

July 12, 1932.

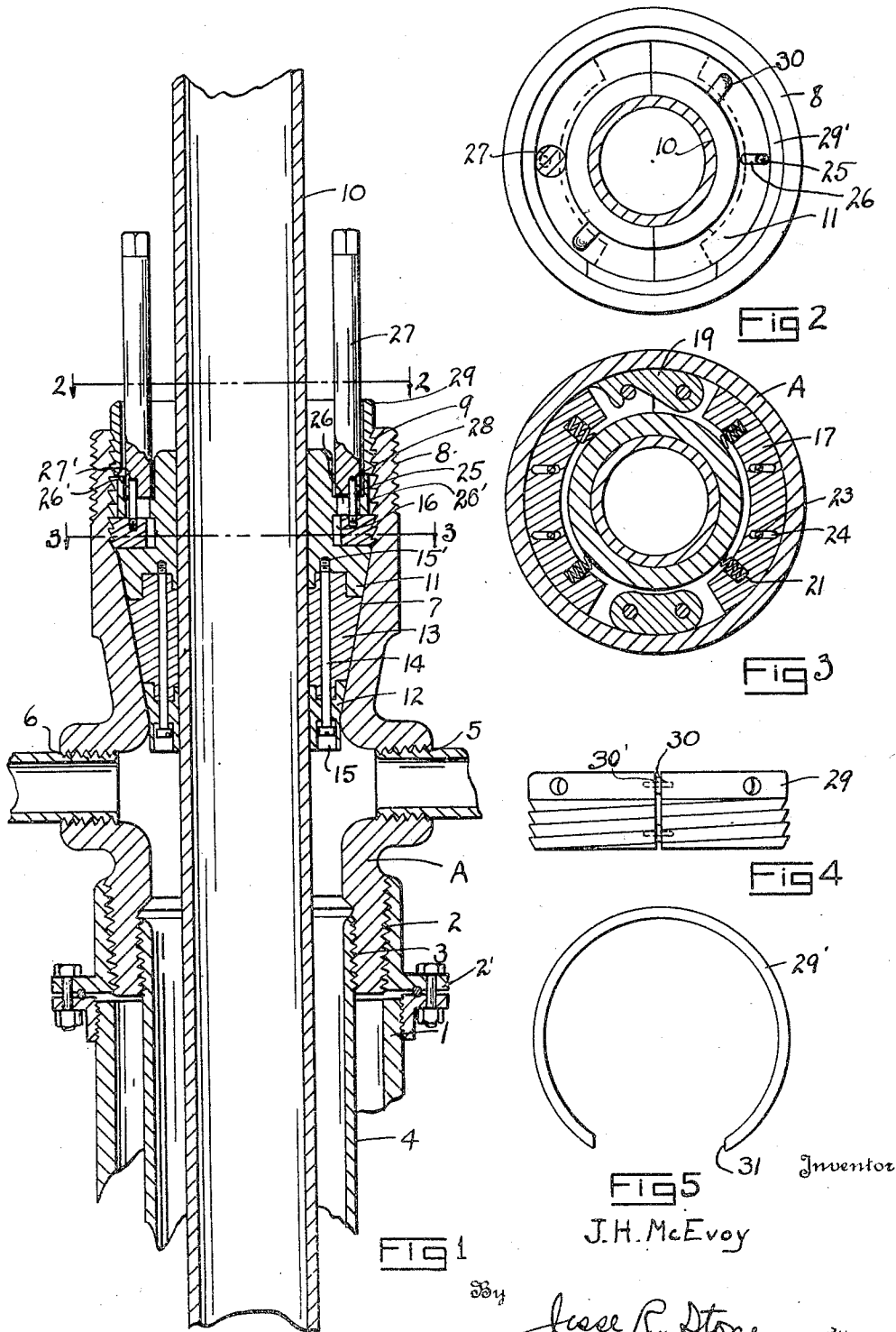
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SAFETY PRESSURE HEAD

Filed May 7, 1929

2 Sheets-Sheet 1



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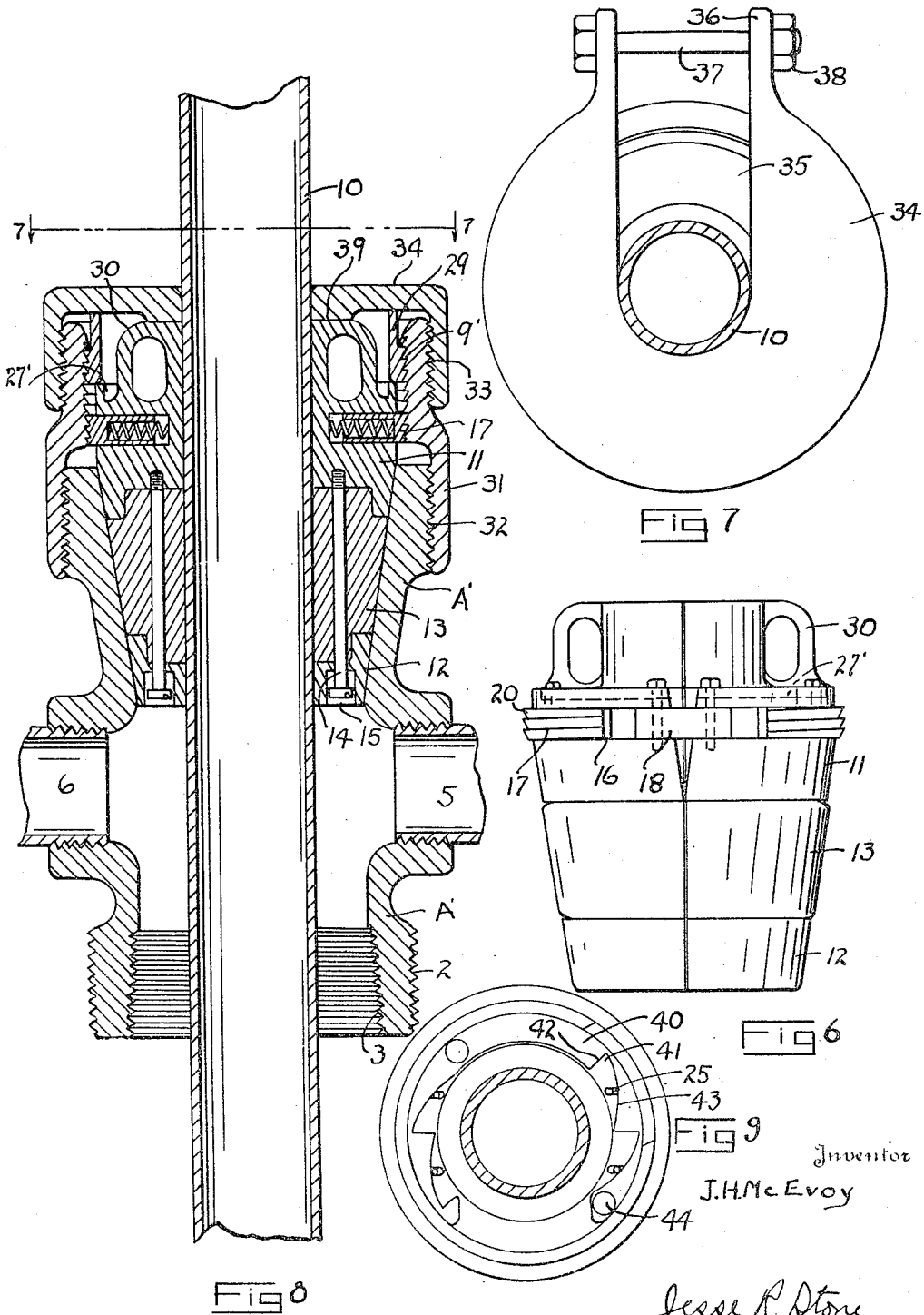
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SAFETY PRESSURE HEAD

Application filed May 7, 1929. Serial No. 361,059.

My invention relates to safety devices for use on casing heads in well drilling and pumping operations.

My device is for use particularly in drilling operations when danger of a blowout from gas pressure in the well is imminent. It is also adapted for use when it may be desired to force mud into the walls of the well bore to prevent caving of sand or shale by employing heavy pressure of the slush pumps.

I aim to provide a pressure head adapted to fit within the casing head and close off the space about the drill stem tubing or other pipe, and serve as a seal for said casing head about the said drill stem or pipe and prevent the escape of fluid from the well.

I have as an object to produce a pressure head which is adapted to be set in position about the drill stem quickly and without danger to the operator.

I also desire to provide means to automatically latch the pressure head in position, when it has been introduced into its seat, and to also furnish means to readily unlatch and remove the device when necessity for its use has passed.

The device may be used with or without the automatic dogs or latching means, and various means of holding the pressure head firmly in place are contemplated and may be used as desired.

Referring to the drawings herewith, Fig. 1 illustrates a broken view in central longitudinal section showing my invention installed in a casing head.

Fig. 2 is a top plan view on the plane 2—2 of Fig. 1, one of the operating wrenches being removed.

Fig. 3 is a transverse section on the plane 3—3 of Fig. 1.

Fig. 4 is a side elevation of a hold down ring which I employ.

Fig. 5 is a top plan view of a different embodiment of the hold down ring.

Fig. 6 is a side elevation of the pressure head removed from the casing head.

Fig. 7 is a top plan view taken on the line 7—7 of Fig. 8.

Fig. 8 is a central vertical section thru a

casing head with my invention installed therein, a cap such as shown in Fig. 7 being added.

Fig. 9 is a top plan view with the cap removed and illustrating a modified form of latch operating means.

My device is intended for use in casing heads of a construction similar to that now in ordinary use. The said casing head shown at A is secured at the upper end of the casing 1, which may be understood as being installed in a well. The casing head A is threaded on its outer periphery at 2 for engagement with the coupling 2'. It is also threaded at 3 on its interior diameter for connection with an inner pipe or liner 4.

As will be noted from Fig. 1 the casing 1 has a coupling or flanged joint 2' thereon so that the attachment of the casing and liner both to the casing head may be practically accomplished under field conditions.

The casing head has the usual lateral outlets 5 and 6 thru which the fluid from the well may be directed to some place of storage. The upper end of the casing head is provided with a tapered seat 7 on its inner face and its upper extremity is threaded exteriorly at 8 to receive a cap or any desired extension which may be placed thereon. The inner wall of the casing head at its upper end is provided with a ratchet thread 9. I prefer to form a spiral thread at 9 so that a holddown ring or other member may be threaded into engagement therewith although it may be understood that a ratchet with parallel serrations may be formed if desired. In drilling operations a drill stem represented at 10 is ordinarily operated thru the casing head and the casing in the drilling of the well. When gas pressures are encountered in drilling, precautions must be taken to prevent the pressure of gas in the well from overcoming the pressure of the flushing fluid and blowing out. I have provided a type of quickly adjustable pressure head which may be installed in the upper end of the casing head to seal off the space around the drill stem so as to prevent the escape of gas or other fluid except by way of the lateral outlets 5 and 6.

My improved pressure head comprises an upper plate or crown 11 and a lower plate 12 with a packing member 13 between the two plates. The upper and lower plates are preferably made of steel or other hard material and the packing member between said plates is preferably made of rubber or other similar compressible composition. The rubber packing ring 13 interfits with the plates 11 and 12 at its upper and lower ends and the assembly including the plates with the packing member is tapered downwardly between the ends to fit the tapered seat 7 in the casing head.

The upper plate or crown 11 of the safety pressure head is made cylindrical on its outer face adjacent the upper end to fit within the cylindrical upper end of the casing head. I may provide an annular recess 16 in the outer wall of the said plate, said recess being adapted to receive the latching dogs 17, hinge members 18 and a latch member 19. These parts are seen best in Fig. 3. The latching dogs 17 may be of any desired number or of any desired width. I have shown two latching dogs 17 each extending approximately one-quarter the distance about the pressure head. Each dog may be formed with ratchet teeth 20 to engage with the ratchet threads 9 upon the casing head which were previously described. The dogs are held resiliently outward thru springs 21 set in recesses in the dogs and bearing against the inner wall of the annular recess 16. I prefer this type of spring although manifestly other resilient means may be employed to hold the dogs in outwardly projected position. I have also shown the dogs as being held in position and guided to and from the latching position by guide pins 23 extending thru slots 24 in the dogs. As will be seen from Figs. 1 and 2, I also form or affix on the upper side of each dog one or more wrench engaging pins 25. Said pins extend upwardly thru a slot 26 which is formed in the crown or plate 11, a sufficient distance to be engaged by a wrench 27. Said wrench has an offset or eccentric recess 28 therein to fit over the upper end of the pin. The crown 11 may have a depression 27' formed in the upper face thereof so that a rim or wall 26' stands up, and as the wrench bears at its outer side against this wall 26' of the recess 27' into which it fits the rotation of the wrench will tend to carry the pins 25 inwardly and to thus force the dogs inwardly against the action of the springs 21 and release said dogs from latching position with the ratchet 9. If desired, instead of the depression 28' a small lug may be formed on the crown 11 adjacent the slot 26 and the wrench may cam against this lug.

The lower plate 12 is formed with an upper annular recess to interfit with a rim on the packing member 13 and said plate and

said packing ring are provided with a plurality of longitudinal openings therethru to receive bolts or pins 14. The heads of the said pins 14 are countersunk in recesses or counter bores 15 in the lower side of the plate 12. These pins extend thru the packing ring and are screwed into recesses 15' in the under side of the plate or crown 11. It will be seen that when the lower plate is forced upwardly thru pressure from beneath, due to any force from within the casing, that the heads of the bolts 14 will pass downwardly in the counter bores 15 in the plate 12 and the packing ring 13 will be compressed to form a tight seal with the seat 7. The ring 13 is thus compressed due to the dogs 17 latching with the threads at 9 whereby upward movement of the crown 11 is prevented.

While the pressure head may be held securely in its seat by means of the latching dogs, I prefer to employ also a hold-down ring 29, which is threaded on its outer face to engage with the thread 9 in the casing head. Said hold-down ring may be made as shown in Fig. 4, if desired, the ring being split into two parts, with dowel pins 30 fitting within recesses in the meeting faces of the two parts. Washers 30' may be employed to space the ring segments apart to form a true circle. Thus when the hold-down ring is to be installed the two halves of the ring are fitted together about the pipe 10, the dowels engaging tightly in the recesses in the meeting faces of the ring segments and the washers serving to space the two halves of the ring so that the ring may then be screwed into position in the casing head with its lower end bearing against the ring or lugs 26'.

The hold-down ring may be made as shown in Fig. 5 of one piece with an opening 31 formed at one side thereof of sufficient width to pass the pipe 10. The outer surface may be threaded as in the other embodiment and the ring may be moved into position about the pipe and above the pressure head and screwed into its seat as in case of Fig. 4 embodiment, thus locking the pressure head in position.

The safety pressure head may be formed with lateral handles 30 thereon, as shown in Figs. 6 and 8, it being understood that any desired means for handling the said pressure head may be provided. In the construction shown in Fig. 8, the casing head A' is not extended upwardly in one integral member to engage with the latching means. A special nipple 31 is formed to make a threaded engagement at 32 with the casing head and this nipple is formed with an outer thread 33 and an inner ratchet thread 9'. The inner ratchet thread engages with the hold-down ring 29 as in the other embodiment and also receives the latching dogs 17 to hold the pressure head in its seat.

In the Fig. 8 embodiment I have shown a cap 34 as being screwed upon the outer thread 33 of the nipple 31. It is to be understood that this cap may also be used in the embodiment shown in Fig. 1, the thread 8 shown thereon being for that purpose. The cap 34, as shown in Fig. 7, has a lateral slotted opening 35 therein to allow the cap to be fitted around the pipe 10. On each side of the opening 35 the cap has two laterally extending lugs 36 which are formed with openings therein to receive a bolt 37 and nut 38 by means of which the cap may be clamped in position. In installing the cap on the casing head the bolt 37 is removed, the cap is fitted about the pipe 10, and is then lowered and screwed upon the threaded portion 33 of the nipple. After it is screwed down firmly so as to engage the upper end 39 of the pressure head or upper end of the hold down ring 29 the bolt 37 may be again introduced thru the arms 36 and the nut 38 be employed to clamp the head tightly in position. It is to be understood that the hold-down ring 29 may also be employed in connection with the cap 34, as shown in Fig. 8.

The eccentric wrenches shown at 27 in Fig. 1 may be employed to disengage the dogs from their protected position in contact with the ratchet thread on the casing head. In Fig. 9 I have shown a ring 40, which may be used as a substitute for the wrench 27. I have shown this ring as being formed to operate four separate dogs or rather to engage with four separate pins 25 upon the latching dogs. In some instances two pins 25 may be used on the same latching dog or there may be two latching dogs at each side of the pressure head. The ring 40 is of sufficient width to be received in the recess in the upper end of the plate 11 of the pressure head and notches 41 are formed on the inner side of the ring, said notches having an abrupt shoulder 42 at one side and a cam-shaped inclined surface 43 in the other side. The ring 40 is dropped into position so as to receive the pins 25 in the notches 41 in the ring. When the ring is then rotated in a counter-clockwise direction, as shown in Fig. 9, the pins are moved inwardly by contact with the cam surfaces 43. Handles 44 on the ring 40 may be provided so that the ring may be rotated. If desired any bar or lever may be used to disengage the dogs by prying against the pins 25 using the upper edge of the casing head or nipple 31 as a fulcrum.

My safety pressure head is adapted particularly for use in drilling operations although the smaller sizes are also adapted for use in pumping operations. In drilling information in which heavy gas pressure is encountered the safety pressure head may be kept upon the derrick floor in a position where it may be conveniently obtained or suspended in a swing in unlatched position

ready to be passed around the pipe. When it is noted that the gas is beginning to blow from the well, indicating a blowout, the operator may readily seize the pressure head and place it about the drill pipe or tubing represented in Figs. 1 and 8 by the pipe 10 after which it is latched automatically by swinging the parts of the head together. As the head is latched about the pipe 10 if it fits somewhat loosely it may be released and will slide down the pipe and into the tapered seat in the casing head. The dogs 17 will automatically engage with the ratchet threads 9 on the casing head and when the said pressure head has been tightly seated by the weight of the pipe the latching dogs will hold it in position. It will be obvious that this device may be quickly placed in its position without danger to the operator and when in position it will automatically be prevented from being blown from its seat. The pressure head may however fit tightly about the pipe 10 so that it may be necessary to lower the pipe 10 in order to seat the pressure head within the casing head. As an extra precaution where desired, the hold-down ring 29 may be then screwed into position above the pressure head, and also in extreme cases the cap 34 may be then screwed in position as a further precaution against excessive fluid pressure from the well.

In some instances after the dogs are latched and the hold down ring or cap 34 have been placed it may occur that leakage will begin either between the pipe 10 and the pressure head or at the tapered seat. Any leakage is dangerous as the abrasive material soon cuts away either metal or rubber. To overcome this the operator may raise the pipe 10 by operation of the draw works until a coupling comes in contact with the lower plate 12. Further upward movement raises this plate 12 and compresses the packing 13 and effectively stops any leakage.

It is to be understood that any one or all of these pressure head securing devices may be employed, or any two of them may be used together. Ordinarily, but one of them is required for use at one time.

When the device is to be removed from the casing head the cap 34 and hold-down ring 29 are unscrewed and removed and the eccentric wrenches 27 or lever bars described may be employed to engage the pins 25 in the dogs and by rotation of said wrenches or outward movement of lever bars the dogs will be withdrawn from latching engagement with the threads 9 and the safety pressure head may be removed. The ring 40 may be used in place of wrenches, as previously described.

In some instances where the drilling is proceeding thru sand, shale or other formations which are loosened by the drill bit it is desirable to maintain a heavy pressure on

the mud or flushing fluid in the well bore. In this manner caving may be prevented as the mud is forced or injected into the loose material of the well bore and serves as a cement. When this is to be done my improved pressure head may be applied and any desired pressure applied to the well bore without leakage.

The pressure head forming the subject of this invention is of particular advantage where gas pressure and caving of material are encountered. The driller may have the pressure head in position and when the danger of blowout becomes imminent the danger may be averted by quickly placing the pressure head in position as described. Danger to the operator and to the well may thus be avoided before chance for a dangerous blowout is experienced. It seems apparent that my inventive idea may take various forms in its practical application without departing from the spirit of my invention. Thus the arrangement of the parts as here shown may be reversed and the dogs mounted in the casing head or a nipple such as 31 of Fig. 8, and the teeth or threads placed upon the safety pressure head. The further advantages of the device will be obvious to those skilled in the art.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In a device of the character described, a casing head having a downwardly tapered seat therein through which the drill stem may pass, the combination of a pressure head shaped to fit said seat and close about said drill stem, said pressure head including upper and lower plates, a flexible packing member between said plates, and means on said upper plate slidable laterally in said pressure head to engage said casing head in a plurality of adjusted positions and hold said pressure head from upward movement.

2. A casing head having a passage there-through for a pipe, a seat in said passage, a unitary pressure head adapted to be dropped in said seat and close about said pipe, means in said pressure head to form a seal between the same and said seat, ratchet threads on said casing head, and means on said pressure head to automatically engage said ratchet threads at a plurality of levels as said pressure head is seated to retain the same in said seat.

3. A casing head having a passage there-through for a pipe, a seat in said passage, a unitary pressure head adapted to be dropped quickly into said seat to close about said pipe, ratchet threads on said casing head, toothed dogs on said pressure head, and means to force said dogs into engagement with said ratchet threads for the purpose described.

4. A casing head having a passage there-through for a pipe, a downwardly tapered

seat in said passage, a pressure head shaped to fit said seat and close about said pipe, latching dogs in said pressure head, means holding said dogs resiliently outward, and means on said casing head to be automatically engaged by said dogs, to prevent upward movement of said pressure head.

5. In a casing head, a pressure head shaped to fit within said casing head and form a seal therewith, means to automatically engage said pressure head with said casing head to prevent relative movement thereof, and a cap adapted to engage said casing head and bear against the upper end of said pressure head.

6. In a casing head having a passage there-through for a pipe and a downwardly tapered seat in said passage, a pressure head tapered to fit said seat, said pressure head being split longitudinally, means to hinge the parts of said head together, an automatic latch to engage said pressure head about the pipe, and dogs on said pressure head movable laterally to engage said casing head for the purpose set forth.

7. A casing head in combination with a pressure head to fit therein, said head having an outer groove therein, latching dogs in said groove moving radially to engage said casing head, and upwardly extending pins on said dogs, said pins being formed for engagement by a wrench rotatable to move said pins and dogs inwardly from latching position.

8. A casing head having a seat therein, a pressure head shaped to fit said seat, laterally extending latching dogs in said pressure head to automatically engage said casing head, means to withdraw said dogs and a hold down ring adapted to be screwed into said casing head above said pressure head.

9. A casing head having a seat therein, a pressure head shaped to fit said seat, laterally extending latching dogs in said pressure head to automatically engage said casing head, and means on said casing head engaging said pressure head to force it firmly into said seat.

10. A casing head having a passage there-through for a pipe, a seat in said passage, a pressure head adapted to be inserted in said seat and latched around said pipe, ratchet threads on said casing head, a compressible packing ring in said pressure head, and means on said pressure head to automatically engage said ratchet threads so that said ring may be compressed by fluid pressure from below.

11. In a casing head, a pressure head shaped to fit within said head and form a seal therewith, means to automatically engage said pressure head with said casing head to prevent relative movement thereof, and a bushing adapted to screw down on said casing head and further compress the packing member.

12. In combination with a casing head having an external thread and an interior bore, a pressure head adapted to fit said bore, a

coupling formed to engage said thread, ratchet threads on the interior of said casing head, means on said pressure head engaging adjustably therein, said coupling being adjustable to engage said pressure head and hold the same in adjusted position in said casing head.

13. In a device of the character described, a casing head having a seat therein through which the drill stem may pass, the combination of a pressure head to fit said seat and close about said drill stem, said pressure head including plates, a flexible packing member between said plates and outwardly movable means on said pressure head automatically engaging said casing head at a plurality of fixed points therein to prevent upward movement of said pressure head from any of said fixed points after it has been forced into said seat.

14. In a casing head, a packing unit made up of a plurality of segments, means to latch said segments about a pipe passing through said casing head, and means carried by said packing unit to latch said unit in said casing head, said means including interengaging portions on said head and said unit.

In testimony whereof I hereunto affix my signature this 27th day of April, A. D. 1929.

JOSEPH H. McEVOY.