

2,354,399

2 Sheets-Sheet 1

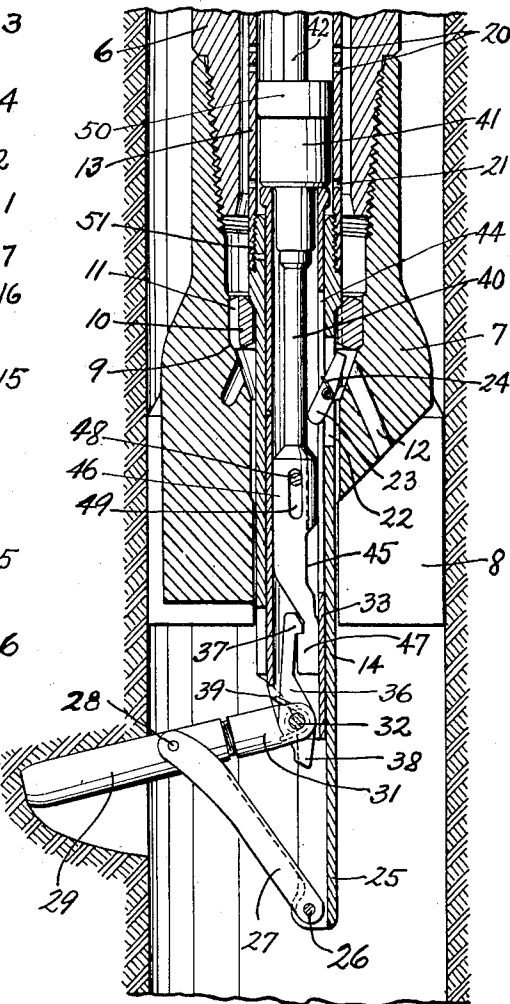


Fig. 5.

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SIDE HOLE CORING DEVICE

Filed May 4, 1942

2 Sheets-Sheet 2

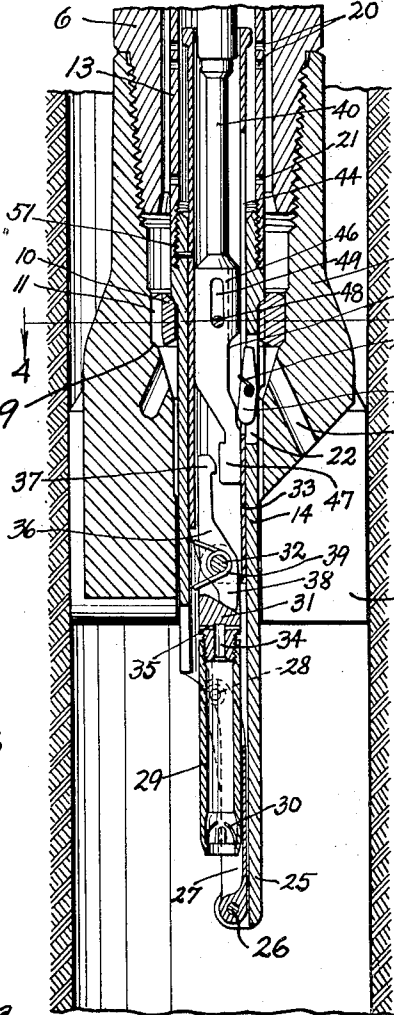
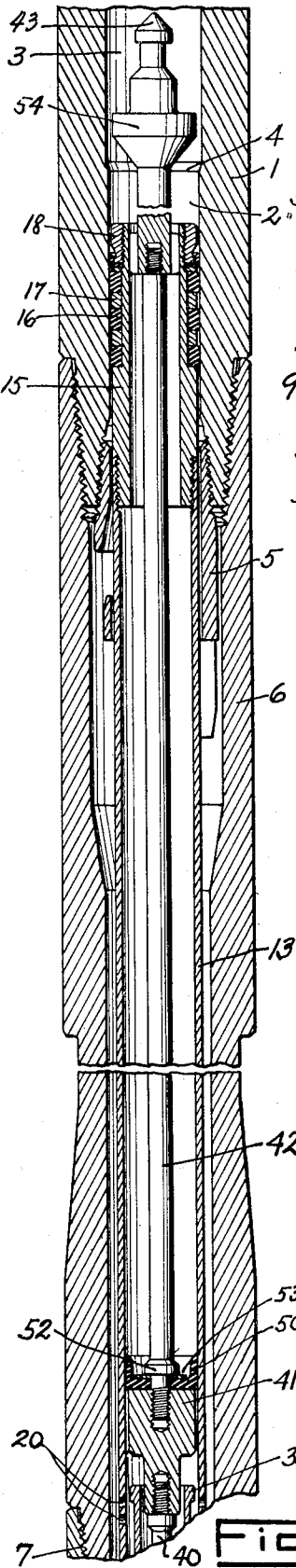


Fig. 3.

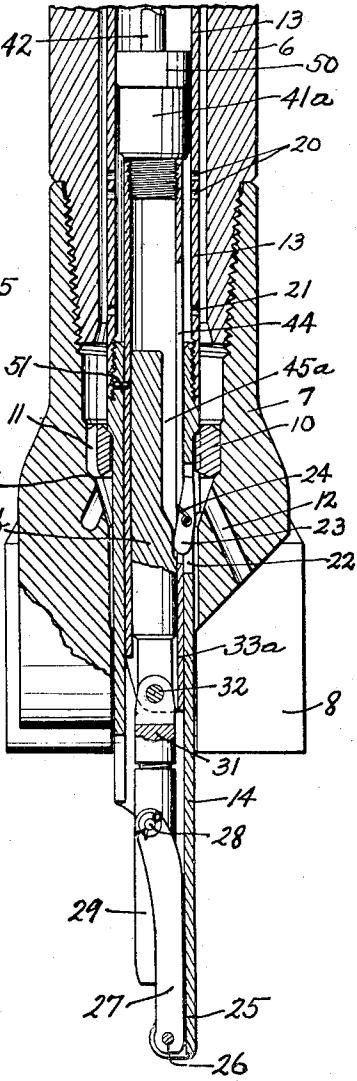


Fig. 7.

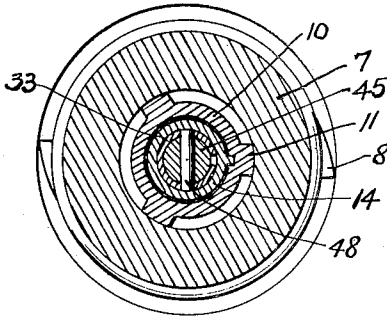


Fig. 4.

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UNITED STATES PATENT OFFICE

2,354,399

SIDE HOLE CORING DEVICE

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14 Claims. (Cl. 255—1.4)

This invention has to do with a side hole coring device and has for its general object the provision of such a device which is capable of being run into a bore hole and then moved laterally to secure a sample of the formations surrounding the bore hole.

Various types of side hole coring devices have in the past been devised, but these have for the most part been made in the form of units adapted to be connected to the lower end of a drill stem and run into a well with the drill stem, and in many instances to be operated by some movement either rotary or longitudinal of the drill stem.

It is an object of this invention therefore to provide a device which need not be connected to the lower end of a drill stem when the same is run into a hole but which may be run in through a drill stem and extended through the lower end of a conventional core bit and then operated to take a core from the side of a hole instead of from the central portion of the bottom of the hole as is customary with an ordinary core bit.

Another object of this invention is to provide such a device which may be operated without movement of the drill stem.

Another object of this invention is to provide such a device which will have a positive action in moving into the formation for the purpose of taking a core and which may then be withdrawn from the formation and removed from the well without necessity for removing the drill stem.

Another object of this invention is to provide a device which will save a vast amount of time otherwise required for taking a side hole core and which will at the same time provide a positive acting dependable core taking apparatus for taking cores from the side walls of a bore hole.

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawings wherein are set forth by way of example and illustration certain embodiments of this invention

Fig. 1 is a view partly in side elevation and partly in longitudinal cross section illustrating a device constructed in accordance with this invention which has just been seated within a core drill of conventional construction.

Fig. 2 is an enlarged vertical cross section of the upper portion of the device illustrated in Fig. 1.

Fig. 3 is a similar view through the lower portion of the device illustrated in Fig. 1.

Fig. 4 is a transverse cross section taken along the line 4—4 of Fig. 3.

Fig. 5 is a view similar to Fig. 2 but showing the parts in the position which they occupy when the core barrel has been moved downwardly and laterally in order to take a core from the formation.

Fig. 6 is a view similar to Fig. 3 but showing the device in core taking position.

Fig. 7 is a view similar to Fig. 3 but illustrating a slight modification.

Referring now more particularly to the drawings, the numeral 1 designates the lower end of a special sub having a bore through its center the lower portion 2 of which is of relatively smaller diameter than the upper portion 3 thereof so that a shoulder 4 is provided therebetween. The lower end of this sub 1 is internally threaded for the purpose of receiving the latching sleeve 5 which is customarily employed for the purpose of receiving the latch of the ordinary so-called wire line core barrel. Exteriously the sub 1 is threaded at its lower end for the purpose of receiving the upper end of a drill collar 6. The lower end of the drill collar 6 is also exteriorly threaded for the purpose of receiving the threaded shank of the core drill 7. The core drill 7 is of conventional construction, in this instance being shown with so-called fishtail blades 8 and having an internal shoulder at 9 adapted to provide a seat for the seating ring 10 that ordinarily receives a core barrel. This seating ring which is also sometimes referred to as a slush ring is provided with splines 11 on its outer surface so that slush may flow downwardly around the outside of the ring and between the ring and the body of the bit, and the bit itself is provided with downwardly and outwardly extending slush passages below the ring 10, these slush passages being designated 12 and serving to direct the slush against the blades 8 so as to keep the blades at all times clean and free from cuttings and debris in the bottom of the well.

The apparatus described up to this point is conventional apparatus ordinarily used for the purpose of taking a core during straight-ahead core drilling operations. It is of the so-called wire line type in which the drill stem and core drill remain in the well at all times being removed only for the purpose of repair or replacement, and when a core is desired to be taken a core barrel is lowered through the drill stem into the core bit and latched in place therein. Subsequent drilling causes the production of a core which moves upwardly into the core barrel,

and after the core has been taken the core barrel is retrieved by means of a wire line and over-shot lowered through the drill stem. The core barrel may then be replaced by a so-called center bit which serves to cut the center of the bottom of the hole and prevent the formation of a core when none is desired, and drilling then proceeds without the taking of any core.

In accordance with this invention a device is provided which takes the place of the usual core barrel for straight-ahead coring operation but which is capable of taking a core from the side wall of a hole.

As shown in the drawings, this device is carried in a composite body member which may be termed a carrier. This body member consists of a carrier cylinder 13 having a guide cylinder mounted on its lower end. This guide cylinder is designated 14 and is threaded at its upper end to receive the carrier cylinder 13. The upper end of the carrier cylinder is also threaded to receive a packing cylinder 15 having packing rings 16 surrounding it, these packing rings being spaced apart by means of spacer rings 17 and all these rings being held in place by means of a nut 18 screwed on to the upper end of the cylinder 15. That portion of the cylinder 15 which is surrounded by the rings 16 and 17 and on to which the nut 18 is threaded is of reduced external diameter so as to accommodate the said rings and nut.

The cylinder 13 a short distance above its lower end is provided with lateral openings 20 for a purpose presently to be described, and even closer to its lower end is provided with vent openings 21 through which a fluid can escape from within the cylinder.

The guide cylinder at the lower end of the carrier cylinder 13 has a lateral opening shortly below its upper end as shown at 22, and in this opening is pivotally mounted a holddown latch 23 having a shank portion which extends below its pivot and a latching portion extending above its pivot. Surrounding the pivot of this latch is a spring 24 so mounted that it tends at all times to move the upper latching end of this latch in a radially outward direction so as to cause it to engage beneath the ring 10 and hold the carrier in place within the core bit.

The guide cylinder extends much further down on one side than on the other as illustrated at 25 and adjacent its lower end is provided with a pivot 26 whereby there is connected to this lower end a deflector link 27. The upper end of this deflector link 27 is pivoted at 28 to a core barrel 29 in which the core is adapted to be received. This core barrel 29 is preferably of cylindrical form and has suitable core catching apparatus 30 at its lower end as it hangs within the guide cylinder 14. The upper end of this core barrel is internally threaded to receive the core barrel head 31, and that head is in turn pivoted at 32 to the lower end of the driving sleeve 33, this driving sleeve being slidably mounted within the guide cylinder 14.

The core barrel head 31 is provided with passages 34 and 35 which connect the interior of the core barrel with the exterior thereof at its upper end so that the core barrel may be vented as a core is received into its lower end.

Pivotally secured to the core barrel and to the driving sleeve on the same pivot 32 is a retracting hook 36, the upper end of which is provided with a hook-shaped part 37 for a purpose presently to be described and the lower portion of

which is provided with an abutment 38 adapted to abut against a portion of the core barrel head 31 and limit its rotation to the right about its pivot as the same is seen in Fig. 3. A spring 39 is provided for constantly urging this latching member to rotate clockwise or to the right as seen in Fig. 3 so that its shank portion 38 is at all times held firmly against the core barrel head 31 when the core barrel is in vertical position as shown.

Slidably mounted within the driving sleeve 33 and the carrier cylinder 13 above the latching member 36 is a driving and retracting mechanism consisting of a retractor bar 40, a driving piston 41 secured to the upper end thereof, and a pull bar 42 projecting upwardly from the driving piston and having a spear head 43 on its upper end.

The driving sleeve 33 has an opening laterally therefrom as shown at 44, this opening being somewhat elongated and positioned so as to register at all times during the upward and downward movement of this sleeve within the guide cylinder with the opening 22 through the guide cylinder. The opening 44 thus serves to permit communication between the interior of the driving sleeve and the exterior of the guide cylinder so that the shank 23 of the latching member will be able to extend through the driving sleeve and contact with the cam-shaped part 45 on the retracting head 46 of the retractor bar 40 which is located within the driving sleeve. This head 46 has a hook-shaped part 47 on its lower end which is adapted when the parts are in the position shown in Fig. 3 to just move downwardly past the hook-shaped upper end 37 without engaging said hook. This head is slidably mounted within the driving sleeve 33 but its sliding movement with respect to this sleeve 33 is limited by means of the pin 48 and the slot 49, this pin 48 extending through and being secured in the opposite sides of the driving sleeve 33 and engaging within the slot 49 through the head 46. The slot 49 is of such a length that when the parts are in a position shown in Fig. 3 the latch operating cam surface 45 will be up in the position shown in which the latching member 24 is held in released position. When, however, the head 46 is moved downwardly until the pin 48 comes in contact with the upper end of the slot 49, this cam surface will have moved so that the latch may engage beneath the ring 10. At the same time, the hook-shaped part 47 will have moved downwardly past the hook-shaped part 37 to such an extent that if and when the hook-shaped part 37 rotates to the right under the influence of the spring 39, the two hook-shaped parts will engage each other.

The piston 41 as previously mentioned is threadedly connected to the upper end of the retractor bar 40. This piston 41 has a packing 50 on its upper end whereby the passage of fluid pressure downwardly past this piston is prevented, and when fluid pressure is applied to this piston it will be moved downwardly to move the retractor bar downwardly. At approximately the same time that the upper end of the slot 49 comes in contact with the pin 48, the lower end of the piston 41 will likewise come in contact with the upper end of the driving sleeve 33. Thereafter, further downward movement of the piston 41 under influence of hydraulic pressure will force the driving sleeve downwardly and this will move the upper end of the core barrel 29 downwardly. As this upper end of the core bar-

rel is moved downwardly its lower end will be swung outwardly toward the formation by virtue of the connection provided by the link 27 between the lower end of the guide cylinder and an intermediate portion of the core barrel. As the core barrel swings outwardly toward the formation, it will swing about the pivot 32 and the portion against which the shank 38 of the hook 36 has been engaged will move away from said shank portion permitting the hook 36 to rotate clockwise as seen in Fig. 6 and engage the hook-shaped part 47. The driving sleeve is initially held in its uppermost position as illustrated in Fig. 3 by means of a shear pin 51. It is also noted that as the piston 41 moves downwardly, the space below this piston will be vented through the opening 21 and that when it reaches its lowermost position the openings 20 will be uncovered above the piston and fluid may escape from the cylinder through these openings.

Threadedly secured to the piston 41 and extending upwardly therefrom is the pull bar 42. This pull bar has an enlargement 52 thereon adjacent the upper end of the piston and this enlargement serves to hold in place a washer 53 which in turn retains the cup-shaped packing 50 on the piston.

The upper end of the pull bar 42 is threaded to receive the head on which is carried the spearhead 43. This body of the spearhead is provided below the spearhead with an enlargement 54 which is initially a substantial distance above the upper end of the packing head 15 and also above the shoulder 4. Thus, while the parts are in the position illustrated in Figs. 2 and 3 fluid may be pumped downwardly freely past this enlargement 54, but when the parts have been moved downwardly to their lowermost position this enlargement 54 will have passed the shoulder 4 and flow of fluid will have been substantially reduced. Thus the operator may be able to tell by the slowing down of the fluid pumps at the surface of the ground that the device has been operated fully to its lowermost position.

After the device has been operated to its lowermost position as just referred to it is retracted by means of an overshot which is lowered through the drill stem to engage the spearhead 43 and exert an upward pull thereon. This upward pull is transmitted through the pull bar, the driving piston 41, and the retractor bar 40, and thence through the two hook-shaped parts 37 and 47 to the core barrel 29. This moves the upper end of the core barrel upwardly and swings the lower end inwardly through the influence of the link 27. As soon, however, as the core barrel reaches the position very near to the vertical position, its upper end will come in contact with the shank 38 of the retracted hook member 36 and disengage the hook-shaped part 37 from the part 47. Thereupon, the retractor bar 40 may be moved upwardly within the driving sleeve 33 until the lower end of the slot 49 comes in contact with the pin 48. Thereafter, the driving sleeve and core barrel will be moved upwardly to their original positions. Further, when this retractor bar and driving sleeve are moved to their uppermost positions, the cam surface 45 will have acted upon the shank of the latching member 23 to retract this latching member so that it disengages the ring 10. Thereupon, further pull upon the spearhead 43 will serve to pull the entire device including the carrying cylinder 13 and the parts attached thereto up through the drill stem and out of the well.

With reference to the form shown in Fig. 7, this is very similar to that just described with a few minor exceptions. In this device the retractor bar 40 is omitted and the piston 41a is secured directly to the upper end of the driving sleeve 33a. The cam surface 45a which controls the operation of the latch 23 is in this instance mounted upon a cam member 45b which is carried on the pivot 32. This member is connected with pivot 32 merely for the purpose of preventing it from moving longitudinally within the driving sleeve 33a and it is for all purposes during the operation of the device an integral part of the driving sleeve 33a.

In this construction when a hydraulic pressure is exerted upon the upper end of the piston 41a this piston and the driving sleeve will be moved downwardly. As soon as this downward movement starts the cam surface 45a will move to such a position as to permit the latch 23 to move to latching position engaging the ring 10. Further downward movement will move the core barrel downwardly and its lower end will be swung outwardly in the manner above described in connection with the previous form of the invention.

When the parts are retracted by means of a pull on the spearhead 43 this operation is reversed an when the parts reach the position shown in Fig. 7 the cam surface 45a will have engaged the latch 23 and moved it again to its retracted position so that the entire device may be withdrawn from the well.

From the foregoing it is thought that the operation of this device will be perfectly clear. It is to be noted, however, that during the ordinary drilling operations without any core barrel in place a center bit will be employed for the purpose of drilling at the center of the bottom of the hole. Whenever it becomes desirable to take a side hole core with a device such as constructed in accordance with this invention, the entire assembly within the drill stem and core drill as hereinbefore described will be introduced at the upper end of the drill stem and caused to move downwardly through the drill stem until the shoulder provided for the purpose on the guide cylinder 14 engages with the ring 10.

Thereupon fluid will be pumped downwardly through the drill stem from the surface of the ground. This fluid will not be permitted to pass outwardly around the outside of the carrier cylinder 13 because of the packing 16 around the upper end thereof. It will therefore be forced downwardly through this carrier cylinder and caused to act upon the upper end of the piston 41. This will act in the manner above described to cause the shearing of the pin 51 and the downward movement of the respective parts so that the lower end of the core barrel is swung downwardly and outwardly to engage the side wall of the hole and take a core therefrom. This mechanism cannot be forced too far because when it reaches its lowermost point of travel the holes 20 will as above described be uncovered and fluid will be permitted to escape from above the piston 41. The operator will also be informed after the operation has been completed by the restriction of the flow of fluid when the enlargement 54 passes below the shoulder 4.

Thereupon an overshot will be lowered through the drill stem to engage the spearhead 43 and the parts thereupon retracted until the latch 23 is released after which the entire device may be removed from the well through the drill stem.

From the foregoing it will be seen that a de-

vice has been provided which is capable of accomplishing all of the objects and securing all the advantages sought by this invention.

Having described my invention, I claim:

1. In a side hole coring device, a carrier comprising a cylinder and a guide extending from the lower end of the cylinder, a core barrel in said guide, a driver in said guide adapted to act upon the upper end of said core barrel to move it downwardly, and a link pivotally connecting the lower portion of said guide with a part of said core barrel below its upper end, whereby upon downward movement of said driver said core barrel will be moved downwardly and the lower end thereof will be swung outwardly to take a side hole core.
2. In a side hole coring device, a support, a core barrel, a link connecting the intermediate part of said core barrel with a lower point on said support, and means for moving the upper end of said core barrel downwardly within said support to cause the lower end thereof to swing laterally away from said support to take a side hole core.
3. In a side hole coring device for use with a drill stem, a support movable downwardly through said drill stem and adapted to be carried rigidly thereby at the lower end of the drill stem, a core barrel downwardly movable with respect to said support, means for forcing the core barrel downwardly, and means on said support for deflecting said core barrel laterally when it is forced downwardly.
4. In a side hole coring device for use with a drill stem, a support carried rigidly by said drill stem, a core barrel downwardly movable with respect to said support, means for forcing the core barrel downwardly, means on said support for deflecting said core barrel laterally when it is forced downwardly, and means for retracting said core barrel upwardly with respect to said support and for retracting said support and core barrel upwardly through said drill stem.
5. In a side hole coring device for use with a drill stem, a support movable downwardly through said drill stem and adapted to be secured to said drill stem adjacent the lower end thereof, means for latching said support in place with respect to said drill stem adjacent the lower end of said drill stem, a core barrel downwardly movable with respect to said support, means for forcing the core barrel downwardly, means on said support for deflecting said core barrel laterally when it is forced downwardly, and means for retracting said core barrel with respect to said support, unlatching the support from the drill stem, and retracting said support and core barrel upwardly through the drill stem.
6. In a side hole coring device for use with a drill stem, a support carried rigidly by said drill stem, a core barrel downwardly movable with respect to said support, a shear pin interconnecting said support and said core barrel to initially hold said core barrel in an upper position with respect to said support, means for forcing the core barrel downwardly, and means on said support for deflecting said core barrel laterally when it is forced downwardly.
7. In a side hole coring device, a support, a core barrel, a link connecting an intermediate part of said core barrel with a lower point on said support, means for initially holding said core barrel in an upper position with respect to said support, and means for overcoming said last mentioned means and for moving the upper end of said core barrel downwardly within said support to cause the lower end thereof to swing laterally away from said support to take a side hole core.
8. In a side hole coring device, a support, a core barrel, a link connecting an intermediate part of said core barrel with a lower point on said support, a shear pin for initially holding said core barrel in an upper position with respect to said support, and means for overcoming said shear pin and for moving the upper end of said core barrel downwardly within said support to cause the lower end thereof to swing laterally away from said support to take a side hole core.
9. In a side hole coring device for use with a drill stem, a support carried rigidly by said drill stem, and movable downwardly through said drill stem, a core barrel downwardly movable with respect to said support, means for forcing the core barrel downwardly, means on said support for deflecting said core barrel laterally when it is forced downwardly, latching means for latching said core barrel in place adjacent the lower end of said drill stem for the purpose of taking a core, a cam for operating said latch to engaging position to latch said support in place prior to the taking of a core and for moving said latch to disengaging position to unlatch said support when said core barrel is retracted, means for retracting said core barrel to the support and means for retracting said support and core barrel upwardly through said drill stem.
10. In a side hole coring device for use with a drill stem, a support movable downwardly through said drill stem, a core barrel downwardly movable with respect to said support, means for forcing the core barrel downwardly, means on said support for deflecting said core barrel laterally when it is forced downwardly latching means for latching said storage rigidly with respect to said drill stem adjacent the lower end of said drill stem, a cam initially movable without movement of said core barrel to permit engagement of said latch with said drill stem to latch said support in place in said drill stem, and then movable with said means for forcing said barrel downwardly.
11. In a side hole coring device for use with a drill stem, a support movable downwardly through said drill stem and adapted to be rigidly secured to said drill stem adjacent the lower end thereof, a core barrel downwardly movable with respect to said support, means for forcing the core barrel downwardly, means on said support for deflecting said core barrel laterally when it is forced downwardly, means for rigidly latching said support with respect to said drill stem adjacent the lower end of said drill stem, a cam for operating said latch and initially movable separately from said core barrel to permit engagement of said latch for securing said support to said drill stem, and then movable with said means for forcing said barrel downwardly, and means for latching said cam in its lowermost position with respect to said means for forcing the barrel downwardly until said barrel has been substantially fully retracted with respect to said support, whereby said latch cannot be released by said cam until said barrel has been fully retracted.
12. In a side hole coring device for use with a drill stem, a support movable downwardly through said drill stem and adapted to be carried rigidly by the lower end of said drill stem, a core barrel downwardly movable with respect to said support, means for forcing the core barrel downwardly, means on said support for deflecting said core barrel laterally when it is forced downwardly,

latching means for latching said support rigidly with respect to said drill stem adjacent the lower end of said drill stem, and a cam secured to and movable at all times with said means for forcing the core barrel downwardly to operate said latch, the initial downward movement of said cam serving to permit engagement of said latch with said drill stem to secure said support within said drill stem, and final upward movement of said cam serving to release said latch from said drill stem and permit upward movement of said support within said drill stem.

13. In a side hole coring device, a carrier comprising a cylinder and a guide extending from the lower end of the cylinder, a core barrel in said guide, a driver in said guide adapted to act upon the upper end of said core barrel to move it downwardly, a piston in said cylinder, said pis-

ton adapted to be forced by hydraulic pressure against said driver to move said driver downwardly, and a link pivotally connecting the lower portion of said guide with a part of said core barrel below its upper end, whereby upon downward movement of said driver said core barrel will be moved downwardly and the lower end thereof will be swung outwardly to take a side hole core.

14. In a side hole coring device, a support, a core barrel, a link connecting an intermediate part of said core barrel with a lower point on said support, and hydraulic means for moving the upper end of said core barrel downwardly within said support to cause the lower end thereof to swing laterally away from said support to take a side hole core.

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