

July 9, 1940.

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2,207,448

BOTTOM HOLE WELL PLUG

Filed Aug. 13, 1937.

2 Sheets-Sheet 1

Fig. 1

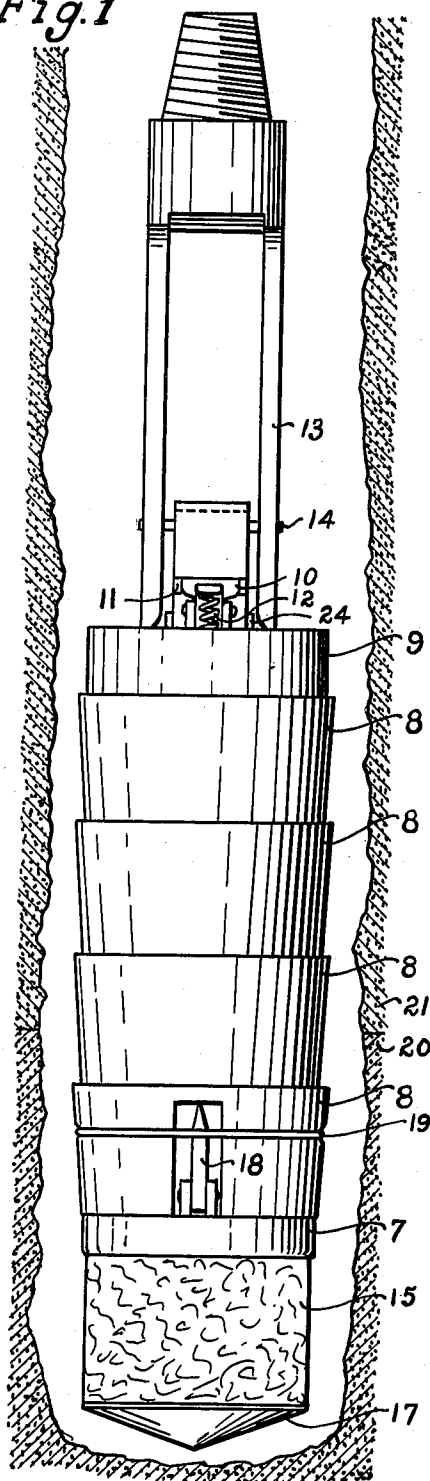
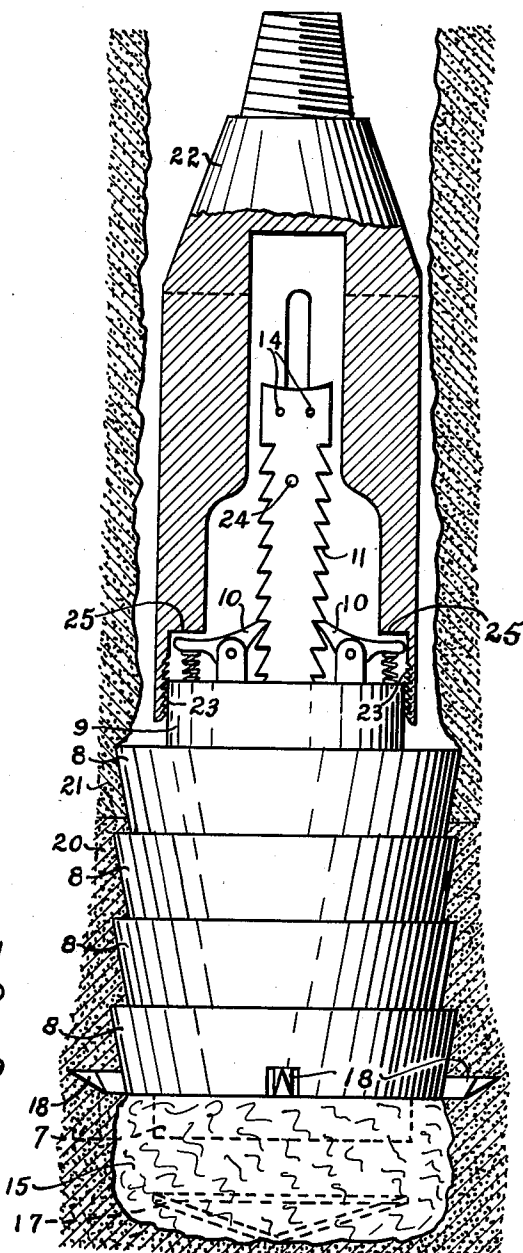


Fig. 2



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Fig. 3

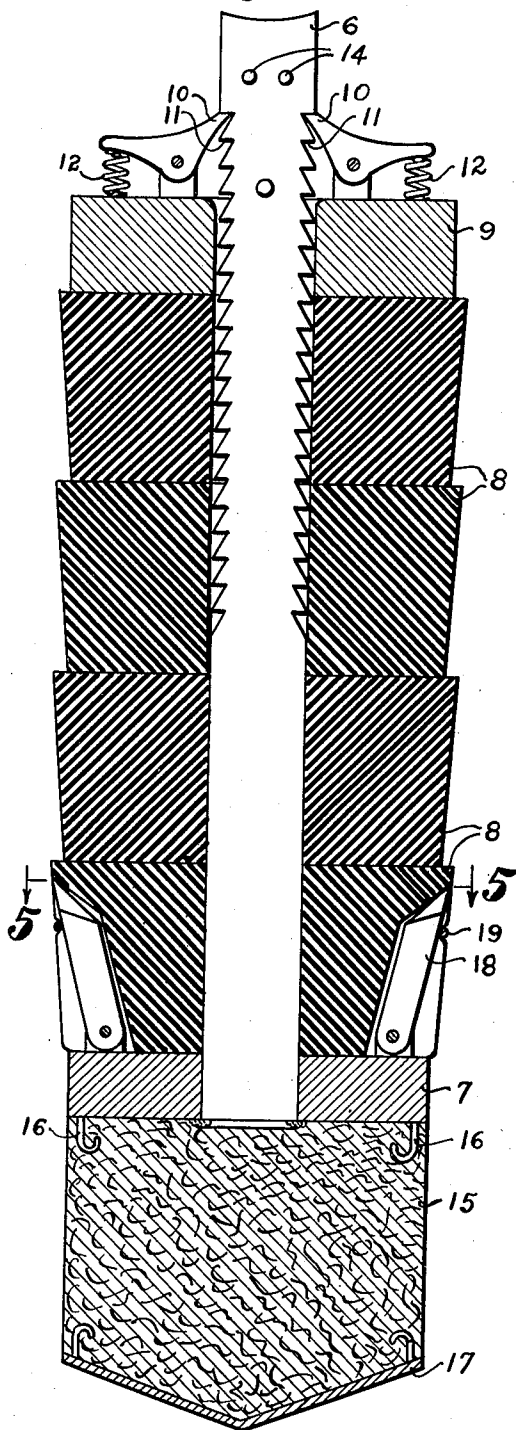


Fig. 4

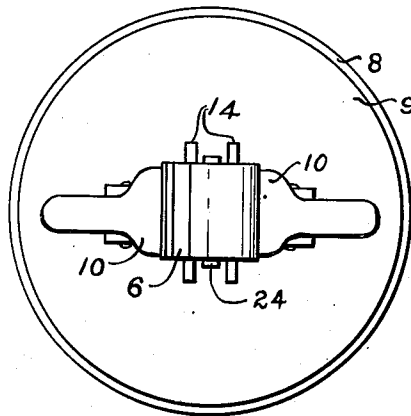
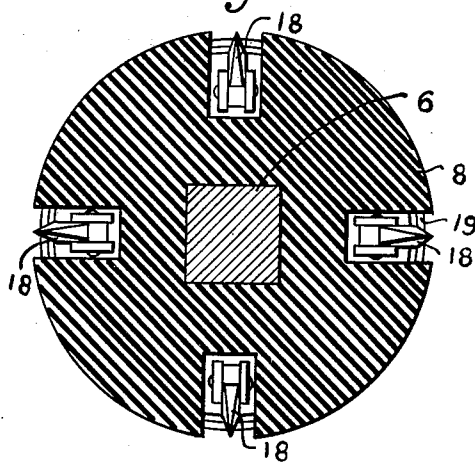


Fig. 5



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BOTTOM HOLE WELL PLUG

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10 Claims. (Cl. 166—13)

This invention relates to improvements in bottom hole plugs for oil wells and the like.

Many devices have been made in an effort to close off salt water from coming in at the bottom of wells that are drilled through the oil sand into the salt water sand. However, most of such plugs do not completely shut off the salt water and those few that are effective at first often fail after a short period of use.

The object of this invention is to provide a bottom hole plug for oil wells that will effectively shut off the salt water and that may be easily set in place, and once set in place and expanded will mechanically lock the device against accidental loosening or removal unless removed by a special tool provided for the purpose.

While the drawings illustrate a preferred embodiment of the invention, it is to be understood that in adapting the same to meet specific needs and requirements, the design may be varied and changes in the minor details of construction resorted to within the scope of the invention as claimed without departing from the spirit thereof.

A preferred embodiment of this invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a sectional elevation of this improved plug being installed in the well;

Fig. 2 is a view of the plug after insertion and setting, and showing the tool used in the removal thereof partly in section;

Fig. 3 is a vertical section of the plug, partly in elevation;

Fig. 4 is a top plan view of the plug; and

Fig. 5 is a transverse section on the line 5—5 of Fig. 3.

With more particular reference to the drawings, the numeral 6 represents a mandrel which is secured to and extends upwardly from a base plate 7. Packing elements 8 of rubber or other resilient material are slidably disposed upon the mandrel 6. These packing elements 8 are preferably of inverted frusto-conical shape which allows ready and secure holding engagement with the walls of the well when the plug is secured in place. A plate 9 is slidably disposed on the mandrel 6 at the upper end of the packing elements 8 and carries pawls 10 thereon which engage ratchet teeth 11 at opposite sides of the mandrel 6. Springs 12 bear upwardly against the pawls 10 and insure engagement thereof with ratchet teeth 11 when the slidable plate 9 is depressed.

To place the plug in a well a special forked setting tool 13 (Fig. 1) is provided which engages

shear pin 14 that are preferably made of wood or other material readily sheared under additional strain. The pins 14 extend through the mandrel 6 and through the tool 13. This permits the plug to be lowered by the tool into the well, and when the weight of the drill stem or other tools is applied upon the setting tool 13, it will cause the shearing of pins 14 and permit the fork of tool 13 to bear down upon and depress the sliding plate 9 against the resilient packing members 8.

A mass of plastic material and mineral wool 15 (Fig. 3) is attached to the bottom of the base plate 7 and is secured thereto by means of hooks 16 which are embedded in the plastic material. A plate or cover 17 may be secured beneath the plastic material to hold the mass in the desired shape until the plug is inserted into the well, when the pressure from above causes this plastic mass to expand and provide an additional seal of the bottom of the hole against salt water.

After the plug is inserted into the well and the weight of the drill stem has been applied thereto, it will cause the plate 9 to slide down into the position shown in Fig. 2, expanding the packing elements 8 and causing anchor bars 18 pivotally mounted in the sides of the lowermost packing element and attached to the plate 7, to break retaining wire 19 and swing outwardly to the positions shown in Fig. 2.

The plastic material, under the weight of the drill stem, will assume a shape conforming to the bottom of the well, and as before stated, provide an additional seal against salt water. The pawls 10 will engage ratchet teeth 11 and securely hold the packing elements 8 expanded in contact with the walls of the well. The bottom hole plug may be made of sufficient length so that when compressed and in place it will completely shut off salt water sand 20 and permit the oil sand 21 to produce oil free of salt water.

The anchor bars 18 are made of sufficient strength and length that, together with the friction of the expanded packing elements 8, they will withstand the bottom hole pressure.

It is not usually necessary to remove the plug once it is set in place, however, should it become desirable to remove the plug, an overshot tool 22 (Fig. 2) may be provided having shoulders 25 which will disengage pawls 10; and the tool 22 has teeth 23 to engage the periphery of the sliding plate 9. This will make it possible for the sliding plate 9 to be moved upwardly until it strikes a stop pin 24, which will allow the removal of the bottom hole plug. In removing the

plug it will be necessary to exert enough pull to shear the anchor bars 18 or tear them loose from the sides of the wall, which pull will be in excess of any pressure that will be normally applied while the plug is in operation. After the sliding plate 9 has been moved upwardly, the resilient packing elements 8 will contract approximately to normal size. The plastic material 15 will remain in the well and may be drilled out if desired.

The plastic material 15 preferably is compounded of a plastic which is impervious to both oil and water, and which will set or harden after a period of time. It may be compounded of material which is impervious to the action of water and may consist of approximately equal parts of castor oil and paraffin mixed with lead or mineral wool.

By shutting off the salt water to a point approximately at the bottom of the oil producing sand 21 it will prevent the salt water from entering the bottom of the well and due to the oil permeating the oil sand, salt water has little tendency to find its way upward through the sand impregnated with oil.

I claim:

1. In a device of the character specified, a mandrel having ratchet teeth on opposite sides thereof, a resilient packing element on the mandrel, a cap plate slidable on the mandrel for expanding said resilient element, and pawls pivoted to the cap plate in position to engage the ratchet teeth for locking said element in expanded condition.

2. In a device of the character specified, a mandrel, resilient inverted frusto-conical packing elements disposed upon the mandrel, means of expanding said packing elements, and means of locking said elements in expanded condition.

3. A well plug comprising a mandrel having ratchet teeth on opposite sides thereof, a plurality of resilient packing members sleeved on said mandrel, a cap plate slidable on the mandrel to compress the packing members, and pawls pivotally mounted on the cap plate in positions to engage the ratchet teeth and hold the packing members expanded.

4. A well plug comprising a mandrel having ratchet teeth on opposite sides thereof, a plurality of resilient packing members sleeved on said mandrel, a plate fixed to the lower end of the mandrel, a plate slidably mounted on the outer end of the mandrel with the packing members interposed between said plates, and pawls pivotally mounted on the upper plate in positions to

engage the ratchet teeth to hold the packing members expanded when compressed.

5. A well plug comprising a mandrel having ratchet teeth on opposite sides thereof, a plurality of resilient packing members sleeved on said mandrel, a plate fixed to the lower end of the mandrel, a plate slidably mounted on the outer end of the mandrel with the packing members interposed between said plates, pawls pivotally mounted on the upper plate in positions to engage the ratchet teeth to hold the packing members expanded when compressed, the lowermost packing member having recesses in sides thereof, and anchor bars disposed in the recesses and pivotally connected with the bottom plate for outward swinging movement to anchor the plug in a well.

6. In a device of the character specified, a mandrel, a resilient packing element disposed on the mandrel, means of expanding said resilient element, means of locking said resilient element in expanded condition, and auxiliary anchor means operable by the expansion of said resilient packing element.

7. A well plug comprising a mandrel, expandible packing means on the mandrel adapted for expansible movement relative thereto, means for locking said packing means in expanded condition, and auxiliary anchor means operable on the expansion of said packing means.

8. A well plug comprising a mandrel, expandible packing means on the mandrel adapted for expansible movement relative thereto, means for locking said packing means in expanded condition, and auxiliary anchor bars pivotally connected with the mandrel in position for expansible operative movement by the expansion of said packing means.

9. A well plug comprising a mandrel, a plurality of resilient packing members sleeved on said mandrel, a cap plate slidable on the mandrel to compress the packing members, said mandrel having ratchet teeth in the side thereof, and locking means on said cap plate having ratchet engagement with the teeth of said mandrel so as to hold the packing members in expanded condition.

10. In a device of the character specified, a mandrel resilient inverted frusto-conical packing elements disposed on the mandrel and having outwardly projecting angular upper peripheral edges, means for expanding said packing elements, and means of locking said elements in expanded condition.

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