

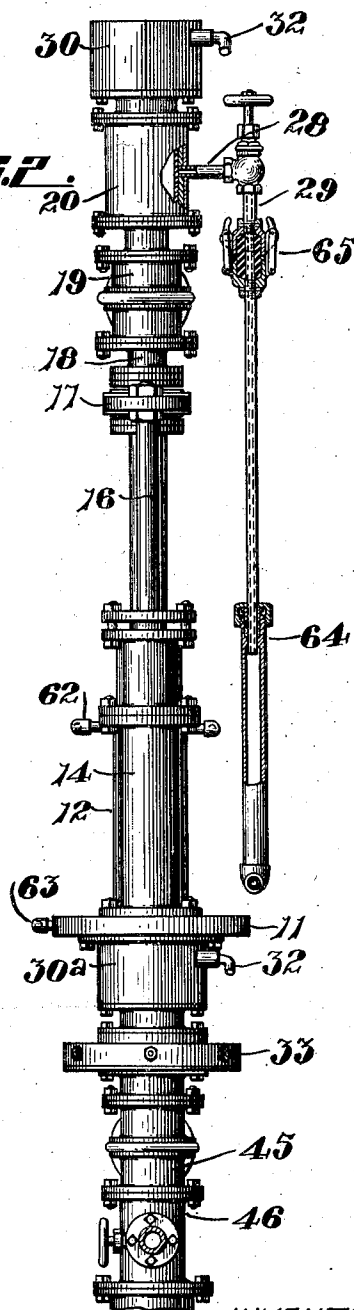
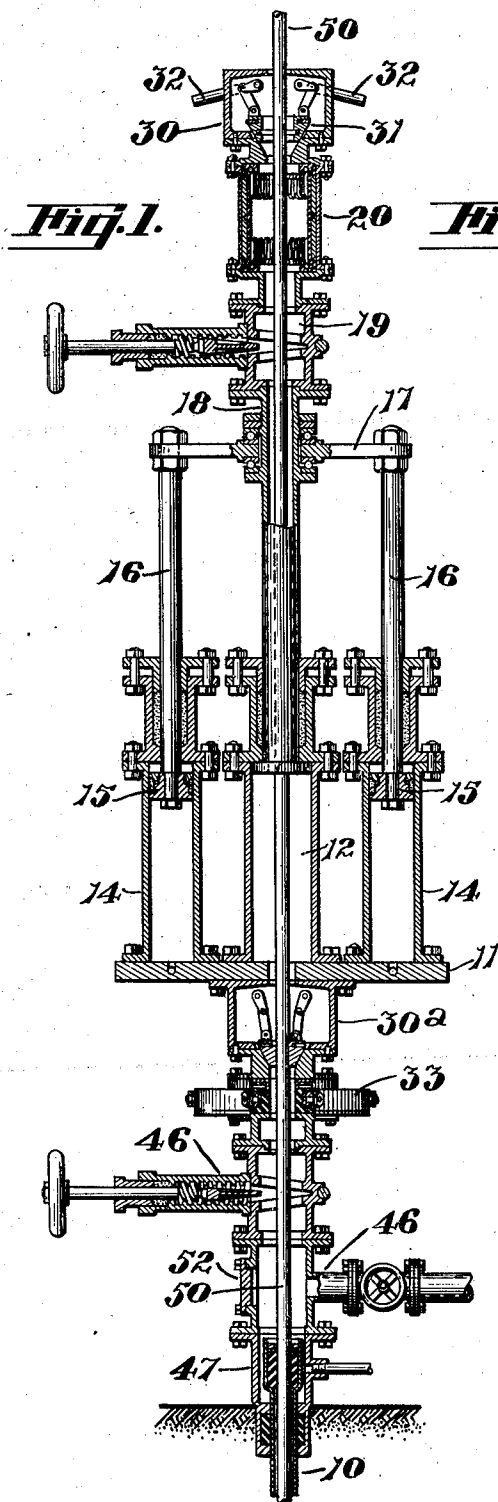
June 1, 1926.

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E. E. TOWNSEND
WELL DRILLING EQUIPMENT

Filed Feb. 18, 1924

5 Sheets-Sheet 1



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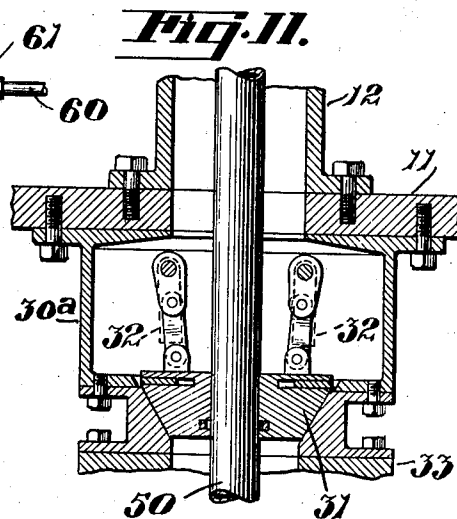
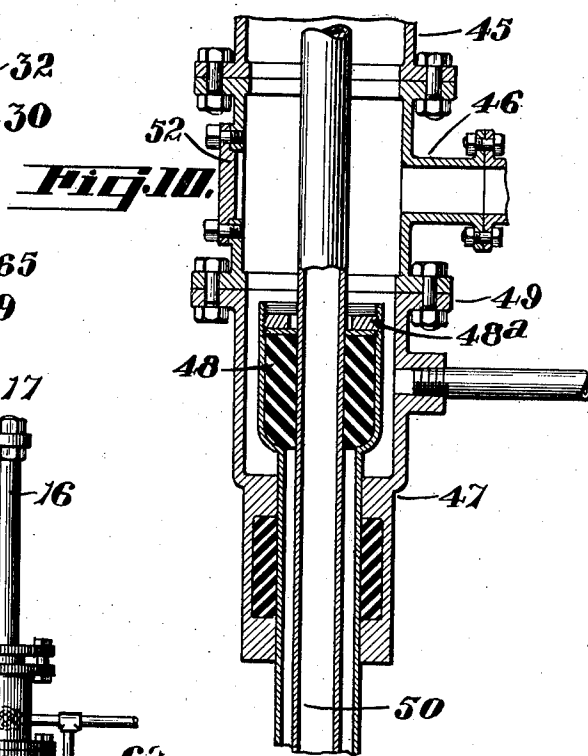
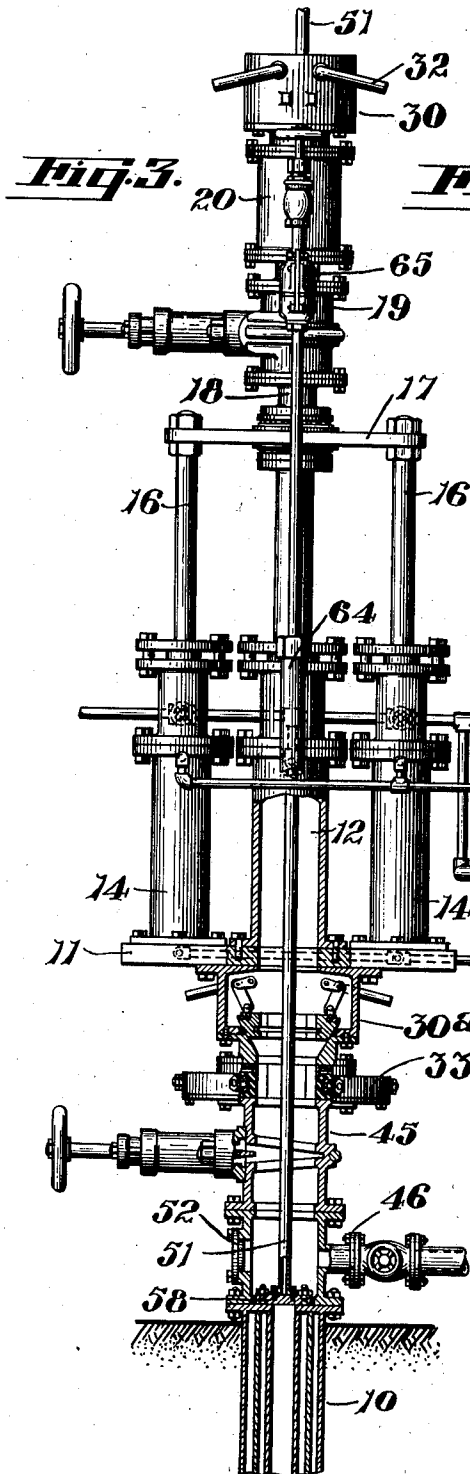
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5 Sheets-Sheet 2



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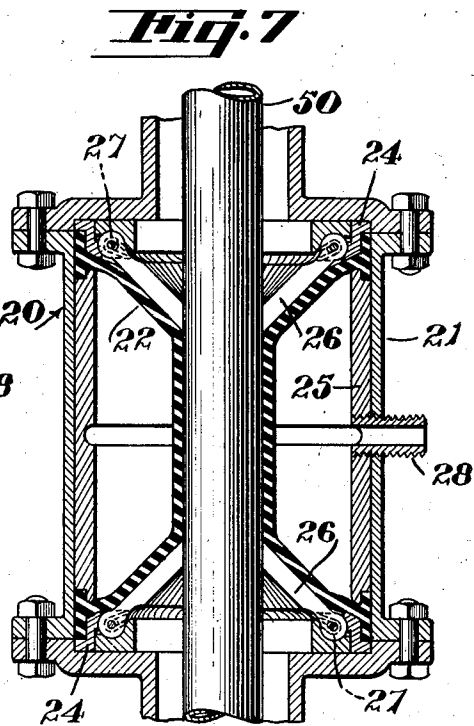
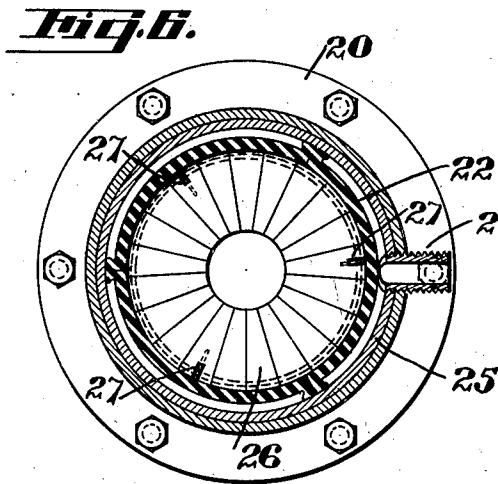
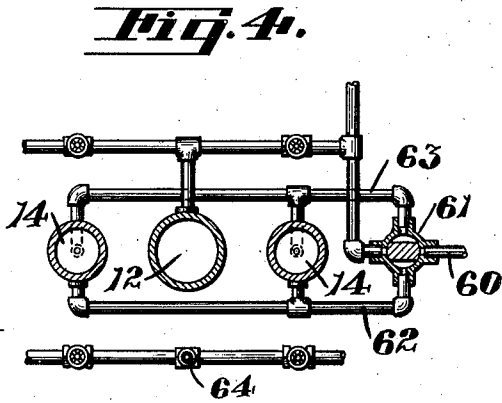
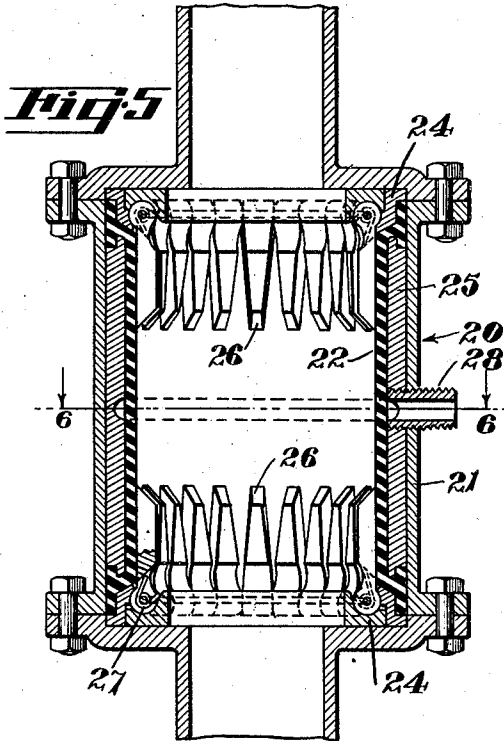
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5 Sheets-Sheet 3



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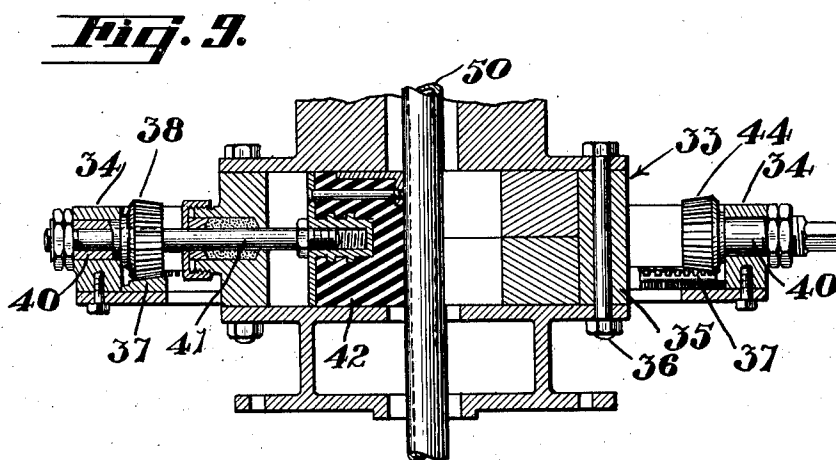
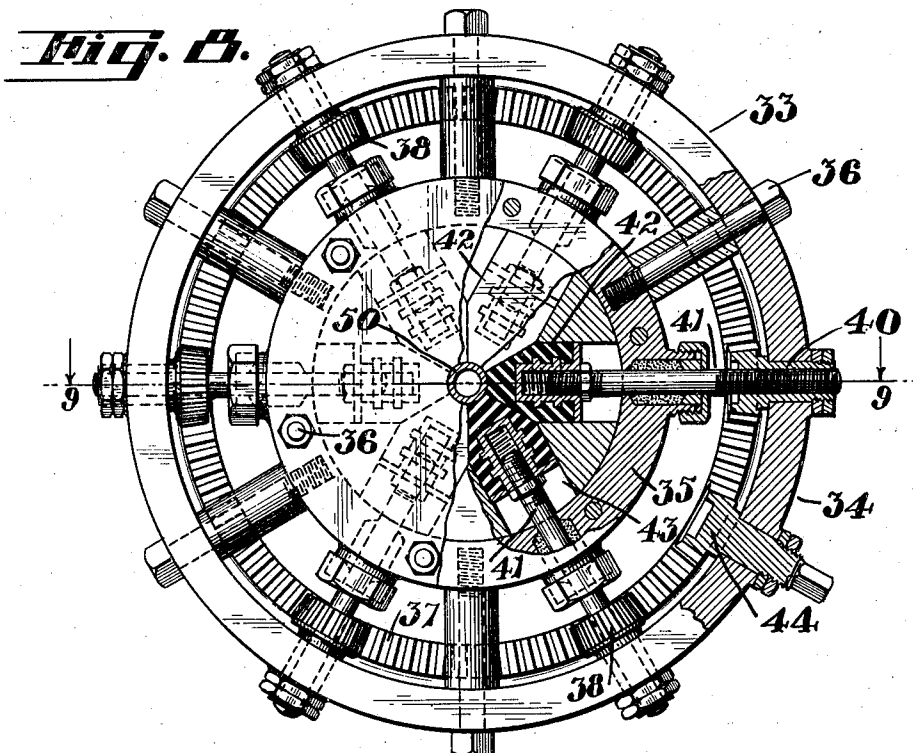
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5 Sheets-Sheet 4



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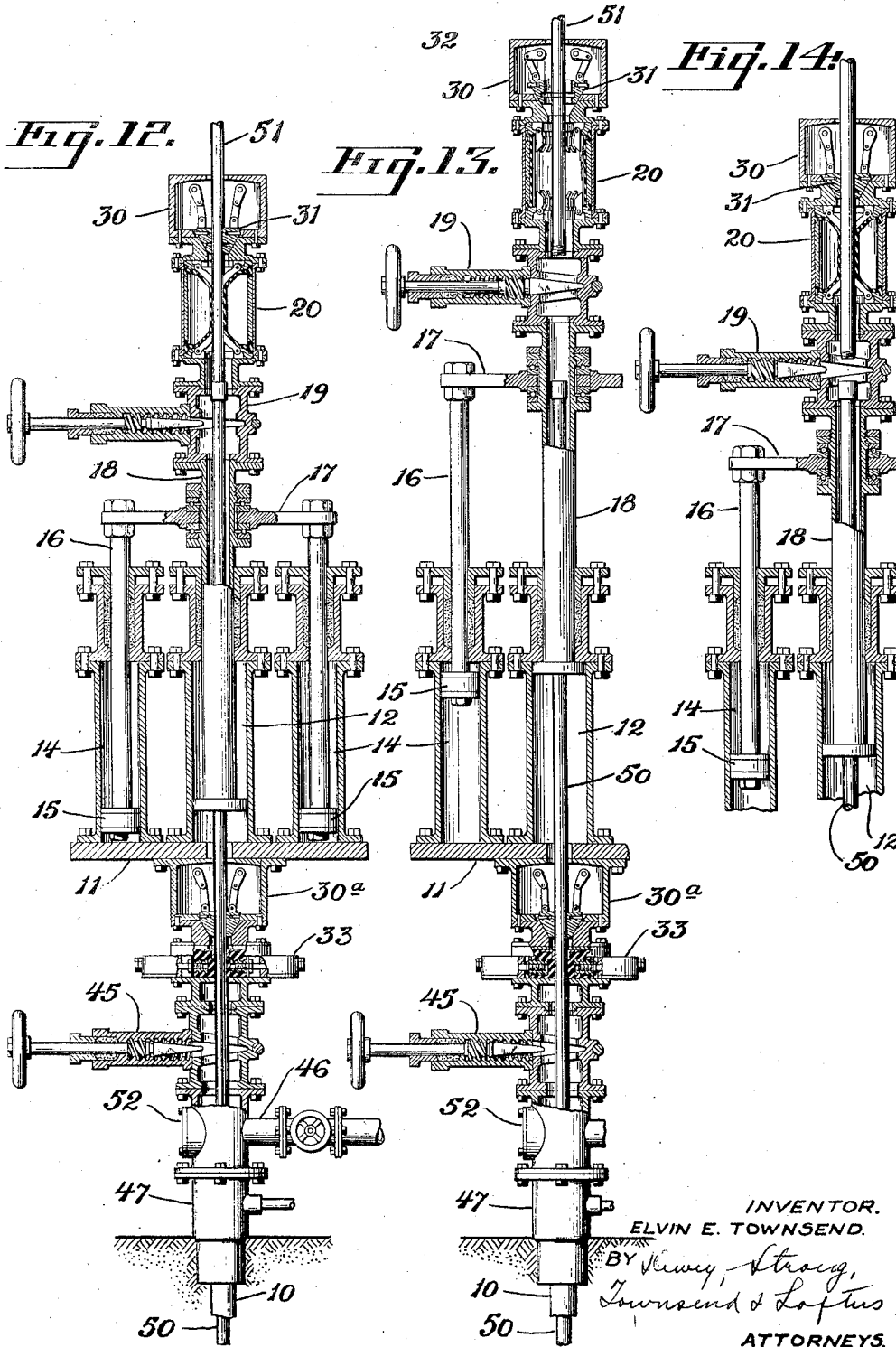
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WELL DRILLING EQUIPMENT

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5 Sheets-Sheet 5



UNITED STATES PATENT OFFICE.

ELVIN E. TOWNSEND, OF WATSONVILLE, CALIFORNIA.

WELL-DRILLING EQUIPMENT.

Application filed February 18, 1924. Serial No. 693,532.

This invention relates to well drilling equipment.

It is the principal object of the present invention to provide an improved apparatus capable of use in rapidly lowering drilling equipment and casings into a well or removing such elements from a well without permitting the escape of fluid from the latter, whereby to expedite well drilling and operations incident to well drilling.

In carrying out this object I provide an apparatus including a built-up telescoping housing which may be mounted vertically over the mouth of a well. The ends of this housing are equipped with devices for engaging and forming a fluid-tight connection between the housing and the drill pipe or other element projecting upwardly through the apparatus from the well. The devices mentioned may be alternately operated to raise or lower the drill pipe or casing without unsealing the mouth of the well. The devices are also capable of use in capping and uncapping wells.

One form of which the invention may assume is exemplified in the following description and illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a central vertical section through an apparatus embodying the preferred form of my invention and shown as mounted upon a sealed well.

Fig. 2 is a side elevation of the same.

Fig. 3 is an elevation of the apparatus with parts in section showing the same mounted in the top of the well and in use capping a well.

Fig. 4 is a diagrammatical view disclosing the arrangement of the fluid pressure pipes for delivering fluid pressure to the operating cylinders.

Fig. 5 is an enlarged vertical section through the upper seal.

Fig. 6 is a horizontal section through the same, taken on line 6—6 of Fig. 5.

Fig. 7 is an enlarged vertical section through the upper seal showing it in contracted position.

Fig. 8 is a plan view of the lower seal with parts broken away to more clearly disclose its construction.

Fig. 9 is a vertical section through the same taken on line 9—9 of Fig. 8.

Fig. 10 is an enlarged view of the end of

the well with an ordinary type of seal applied thereto.

Fig. 11 is an enlarged view of one of the clamps with parts in section to more fully disclose its construction.

Figs. 12, 13 and 14 are views in central vertical section through the apparatus disclosing the different positions and operations by which a drill pipe or casing may be removed from the well in sections without unsealing the well.

Referring more particularly to the accompanying drawings 10 indicates the upper end of a well assembled upon which is my improved apparatus. The latter includes a base plate 11 upon which is fixed a central guide cylinder 12 and a pair of operating cylinders 14. The latter are positioned one at each side of the guide cylinder as shown in Fig. 1. The operating cylinders are each fitted with a plunger 15 and a plunger rod 16, which are intended to be reciprocated by pressure admitted to the ends of the cylinders. The upper ends of the plunger rods are connected by a yoke 17. The guide cylinder is fitted with a guide sleeve 18 which is journaled adjacent its upper end in the yoke 17. The lower end of the guide sleeve is fitted with a plunger reciprocably mounted in the guide cylinder 12. It will be noticed in Fig. 1 that the upper ends of all of the cylinders mentioned are fitted with packing glands.

At the upper extremity of the guide sleeve 18 I mount an upper gate valve 19 which in turn is connected with what I prefer to term an upper seal 20, which is most clearly illustrated in Figs. 5 to 7, inclusive. Reference being had to these figures it will be seen that the upper seal comprises an outer cylindrical casing 21 which is formed at its ends with flanges whereby it may be connected to adjacent parts of the apparatus.

Fixed at its ends within the cylindrical casing 21 is a flexible sleeve 22, preferably formed of rubber. The ends of this sleeve are clamped into position within the cylindrical casing 21 by means of pairs of clamping collars 24 and a clamping sleeve 25. Pivottally connected to the clamping collars 24 at each end of the seal is a set of gripping members 26. These members are tapered and when the flexible sleeve is contracted by means of hydraulic or pneumatic pressure

they unite to form a substantially solid conical collar around a pipe or the like extending through the seal. The gripper members are fitted with flat springs 27 which tend to maintain the grippers in expanded position as shown in Fig. 5. It will be seen in Fig. 7 that the conical gripping collars extend in opposite directions. These collars serve to grip the pipe extending through the seal and to limit the contraction of the flexible sleeve as well as protect the ends thereof.

To contract the flexible sleeve to form a seal around a pipe extending through the apparatus I fit the casing 21 with a pipe nipple 28 which extends through the casing 21 and the clamping sleeve 25 and is in communication with an annular groove formed in the latter. The pipe nipple is connected by a pipe 29 to a source of fluid pressure.

Mounted above the seal is a clamp 30 which comprises a casing having a frusto-conical bore formed at its lower end. Segmental clamping jaws 31 are mounted in this casing for cooperation with the conical bore mentioned. These clamping jaws are fitted with operating levers 32 by which they may be placed into engagement with the conical bore and thereby contract to grip a pipe or the like extending through the apparatus.

A similar clamp 30^a is located beneath the base 11, which lower clamp cooperates with a lower seal 33. This seal is most clearly illustrated in Figs. 8 and 9 of the drawings. Reference being had to these figures it will be seen that the device comprises an outer ring 34 and an inner ring 35 which are rigidly connected by bolts 36. The outer ring supports a turnable bevel gear 37 which is in constant mesh with pinions 38 formed on radially disposed shanks 40, the latter of which are journaled in the outer rings mentioned. The outer ends of spindles 41 are threaded through the shanks 40. The inner ends of the spindles connect with resilient segmental members 42, which are adapted to unite to form a seal about a pipe or the like led through the apparatus. The members 42 are interposed between top and bottom plates secured on the inner ring and are radially slidable in guideways 43.

To rotate the bevel gear 37 I journal the shank of a bevel pinion 44 in the outer ring 34. The outer end of the shank of the bevel pinion mentioned is formed square so that it may be rotated by means of a socket or a like wrench. It is obvious that when the ring gear 37 is rotated the spindles carrying the segmental members 42 will be advanced or retracted radially in unison.

Connected to the lower end of the lower seal 33 and in communication therewith is a lower gate valve 45. This valve is connected with the top of a T-fitting 46 which is directly connected to the top of the well.

The horizontal arm of this fitting is connected to a discharge pipe through the medium of the control valve.

For the purpose of illustration, in Fig. 1 I have shown the top of the well sealed in the usual manner. In Fig. 10 this seal is shown in detail and comprises a sleeve 47 which is placed over the well casing and connected thereto. The upper end of the well casing is slightly enlarged and a rubber packing gasket 48 is clamped in the enlarged end around the drill pipe. This gasket is clamped into place by a clamping nut 48^a which is threaded into the enlarged end of the casing.

When assembling my approved apparatus upon the well for the purpose of removing the drill pipe the clamping nut 48^a is first removed. The apparatus is then assembled over the drill pipe and connected at its lower end to the top flange 49 of the sleeve casing 47. The apparatus is then placed in use, as will be described, to raise the drill pipe. When the drill pipe is raised the gasket 48 will be removed with it.

When it is desired to use the apparatus to remove the drill pipe the lower seal 33 is closed around the pipe and pressure is exhausted from the bottom of cylinders 14 to place the guide sleeve 18 in its lowermost position. The upper clamp 30 is then actuated to tightly grip the drill pipe which is indicated at 50 in Fig. 1. Pressure is then admitted to the upper seal 20 to form a fluid-tight seal around the pipe 50. The lower seal 33 is then opened and pressure is admitted to the bottom of the cylinders 14 to raise the guide sleeve 18 and the mechanism connected therewith. As the upper seal 20 and the clamp 30 will be tightly connected to the drill pipe the latter will be raised simultaneously with the guide sleeve. The lower clamp 30^a is then actuated to grip the pipe and the lower seal 33 is clamped to the pipe and the upper clamp and seal are released. The pressure is then admitted to the top of the cylinders to lower the sleeve 18 and the mechanism connected therewith. The operation is then repeated to raise the drill pipe a second step.

Should the drill be of a length necessitating its removal by sections it is raised by the operations described until when the sleeve 18 is in its lowermost position the joint between the sections will be above the clamp 30^a. The joint is then broken but the drill sections are not entirely disconnected. During these operations the lower clamp and seal are maintained tightly in engagement with the drill pipe. Pressure is then admitted to the bottom of the cylinders 14 to raise the guide sleeve 18 and its associating mechanism sufficiently to place the joint just below the valve 19. The upper seal 20 is then closed and the guide

sleeve 18 and the mechanism connected thereto are revolved to entirely separate the two sections of the drill. When this has been accomplished the guide sleeve is raised further to separate the sections of the drill and to permit the upper valve 19 to be closed. The upper seal 20 and the clamp 30 may then be released and the uppermost section of the drill removed from the apparatus. A suitable tool carrying a plug at its lower end may then be lowered into the apparatus. The clamp 30 and the seal 20 are then placed in operation to grip the tool. The valve 19 is then opened and pressure is admitted to the top of the cylinders to lower the sleeve 18 to engage the plug carried by the tool with the end of the drill pipe. The sleeve 18 may then be revolved to thread the plug into the end of the drill pipe. During the latter operation the lower clamp and seal are used to hold the lower part of the drill.

For supplying fluid pressure to the cylinders and to the upper seal 20 I provide a fluid supply pipe 60 which may be connected with any suitable source of fluid pressure. This pipe connects with a four-way valve 61 which in turn is connected with the top and bottom of the cylinders by pipes 62 and 63. This valve is also connected with the pipe 28 which is fitted with a telescoping joint 64. A quickly detachable union 65 is interposed in the pipe line 28 to permit the latter to be disconnected when it is desired to rotate the sleeve 18 and its associated mechanism.

Referring to Fig. 3, when the drill has been removed and it is desired to recap the well, the lower gate valve 45 is closed and the portion of the apparatus above the gate valve is disconnected therefrom and elevated. A cap 58 is then placed in the valve casing of the lower gate valve above the valve member therein and a turning tool 51 is lowered through the apparatus and connected at its lower end to the cap 58. The apparatus is then reconnected to the top of the valve 45 and the guide sleeve 18 and its associated mechanism is raised to its uppermost position. The upper seal and clamp are then actuated to tightly grip the turning tool 51. Pressure is then exhausted from the bottom of the cylinders 14 to cause the guide sleeve 18 and the upper clamp and seal to lower and thereby force the cap 58 downwardly into engagement with the top of the well to close the same. A hand plate 52 may then be removed from the T-fitting 46 to permit cap 58 to be bolted to the top of the well. The apparatus may then be removed if desired.

While I have described but two uses to which my apparatus may be put, it is understood that it is capable of a wide variety of uses, including the insertion and removal

of drill pipes, tools and casings, and that by its use these various operations may be performed without unsealing the mouth of the well.

The apparatus may also be used while drilling. That is, the drill pipe may be held by the upper clamp and seal. Thus, the sleeve 18 will revolve with the drill and the mouth of the well will be kept closed.

While I have shown the preferred form of my invention, it is understood that various changes in its construction may be made without departing from the invention as defined in the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. An apparatus of the character described comprising a vertically telescoping housing adapted to be mounted over the mouth of a well, and normally ineffective packing elements at the opposite ends of said housing, said packing elements being adapted to be independently operated and each capable of forming a fluid tight joint around a pipe or the like extending into said housing to prevent the passage of fluid through the housing.

2. An apparatus of the character described comprising a vertically telescoping housing adapted to be mounted over the mouth of a well, normally ineffective means adapted to be independently operated and capable of connecting an element extending into said housing to said housing, and normally ineffective packing elements at the opposite ends of said housing, said packing elements being adapted to be independently operated, and each capable of forming a fluid tight joint around a pipe or the like extending into said housing to prevent the passage of fluid through the housing.

3. An apparatus of the character described comprising a lower housing adapted to be mounted over the mouth of the well, an upper housing telescopically connected to the lower housing, said upper housing being capable of vertical reciprocation and rotating movement, and normally ineffective packing elements carried by each of the housings, said packing elements being adapted to be independently operated and each capable of forming a fluid tight joint around a pipe or the like extending into said housing to prevent the passage of fluid through the housing.

4. An apparatus of the character described comprising a lower housing adapted to be mounted over the mouth of the well, and upper housing telescopically connected to the lower housing, said upper housing being capable of vertical reciprocation and rotating movement, normally ineffective packing elements carried by each of the housings, said packing elements being

adapted to be independently operated and each capable of forming a fluid tight joint around a pipe or the like extending into said housing to prevent the passage of fluid through the housing, and operating means for reciprocating the upper housing.

5. An apparatus of the character described comprising a vertically arranged lower housing adapted to be fixed over the mouth of a well, a rotatable and vertically reciprocable upper housing arranged in longitudinal alignment with said lower housing and telescopically connected thereto, operating means for reciprocating said upper housing, a gate valve forming a section of the upper housing, independently operated means carried by each of the housings for connecting an element extending into said housings to said housings, and normally ineffective means carried by the housings capable of forming a fluid-tight joint around a pipe or the like extending into said housings.

6. An apparatus of the character described comprising a vertically arranged lower housing adapted to be fixed over the mouth of a well, a rotatable and vertically reciprocable upper housing mounted in longitudinal alignment with said lower housing and telescopically connected thereto, operating cylinders operatively connected to said upper housing for vertically reciprocating the same, a gate valve forming a section of the upper housing, normally ineffective means in each housing and capable of independent operation to clamp a pipe extending through said housings to said housings, and normally ineffective sealing

means in each housing capable of forming a fluid-tight joint around a pipe or the like extending into said housings.

7. An apparatus of the character described comprising a lower housing adapted to be fixed over the mouth of a well, an upper housing forming a continuation of the lower housing, said upper housing being telescopically connected to said lower housing and capable of rotating and reciprocating movement, a pair of operating cylinders connected to the lower housing, plungers in said cylinders, said plungers being operatively connected to said upper housing for reciprocating the same, a gate valve in the upper housing capable of closing the passage through the same, clamping means carried by each housing for clamping a pipe or the like extending through said housings to said housings, sealing means in each housing for forming a fluid-tight joint around a pipe or the like, extending into said housings, to entirely prevent the passage of fluid through said housing.

8. In a device of the character described a seal comprising an outer cylindrical casing, a flexible sleeve fixed at its ends within said casing, means for admitting fluid under pressure between said flexible sleeve and said casing to cause the sleeve to contract and grip an object extending through said casing, and a set of segmental members pivotally mounted at each end of said casing, the members of each set being adapted to cooperate to form a conical collar when said sleeve is contracted, said conical collars being oppositely disposed.

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