Dec. 30, 1952 B. W. SEWELL 2,623,733

PUNCH TYPE CORE BARREL

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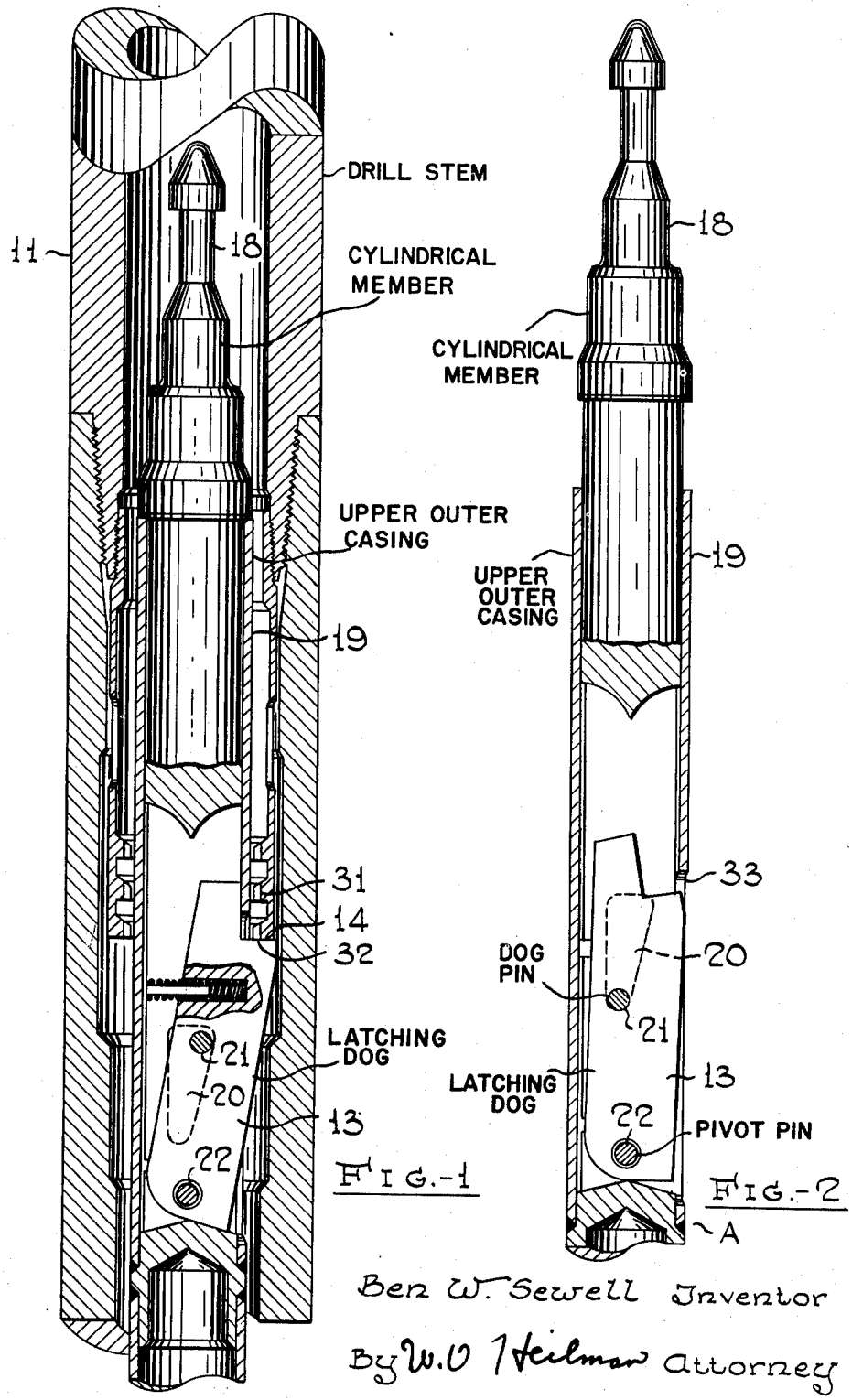

FIG.-1

FIG.-2

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PUNCH TYPE CORE BARREL

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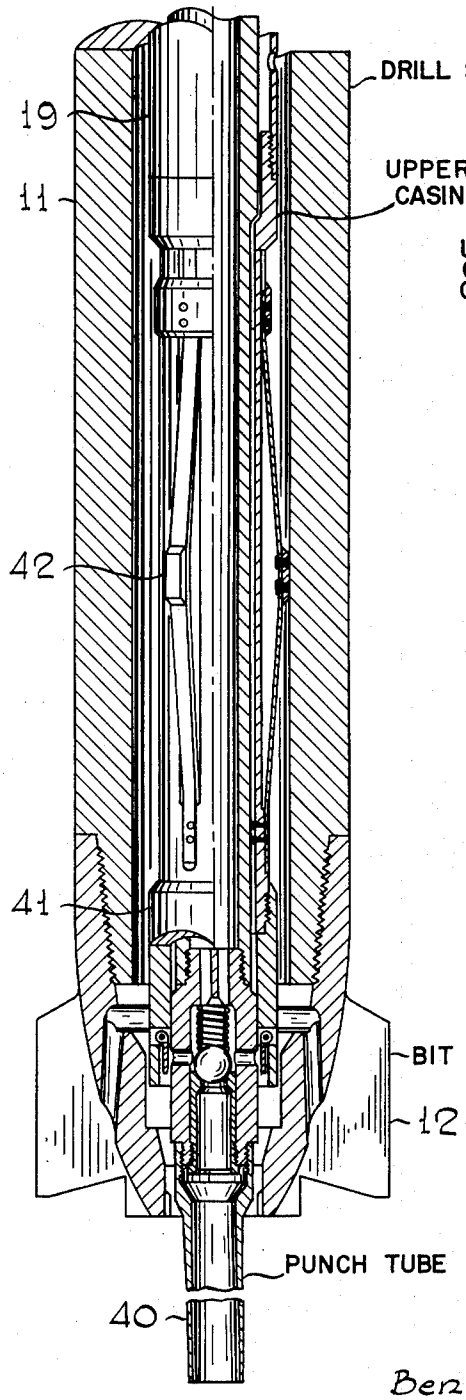

FIG.-3

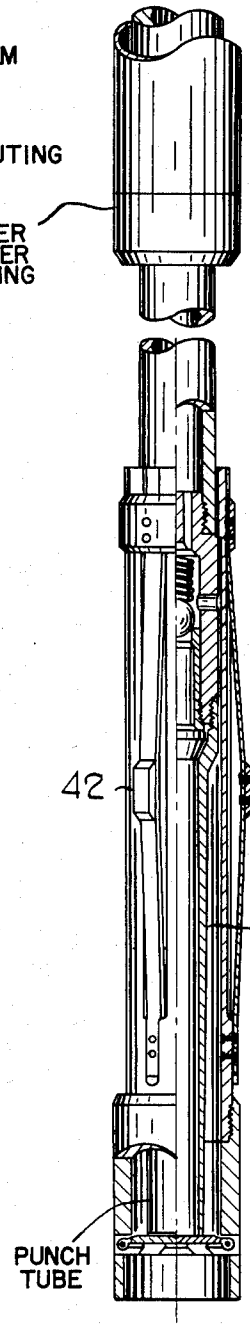

FIG.-4

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PUNCH TYPE CORE BARREL

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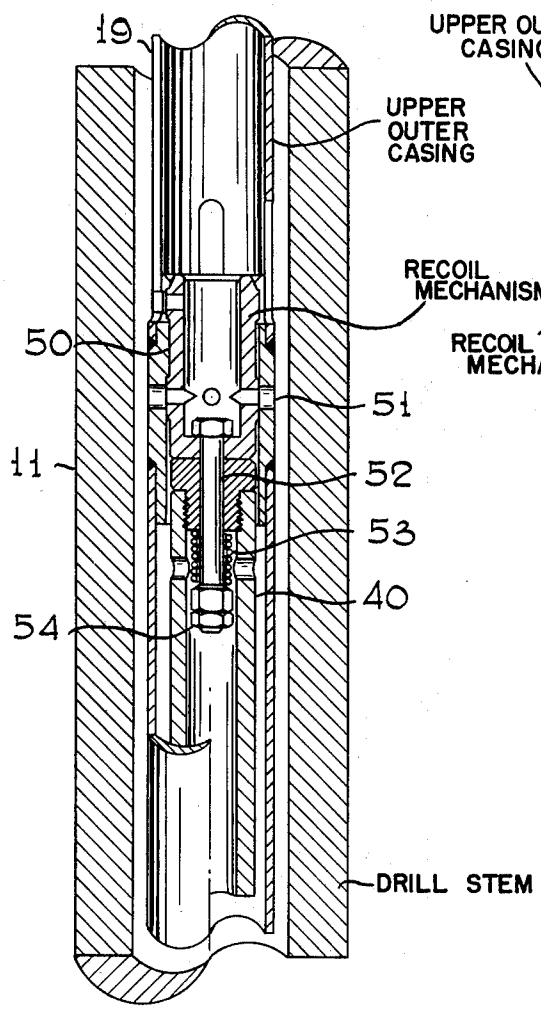

FIG.-5

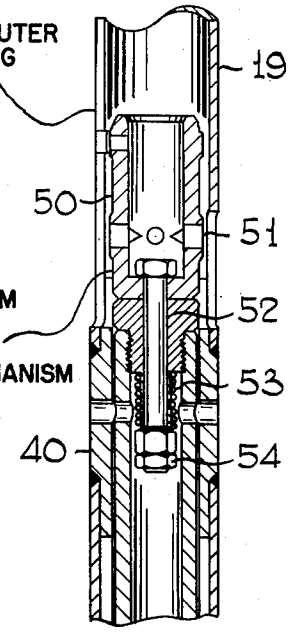

FIG.-6

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UNITED STATES PATENT OFFICE

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PUNCH TYPE CORE BARREL

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Application October 27, 1949, Serial No. 123,863

4 Claims. (Cl. 255—1.4)

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The present invention is concerned with the production of oil. The invention is more particularly concerned with a device for securing core samples of unconsolidated formations incurred during the drilling of the bore hole. The punch type core barrel of the present invention is characterized by a shear pin safety device and by a movable tube element which protects the punch coring tube itself when not in actual operation.

In conventional oil well drilling operations, in which a well hole is bored in the earth in order to locate strata from which oil may be obtained it is necessary to adopt various procedures in order to determine the character of the formations through which the bore hole is being drilled. For example, samples of various fluids encountered at the various depths are secured by various types of formation testers. On the other hand, it is often desirable to secure undisturbed samples of unconsolidated sands in order to help to determine the probability of the occurrence of oil. In order to accomplish this various types of retractable core barrels have been used. The core barrels are normally dropped through a drill stem to a seat in the core bit. The core is taken by various procedures; the core barrel is sealed up and the core barrel and the sample withdrawn to the surface by suitable means.

The present invention is concerned with an improved type punch tube core barrel by which undisturbed samples of unconsolidated sands are readily secured and withdrawn to the surface. The present invention may be readily understood by the various drawings illustrating embodiments of the same.

Referring specifically to the drawings, Figure 1 illustrates the upper section of the core assembly positioned within the drill stem and latched thereto. Figure 2 shows the upper section of the core assembly in an unlatched position without the drill stem. Figure 3 illustrates the lower section of the core assembly positioned within the drill pipe with the punch tube extending through the bit. Figure 4 shows the lower section of the core assembly without the drill pipe and with the punch tube drawn within the core retainer. Figures 5 and 6 illustrate the shear element assembly.

Referring specifically to Figure 1 the upper section of the punch core assembly is shown positioned within and latched to drill stem 11. An integral part of drill stem 11 comprises an element 31 which is characterized by having a recessed surface 32 adapted to receive and seat

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the latching dog 13 of the punch core assembly.

The punch core assembly comprises an inner cylindrical member 18 disposed as hereinafter described within an upper outer casing 19. The upper end of cylindrical member 18 comprises a spearhead unit by means of which an overshot assembly can be attached thereto for the recovery and removal of the entire punch core assembly from the bottom of the hole. The lower section of cylindrical member 18 contains cam slots 20. As member 18 moves with respect to outer casing 19 these cam slots are designed to move the dog pins 21 in a horizontal direction. The dog pins 21 are rigidly attached to latching dog 13. Thus, as cylindrical member 18 moves upwardly with respect to outer casing 19 the slots 20 move upwardly, moving the latching dog toward the center of the assembly; thus unlatching the assembly from the drill stem. The upward thrust is thus transmitted from the cylindrical member 18 by means of the slots 20, to the dog pins 21 directly attached to the latching dog 13. Latching dogs 13 are directly attached to the outer casing 19 by means of pivot pins 22. The latching dog is positioned within casing 19 and operates through slot 33 in the wall of casing 19.

Figure 2 illustrates the upper section of the assembly without the drill stem and is entirely similar to Figure 1 except that with respect to Figure 2 cylindrical member 18 is extended upwardly with respect to outer casing 19 and the latching dog is within the member in the unlatched position.

Referring specifically to Figure 3 the punch tube 40 is shown extended through bit 12 which is attached to the lower end of drill stem 11. The core retainer or the free-sliding tubular element 41 is shown seated within the bit. The punch tube 40 comprises an elongated tubular member that is attached as hereinafter described by a shear pin unit to the lower end of upper outer casing 19. Figure 4 is entirely similar to Figure 3 except that the punch core tube 40 is shown withdrawn within the core retainer 41.

In operation as an upward thrust is given the entire assembly by means of the overshot on the spearhead, the punch core tube 40 is drawn upwardly through the bit 12 into the core retainer 41 which does not move upwardly until the punch tube is within the retainer. This non-movement of the core retainer is secured by means of frictional spring guides 42 which bear against the inner surface of the drill stem 11.

In operation it is desirable to protect the punch tube 40 from excessive strain which might possibly be placed upon the same due to an overload of the drilling stem 11 or drill collars. This is secured by having a shear pin assembly connecting the outer casing 19 with the punch tube element 40. On the other hand, it is desirable not to have these two members shear due to a momentary shock. Therefore, the connection between these two members is made by means of a shear mechanism having a buffing action.

Referring specifically to Figure 5 the shear assembly is shown within drill stem 11. The lower end of outer casing 19 is connected to a shear sleeve 50 by means of shear pins 51. Bolt 52 works against the action of spring element 53 positioned between the head of core tube 40 and a lower nut 54. Figure 6 corresponds to Figure 5 except that the mechanism is shown without the drill stem and with the pins sheared.

The exact measurements and operation of the assembly may vary appreciably. As pointed out heretofore, the assembly is intended for use only in unconsolidated formations which can not be recovered in an undisturbed state by conventional coring equipment. Although the necessary thrust on the punch tube may be secured from the drill stem itself, it is preferred that drill collars be used in order to eliminate any danger of damaging the drill stem. In general up to 20,000 lbs. weight is required to push the core tube into the formation.

The punch tube usually extends from 10 to 15 inches beyond the bit and has a diameter in the range from about 1 to 1½ inches. In operation a conventional core drill is utilized until an unconsolidation formation is located. The core barrel assembly of the present invention is then dropped through the drill pipe at a rate of about 1,000 ft. per minute until the bottom is reached. While it is preferred not to run the pumps while the barrel is falling, if necessary they may be run at a very low rate of circulation, just enough to be able to see a pressure rise when the barrel reaches the bottom. With the mud pumps stopped and without rotation of the drill pipe, the drill pipe is lowered until the weight indicator shows 20,000 lbs. on the bottom. If the shear pins fail it will usually be indicated by a jump in the weight indicator. The drill pipe is then raised and set in the slips. The core barrel assembly is then recovered by a suitable overshot mechanism connecting with the spearhead.

Having described the invention it is claimed:

1. Improved retractable punch type core barrel assembly for use in unconsolidated formations comprising an upper outer casing adapted to fit within a string of drill pipe, locking means attached to said outer casing and movable into and out of engagement with a projection on the inside of said drill pipe, a cylindrical member slidably fitted within said upper outer casing and engaging said locking means so as to move said locking means upon relative slidable movement of said member within said outer casing, said cylindrical member having means at its upper end for attachment to a wire line, an elongated tubular member attached to the lower end of said upper outer casing and terminating in a punch tube portion, a lower outer casing surrounding said elongated tubular member and adapted for limited slidable movement therealong to an upper position exposing said punch tube portion and to a lower position covering said punch tube portion, and frictional elements fastened to said lower outer casing whereby to engage the inner surface of said drill pipe to ensure slidable movement of said outer casing to said lower position upon upward movement of said assembly in said drill pipe.

2. Core barrel assembly according to claim 1 in which said cylindrical member is provided with cam slots and in which said locking means comprises latching dogs attached to said outer casing and pins protruding from said dogs and engaging said cam slots.

3. Core barrel assembly according to claim 1 in which said elongated tubular member fits slidably within said upper outer casing and including shear pins holding said tubular member against such slidable movement.

4. Core barrel assembly according to claim 1 including a short sleeve slidably fitting within the lower end of said upper outer casing, shear pins holding said sleeve against slidable movement, and a spring cushioned bolt fastening the upper end of said elongated tubular member to said sleeve.

BEN W. SEWELL.

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