this manner be formed.

It seems obvious that those fingers in the center as seen in Fig. 3 will compel the resilient packing material to flow around them to a greater extent than the side fingers but the fact that these fingers are relatively movable with respect to each other and the fact that they are fresh on top of the packing and the pipe enables them to conform themselves with the configuration of different diameters of pipe. The pressure applied to the resilient packing material will also flow through the legs 31 which abut against the packing 22 so as to form a complete seal about the ram. In Fig. 3 some of the edge fingers 52 are of greater width than those fingers 53 which are nearer the center and if desired the center finger 54 may be of greater thickness. It seems obvious that the thickness of the packing is such that the desired reinforcing and supporting effect will be obtained so as to reduce the areas 58 to a minimum.

Broadly, the invention contemplates a universal packing which will fit about different diameters of pipe and form a seal, even though there is no pipe in the blowout preventer passage.

What is claimed as new is:

1. A blowout preventer including a housing, rams therein, a passage to be closed which may or may not have a pipe extending therethrough, means to move said rams to engage each other, yieldable means carried by each of said rams to adapt itself to the configuration of a pipe in the passage or to abut against the opposing ram to close the passage if no pipe is present, and a plurality of rigid reinforcing members also on said ram and packing to engage each other or to fit about a pipe and confine said packing.

2. A ram for blowout preventers comprising a body, a transverse recess therein, a packing in said recess, and a plurality of finger members floating on said packing.

3. A ram and packing for blowout preventers to provide a seal regardless of whether there may be a pipe extending through the Preventer, comprising a ram member, a resilient packing body.
4. A ram and packing for blowout preventers to provide a seal regardless of whether there may be a pipe extending through the preventer, comprising a ram member, a resilient packing body carried thereby, and projecting from the forward end of said ram, a plurality of rigid finger pieces on said packing and also projecting in front of said ram.

5. A ram and packing for blowout preventers to provide a seal regardless of whether there may be a pipe extending through the preventer, comprising a ram member, a resilient packing body carried thereby, and projecting from the forward end of said ram, a plurality of rigid finger pieces on said packing and also projecting in front of said ram, said fingers bearing against a part of said packing at their rear ends inside of said ram.

6. A ram and packing for blowout preventers to provide a seal regardless of whether there may be a pipe extending through the preventer, comprising a ram member, a resilient packing body carried thereby, and projecting from the forward end of said ram, a plurality of rigid finger pieces on said packing and also projecting in front of said ram, said fingers bearing against a part of said packing at their rear ends inside of said ram.

7. A blowout preventer, a universal ram construction therein, a resilient packing projecting from the face of said ram and adapted to conform to the shape of an object against which the ram abuts, and a plurality of reinforcing fingers floating on said packing and projecting into said ram to confine said packing.

8. A blowout preventer, a universal ram construction therein, a resilient packing projecting from the face of said ram and adapted to conform to the shape of an object against which the ram abuts, and a plurality of reinforcing fingers floating on said packing and projecting into said ram to confine said packing, said fingers abutting said packing so that as said fingers abut an object additional movement of the ram flows the packing around said flingers to provide a seal.

HERBERT ALLEN.