This invention relates to an apparatus for drilling wells and permits more particularly to a device for guiding well tools into the bore of a section of lost drill string, or other tubular apparatus, commonly known as a "fish," whereby repair operations may be carried out without removing said fish from the well borehole. While the present tool may be used within well casing, it has been found to be especially adapted for use in an uncased well borehole and will be described hereinafter with regard to its use in this manner, it being understood that the invention is in no way limited to this specific use.

In the drilling of an oil well, or in repairing a well, it occasionally happens that it becomes necessary to fish for portions of a drill string or a producing string which may be left in the borehole. For example, during rotary drilling operations, the drill bit or a portion of the drill string may become im movably wedged in the borehole and in the process of freeing the stuck drill string, it may be snapped or twisted off at some point above its wedged portion.

During the course of subsequent fishing operations it is sometimes necessary or desirable to utilize various well tools which are capable of entering the bore of the portion of the tubular drill string left in the borehole or well casing. Since it may be desirable to carry out such operations as washing in or around the upper broken end of the drill string, cutting off a portion of the broken end with an inside cutter, milling or tapping the inner surface of the pipe at the end thereof, or performing any of the many other operations, it is evident that the tool to be guided into the bore of the fish may be of any of a number of different types.

In general, the upper end of a fish remaining in a well borehole is not positioned coaxially therein, thus necessitating the use of suitable means for guiding a tool into the bore of the fish from the top thereof. It is therefore an object of this invention to provide apparatus adapted to be run into a well borehole, engage the top of a fish positioned therein, and guide a well tool into the bore of said fish.

It is also an object of this invention to provide a tool guide adapted to be run into a well borehole on a pipe string in such a manner that an operator controlling the fishing string can ascertain when the tool guide has engaged the fish in the well, or when a tool carried by said tool guide has entered the bore of the fish.

Another object of this invention is to provide a guide apparatus adapted to be run into a well borehole on the end of a drill string and surround the upper end of a fish positioned therein, said guide apparatus carrying a tool adapted to be released by manipulation of the drill string when said guide apparatus is properly positioned over said fish.

A further object of the present invention is to provide a tool carrying guide apparatus adapted to be run into a well borehole on the end of a drill string, said tool being releasably carried in said guide apparatus in a manner which prevents premature release of said tool in the event that the guide apparatus strikes an obstruction while being run into the well borehole. These and other objects of this invention will be understood from the following description of a preferred embodiment of the invention as shown in the accompanying drawing wherein the figure is a view, partly in longitudinal cross section, of the present tool guide secured to a fishing string and surrounding a fish in a well borehole.

Referring to the drawing, the present tool guide comprises an elongated cylindrical guide housing or overshoot body 11 preferably swaged or reduced in diameter at its upper end, as at 12, to form a bushing which is internally threaded at its upper end 13 for connection with an externally threaded pipe or fishing string 14. The fishing string 14 is provided with a short sub or section of pipe 15 having a portion of the outer surface thereof threaded, as at 16, to engage the threaded bushing 13 of the guide body 11. At its upper end 17 of the sub 15 is threaded to form a tool joint for connection of said sub 15 to the fishing string 14 while another tool joint is formed on the lower end 18 of said sub 15 to engage a co-operating tool joint 19 carried at the upper end of a tool 20 which is being inserted into the well borehole. The tool 20 may be of any desired type having a size small enough to enter the bore of a fish (shown by broken lines at 21) at the upper end thereof. For example, the tool may be a small bit, milling tool, inside pipe cutter, tap, or the like.

The lower end or skirt 22 of the guide body 11 may be provided with one or more cutting faces 23 to facilitate in cutting debris or savings from around the upper end of the fish 21 in order that guide body 11 may readily surround the upper end of said fish. The cutting face 23 may be formed in any desired manner depending on whether right or left hand rotation of the fishing string 14 is employed to work the guide body 11 over the upper end of the fish 21.

Mounted within the guide body 11 are suitable means for centering the fish 21 so that said fish and the tool 20 are in coaxial relation with each other when the tool enters the bore of the fish. The centering means may be of any type well known to the art, such, for example, as tapered wedges, centering springs, or, as illustrated here, at least three radially extending fins 24 secured as by welding to the inner wall of said guide body 11 and having their lower ends 25 tapered or beveled inwardly.

Carried within the overshoot body 11 are suitable means for frictionally engaging the upper end of the fish to prevent any rotation of the guide body 11 about the upper end of the fish when the present tool guide has been positioned for operation over the end of the fish in a manner illustrated in the drawing. The fishing gripping means may comprise, for example, a plurality of serrated-faced wedges welded to the inner wall of the guide body 11 but preferably comprise an inner cylindrical member 26 coaxially mounted within the guide body 11 and welded to the top 12 thereof. The member 26, which may consist of a short section of pipe, has a plurality of teeth 27 cut or formed in the lower end thereof and is of a diameter substantially equal to that of the fish 21 so that when the toothed lower end of the tubular member 26 is in frictional contact with the fish 21, the possibility of any relative movement between the fish 21 and member 26 is eliminated or greatly reduced.

Preferably, the cylindrical member 26 which frictionally engages the fish 21 is of a length at least as great as the tool 20 extending into the overshoot body 11, thereby serving additionally to prevent the possibility is run into the well and positioned over the fish 21. Although the teeth 27 are formed in the end of tubular
member 26 in the illustrated embodiment, it is realized that the teeth 27 may be cut in the inner face 28 of the top of the overshoot body 11 when member 26 is not used.

In assembling the present tool guide, the tool 20 is secured in screw threaded engagement to the lower end 18 of the sub 15. The central threaded portion of the sub 15 and the bushing 13 are disposed smaller in diameter than the diameter of the fishing string 14 thus permitting the fishing string 14 to slide freely through the threaded bushing when the sub 15 is unscrewed therefrom.

Prior to using the present tool guide in fishing operations, any earth or debris covering the top of the fish is generally cut away and removed, as W2 shown, by a washer pipe or some similar device well known to the art. Since the depth to the top of the fish would be known by the operator in charge of fishing operations, the present tool guide carrying its tool 20 is secured to the lower end of the fishing string 14 which is lowered into the well borehole and made up to a length sufficient for the tool guide to reach the fish 21.

As the tool guide reaches the fish 21, the guide body 11 is worked over the top of the fish 21 by slowly rotating the fishing string 14. Preferably, instead of using the power of a rotary table to rotate the fishing string, chain togs are used by the fishing crew thus employing a relatively small amount of power to turn the string. In this manner, a better feel of the progress of the guide body is obtained. Additionally, by use of chain togs, the fishing string may be rotated in either a clockwise or a counterclockwise direction since the frictional contact of the threads of the bushing 13 is normally sufficient to prevent any unscrewing action until the teeth 27 contact the fish 21.

As the guide body 11 is worked over the top of the fish 21, the fishing string 14 and the guide body 11 attached thereto. Preferably, instead of using the power of a rotary table to rotate the fishing string 14, chain togs are used by the fishing crew thus employing a relatively small amount of power to turn the string. In this manner, a better feel of the progress of the guide body is obtained. Additionally, by use of chain togs, the fishing string may be rotated in either a clockwise or a counterclockwise direction since the frictional contact of the threads of the bushing 13 is normally sufficient to prevent any unscrewing action until the teeth 27 contact the fish 21.

With the guide body 11 substantially fixed to the top of the fish, the fishing string 14 is rotated in a clockwise direction thus unscrewing the threaded portion 16 of sub 15 downwardly out of the threaded bushing 13. The fishing string 14 and tool 20 may then be lowered through the tubing member 26 and into the top of sub 15 where the desired operation may be carried out on the fish by further rotation of the tool 20 and fishing string 14. For example, the tool 20 may be an inside pipe cutter adapted to expand one or more cutters upon rotation to cut off the top of the fish. After the tool 20 has completed its operation, the tool 20 and the surrounding tool guide assembly 11—25—26 are both withdrawn from the well borehole or casing by pulling the fishing string 14 from the well. As the guide body 11 is withdrawn with the threaded bushing 13 still sets on the threaded portion of the sub 15, but need not be in threaded engagement therewith. In the event that the threads of either the bushing and sub become worn during the operation so as to permit the sub 15 to slide through the bushing 13, the tool, which is preferably of greater diameter than the bore of the bushing 13, will contact the inner wall of the bushing 13 so that the tool 20 and its guide will be raised together.

I claim as my invention:

1. A well tool guide adapted to be secured to the end of a fishing pipe string and run into a well borehole in which a tubular member is lodged, said tool guide comprising an elongated tubular guide body having an open lower end, the bore of said guide body having a larger diameter than the outside diameter of said tubular member, means closing the top of said guide body forming a bushing having a threaded bore therethrough coaxial to the bore of said guide body, a sub having a portion thereof in threaded engagement with the threaded bore of said bushing for axial and rotational movement therethrough, the diameter of said threaded portion being greater than that of the portion of the sub outside the guide body, means for securing said sub to the lower end of the fishing string, the threaded bore of said bushing having a diameter greater than the outside diameter of the lower portion of said fishing string, means at the lower end of the sub for securing a tool thereto, centering means carried within said guide body for positioning said guide body concentrically over the upper end of said tubular member, and means carried within said guide body for frictionally engaging said tubular member to prevent the rotation of said guide body upon rotation of the fishing string.

2. A well tool guide adapted to be secured to the end of a fishing pipe string and run into a well borehole in which a tubular member is lodged, said tool guide comprising an elongated tubular guide body having an open lower end, the bore of said guide body having a larger diameter than the outside diameter of said tubular member, means closing the top of said guide body forming a bushing having a threaded bore therethrough coaxial to the bore of said guide body, a sub having a portion thereof in threaded engagement with the threaded bore of said bushing for axial and rotational movement therethrough, the diameter of said threaded portion being greater than that of the portion of the sub outside the guide body, means for securing said sub to the lower end of the fishing string, the threaded bore of said bushing having a diameter greater than the outside diameter of the lower portion of said fishing string, means at the lower end of the sub for securing a tool thereto, centering means carried within said guide body for positioning said guide body concentrically over the upper end of said tubular member, and means carried within said guide body for frictionally engaging said tubular member to prevent the rotation of said guide body upon rotation of the fishing string.

3. A well tool guide adapted to be secured to the end of a fishing pipe string and run into a well borehole in which a tubular member is lodged, said tool guide comprising an elongated tubular guide body having an open lower end, the bore of said guide body having a larger diameter than the outside diameter of said tubular member, means closing the top of said guide body forming a bushing having a threaded bore therethrough coaxial to the bore of said guide body, a sub having a portion thereof in threaded engagement with the threaded bore of said bushing for axial and rotational movement therethrough, the diameter of said threaded portion being greater than that of the portion of the sub outside the guide body, means for securing said sub to the lower end of the fishing string, the threaded bore of said bushing having a diameter greater than the outside diameter of the lower portion of said fishing string, means at the lower end of the sub for securing a tool thereto, centering means carried within said guide body for positioning said guide body concentrically over the upper end of said tubular member, and means carried within said guide body for frictionally engaging said tubular member to prevent the rotation of said guide body upon rotation of the fishing string.
whereby said upper end is in frictional engagement with said tooth elements.

4. A well tool guide comprising an elongated tubular guide body adapted to be lowered over the upper end of a tubular fish in a well borehole, means closing the upper end of said guide body, said closure means having a threaded bore therethrough coaxial to the bore of said guide body, a sub having a portion thereof in threaded engagement with the threaded bore of said closure means, the diameter of said threaded portion being greater than that of the portion of the sub outside said guide body, coupling means on the upper end of said sub for attachment to the lower end of a fishing string, coupling means at the lower end of said sub for attaching a tool thereto, centering means secured to the inner wall of said guide body and radially extending across a portion of the bore thereof, and gripping means fixedly mounted within said guide body for frictionally engaging the upper end of the tubular fish.

5. A well tool guide comprising an elongated tubular guide body adapted to be lowered over the upper end of a tubular fish in a well borehole, means closing the upper end of said guide body, said closure means having a threaded bore therethrough coaxial to the bore of said guide body, a sub having a portion thereof in threaded engagement with the threaded bore of said closure means for downward axial movement therethrough, the diameter of said threaded portion being greater than that of the portion of the sub outside said guide body, a tool joint on the upper end of said sub for attachment to the lower end of a fishing string, coupling means at the lower end of said sub for attaching a small-diameter tool thereto, said tool being of a size sufficient to fit in the bore of the tubular fish, a tubular member affixed to the closure means of said guide body, said tubular member being shorter in length than said guide body and concentrically positioned therein, centering means carried within said guide body sloping at an angle downwardly from the lower edge of said tubular member to the inner wall of said guide body, and a plurality of downwardly pointing teeth formed in the lower edge of said tubular member for frictionally engaging the upper end of the tubular fish.

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