To all whom it may concern:

Be it known that I, William H. Lyne, a citizen of the United States, residing in the city of Houston, county of Harris, and State of Texas, have invented certain new and useful Improvements in Devices for Oil and Gas Wells, of which the following is a specification.

This invention relates to apparatus adapted to be used in drilling and operating deep wells such as oil and gas wells and has particular reference to means for prevention of blow-outs in such wells.

In drilling wells it often happens that strata of such high pressures are encountered that the drilling apparatus is blown out of the well or otherwise injured. The primary object of my invention is to provide means for preventing such disastrous occurrences.

Accordingly, therefore, I provide means for effectually closing or sealing the well when such high pressures are encountered, such means preferably embodying an arrangement by which an inner string of pipe may be suspended on the upper end of an outer string of pipe, suitable sealing means being provided on the seat between the two strings of pipe and the weight of the inner string of pipe being relied on to prevent the outflow of the pressure fluids.

A further object of the invention is to provide means for controllably releasing the fluids thus held in the well under pressure and discharging these fluids until the excess pressure is relieved.

The invention has particular reference to certain novel features of construction and arrangement of parts an example of which is given in this specification and illustrated in the accompanying drawings wherein:

Figure 1 is a sectional elevation of an apparatus constructed in accordance with the invention and constituting an embodiment thereof.

Figure 2 is a sectional elevation of a portion of the apparatus of Figure 1 and drawn to a larger scale than Figure 1.

Figure 3 is an elevation partially in section of the device shown in Figure 2.

Figure 4 is a cross section taken on the line 4—4 of Figure 2.

In the particular example of the invention illustrated in the drawings the invention is shown as applied in a hydraulic rotary drilling apparatus. 10 designates a rotary table of conventional construction which is mounted upon the derrick floor 11 and is driven by the pinion 12 fixed on the shaft 13. 14 designates an inner string of pipe or the drill stem which may be attached to the rotary 10 in any well-known manner, as by means of slips 15. The drill stem 14 is concentric with the outer casing 16 of the well. In drilling a well the rotary 10 rotates the drill stem 14 so as to operate a cutting tool positioned at the bottom of the drill stem while fluid is forced down through the hollow drill stem to wash away the boring or cuttings of the drill bit, as will readily be understood by those skilled in the art.

A section 17 is provided each end of which is threaded or provided with other means by which it may be attached to adjacent sections of the inner pipe 14. As illustrated, the section 17 is equipped with exteriorly threaded portions 18 adapted to engage in interiorly threaded portions of adjacent sections of the inner string of pipe 14. The member 17 is provided with a longitudinally extending passageway 19 which is preferably of substantially the same diameter as that of the inner diameter of the piping 14.

The member 17 is provided with a swaged or flared portion 20 which attains a diameter that is equal to or greater than the diameter of the well casing 16 so that when the inner string of pipe 14 is lowered the member 17 will rest upon the upper end of the casing 16 as at 21 thereby suspending the inner string of pipe upon the upper end of the outer string.

In order to provide for the escape of the pressure fluids when the inner string of pipe is suspended on the outer it is best to interpose packing means between the member 17 and its seat 21. As clearly shown in Figures 2 and 3 a packing sleeve 22 is positioned on the flared portion 20 of the member 17. The sleeve 22 may be composed of lead or other relatively soft metal or any material that is capable of being distorted so as to form a seal. The flared portion 20 may be provided with peripheral grooves 23 in order that the sleeve 22 may be firmly positioned thereon.

In order to provide for controllably releasing the pressure fluids when the member 17 has been seated on the outer casing I provide a suitable valve arrangement adapted to retain the fluids in the well until such time as the necessary connections can be made for properly disposing of the fluids. As illustrated, a valve 24 is suitably seated
in the member 17 so as to control the passage of fluid through the passageway 19. The valve is shown in the form of a cock but it is to be understood that any suitable type of valve may be employed. It is preferable to equip the valve with suitable locking means and as illustrated, a lock washer 25 is provided which may have an opening 26 adapted to engage the plug portion 27 of the valve and which may be held in place by means of a cap screw 28.

In operation when an area of excessive pressure is encountered drilling is suspended and the drill stem 14 is raised slightly so that the end of a section thereof is positioned just above the rotary table as shown in Figure 1. The drill stem is then disconnected from the swivel and hose stem and the member 17 is attached to the upper end of the drill stem. The slips 15 are then removed allowing the inner pipe 14 to descend and cause the member 17 to be seated on the upper end of the outer string of pipe.

The inner string of pipe is thus suspended on the seat 21 and by reason of the packing material 23 a seal is formed which prevents the egress of the pressure fluids from the well. The valve 24 is then closed and such connections as may be desired are made to the member 17 so that when the valve is opened the fluids from the well may be disposed of as may be desired.

Apparatus of preferred form and construction has been illustrated and described for the purpose of showing a way in which this invention may be used, but the inventive thought upon which the application is based, is broader than this illustrative embodiment thereof, and I therefore intend no limitations other than those imposed by the appended claims.

What I claim is:

1. In hydraulic well drilling apparatus, a well casing, a pipe connection adapted to be attached to a hollow drill stem and having an external periphery of greater diameter than that of the well casing, and a valve positioned within said connection.

2. In combination with a drill stem of a hydraulic well drilling apparatus, a pipe connection threaded at each end by means of which it may be attached to said drill stem and having a flared portion adapted to be seated upon the upper end of the well casing, a sleeve fixed to said flared portion and composed of a material capable of being distorted to form a seal, and a valve disposed in the pipe connection for controlling the passage of fluid therethrough.

3. In hydraulic well drilling apparatus, an inner string of pipe, an outer string of pipe, a connection attached to said inner pipe and having an outwardly swaged portion adapted to be seated on the upper end of said outer pipe and thus support said inner pipe thereon, and a valve adapted to control the passage of fluid through said inner pipe.

4. In hydraulic well drilling apparatus, an inner string of pipe, an outer string of pipe, a connection attached to said inner pipe and having an outwardly swaged portion adapted to be seated on the upper end of said outer pipe and thus support said inner pipe thereon, a valve adapted to control the passage of fluid through said inner pipe and a packing member adapted to be interposed between the swaged portion of said connection and the upper end of said outer pipe.

5. A pipe section each end of which includes a swaged portion of reduced diameter, a threaded portion at each end of said section, a valve arranged to control the passage of fluid through said section, and a sleeve fixed on one of said swaged portions composed of material adapted to be distorted to form a seal.

6. In hydraulic well drilling apparatus, a well casing, a drill stem partially disposed within the casing, a connection attached to the drill stem and having an outwardly swaged portion adapted to be seated on the upper end of the well casing, packing material secured to the swaged portion for making a tight connection with the well casing, means including a rotatable table through which the upper end of the drill stem extends disposed above the well for rotating the drill stem, and removable key members for securing the drill stem to the table and adapted to be removed to permit the lowering of the swaged portion for seating upon the well casing.

In witness whereof, I have hereunto set my hand this 3rd day of June 1922.

W. H. LYNE.