

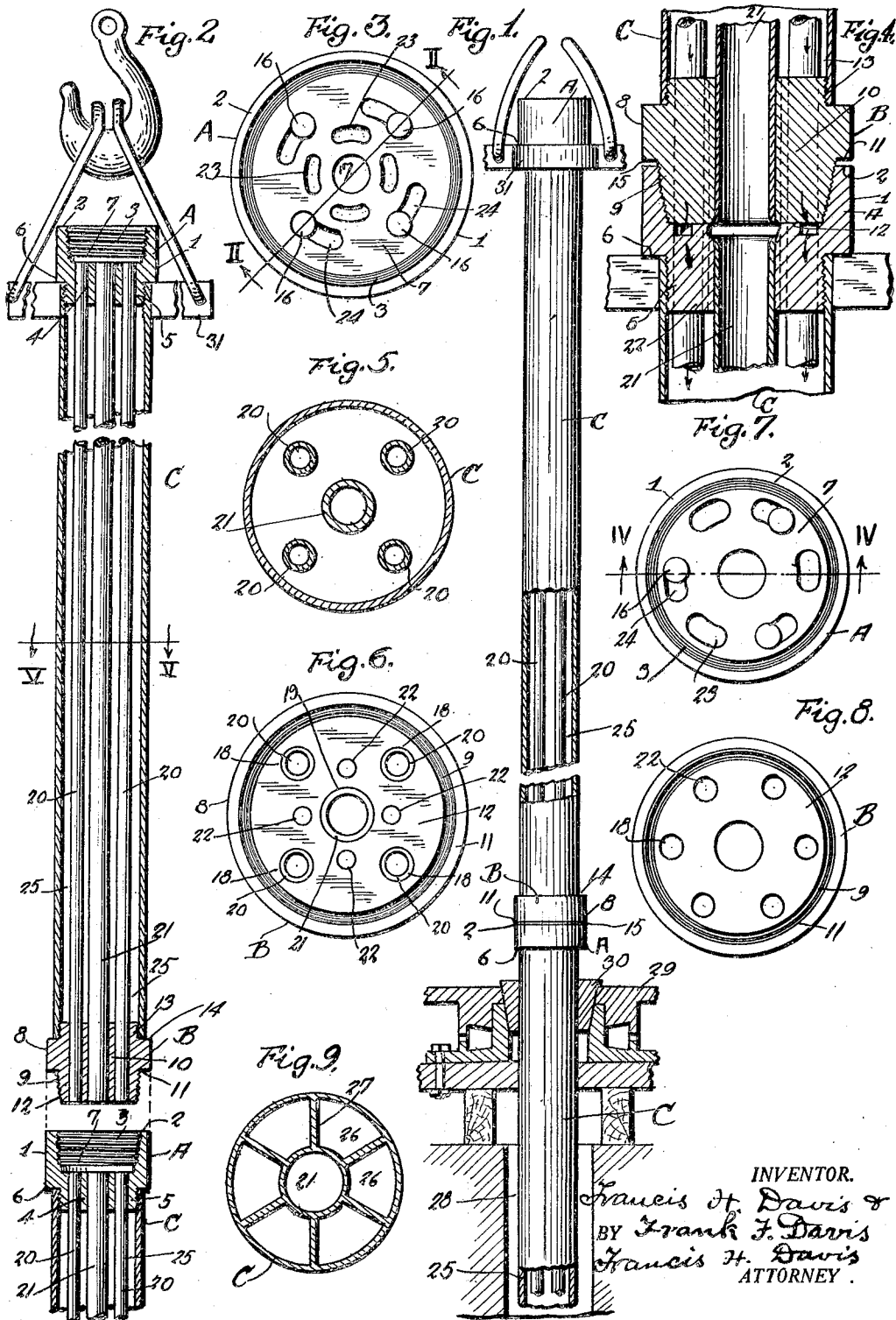
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MULTIPLE PIPE UNIT ADAPTABLE TO THE DRILLING AND PUMPING ARTS

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MULTIPLE PIPE UNIT ADAPTABLE TO THE DRILLING AND PUMPING ARTS

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This invention relates to the drilling of boreholes or wells, and the production therefrom of water, oil, gas, brine, sulphur or other products to be obtained by drilling.

In the oil regions holes approximately 9000 feet deep have been drilled and it is desirable to drill still deeper.

Serious physical, mechanical and financial problems have arisen in connection with the drilling and pumping of holes of such depths; problems which increase rapidly as greater depths are attempted.

In respect to the drilling problem, great advantage would be gained if a drill bit either percussive or rotary could be operated by means such as an air engine or an electric motor disposed down the borehole, close to the work, instead of by rotating a drill bit by means of a string of drill rod revolved at the surface with all its attendant friction against the wall of the hole and wear of parts; or by applying walking-beam action to reciprocate the weight of a churn drill and its mile or so of cable.

In respect to the pumping problem involved, it is most desirable to place a series of pumps down a well, so as to pump by stages, each pump being provided with its own motive power adjacent thereto, whereby each pump raises its own column of pumped fluid a certain height and then transfers it to the next pump above, thereby distributing the load instead of attempting to handle the fluid in a single column.

In either case, no matter whether drilling or pumping by sub-active means it is necessary to provide a plurality of pipes extending down the bore hole or well to convey different fluid matter up and down the hole; such as oil, or gas from the productive measures, and motive agent such as compressed air, electric power or steam from the surface to the sub-active motive means for running said pumps or drills.

It should be noted that such strings of pipe have to be handled into or out of the holes quite frequently, an arduous task which up to the present has militated against the use of drills and pumps of the character described.

We are aware that before our present in-

vention multiple strings of pipe have been used for conveying fluid in boreholes and wells, but in all cases the different individual pipes have had to be screwed together separately and provided with individual packing means which had to be applied and removed at each coupling-together of the different pipe sections when putting in or pulling out of hole.

The primary object of our invention therefore, is to provide multiple-pipe units, each unit handlable as one individual length of pipe and provided with screw threaded means for coupling a series of such pipes together end to end.

A unit of pipe in accordance with our invention comprises, an outer elongated, tubular casing or body, having closure members at each end thereof provided with screw-threaded elements for connecting a series of such pipes together for drilling or pumping purposes. Said closure members being axially and co-incidentally perforated to receive one or more tubes passing longitudinally through said casing; the respective tube ends being rolled as boiler flues are rolled, and beaded, welded or otherwise secured to the respective closures so as to withstand heavy internal and external pressures.

A unit constructed in the above manner not only provides multiple fluid conduits, but affords a re-enforced structure of great torsional and tensional strength which is of great importance in the art where such excessively long strings of drill-pipe have to transmit power, sustain their own weight and are occasionally subjected to heavy strains, as when stuck in the hole.

The coupling means are preferably of the "tool-joint" type familiar to the art, and provide a shouldered portion adjacent the upper end of each unit whereby a unit or string of units may be suspended by the well known elevator means which co-acts against the under side of the shoulder.

A further object is to provide a plurality of tubes within a tubular unit and so arranged that when a series of such units are coupled together to form a "string" of pipe each internal tube will be separate and con-

tinuous throughout the entire series or string.

Another object of our invention is to provide means to prevent the circumferential creep of the coupling joints, due to wear of the contacting closure surfaces, shutting off fluid communication between related tubes of contiguous units; and at the same time preventing escape of fluid from any individual tube to a non-related tube.

An important object is to provide an outer casing for each unit which may be used as a conduit and also as means to drive a rotary drill bit; said casing being further adapted to co-operate with the conical wedge elements in familiar use with drilling apparatus for the support of strings of pipe when being handled in or out of the hole.

A further object of the invention is to provide means for fluid communication extending through said joints whereby fluid may pass from the casing of one unit to the casing of adjacent units; and means whereby fluid flow is established through the various tool joints from the relative tubes of one unit to the companion tubes of the adjoining units.

These objects are attained by the peculiar arrangement, construction and relative combination of parts comprehended on our invention, set forth in the specification, pointed out in the claims and illustrated in the accompanying drawing forming a part thereof, in which:—

Figure 1 shows an elevation of a string of pipe illustrating our invention in relation to a borehole.

Figure 2 shows an elevational mid-sectional view of the invention.

Figure 3 shows a top plan view of the female coupling.

Figure 4 shows a vertical section taken on the line IV—IV of Figure 7.

Figure 5 shows a section taken on the line V—V of Figure 2.

Figure 6 shows a bottom plan view of the male coupling B.

Figure 7 shows a top plan view of a female coupling arranged for a different number of internal tubes or conduits.

Figure 8 shows a bottom plan view of the male coupling arranged to cooperate with the female coupling shown in Figure 7.

Figure 9 is a cross section through a multiple-pipe of the present invention showing a secondary construction.

Similar indicia of reference refer to similar parts throughout the several views:—

In carrying out our invention we provide a tubular body or casing C having the coupling elements A and B secured to the respective upper and lower ends thereof. Obviously, various other forms of couplings could be employed without departing from the spirit of the invention; but, for the purpose of this specification, we prefer to illustrate couplings presenting the general outward ap-

pearance of the "tool-joints" known to the art.

Referring to the drawing it will be noted that the coupling element A comprises the body 1, the face 2, the internally-threaded recess 3, the closure portion 4, the screw-threaded plug portion 5, the shoulder 6 and the contact table 7.

The coupling element B comprises the body 8, the externally-threaded pin 9, the closure portion 10, the pin shoulder 11, the pin contact table 12, the plug portion 13, and the shoulder 14.

In order to have a clear understanding of the invention it should be stated that in the process of manufacture, the blanks for the elements A and B are first machined to screw together as shown in Figure 4, with the respective planes of the tables 7 and 12 in precise contact with each other, but leaving a slight space 15 between the face 2 and the shoulder 11, thereby affording a positive leak-proof contact between the respective contact tables. The respective plug portions 5 and 13 are screwthreaded to interengage complement means at the respective ends of the casing C. The casing C is of any suitable length that can be transported by ordinary means or handled in a derrick, the longer the better as requiring fewer coupling elements.

A coupling element A and a coupling element B are provided for each casing C, the respective parts being very solidly drawn together with the respective ends of said casing abutting firmly against the adjacent shoulders 6 and 14. For additional strength, and to guard against circumferential movement of any component part with relation to the others, said abutting parts may be welded together, thereby affording additional tensional and torsional strength to the unit.

Assuming that a multitubular unit as represented by Figures 2, 3, 5 and 6 is to be constructed, and that the partly finished coupling elements A and B are connected with a casing C as above described, it will be noted that said casing with its respective closures 4 and 10 imperforated constitutes a hermetically sealed, tubular unit arranged to be interchangeably attached to others of its kind.

A concentric series of holes as 16, and the central hole 17, are now drilled axially perforating the closure portion 4 of the element A; holes as 18, and the central hole 19, are now drilled axially perforating the closure portion 10 of the element B, all the holes 18 being in vertical alinement with the holes 16. The embouchures of all said holes are preferably enlarged with a broach tapering inwardly of said casing.

The tubes 20 and the tube 21 are now assembled in the casing C through the respective holes, being a nice fit therefor and cut the proper length to form a flush joint after

being expanded, welded or otherwise secured individually to the contacting structure of the respective closure portions 4 and 10.

It should be noted that the holes 22 are drilled to axially perforate the element B, the holes 23 are provided to communicate therewith, the latter being slotted to guard against fluid being shut off by circumferential creep of said coupling elements.

It will be further noted that recesses as 24 are provided in the table 7 one leading to each tube 20. Said recesses being preferably arcuate and struck with the same radius that cuts the center of said tubes 20. As the object of said recesses is to maintain open communication between the tubes 20 of one unit with the related tubes of contiguous units we arrange the machining of the coupling elements A and B so that, when first in use, fluid flowing from the tubes 20 of one unit will follow the recesses as in an offset conduit which gradually shortens as the related tables wear and abut against each other at different points approaching vertical alignment of the tubes 20 of contiguous units.

Constructed as above described the multitubular unit of our invention comprehends six individual conduits; namely, the four tubes 20, the tube 21 and the space 25 which comprises the space within the casing C surrounding said respective tubes.

Figures 4, 7 and 8 illustrate a multitubular unit comprehending five conduits, comprising three tubes 20, the central tube 21 and the casing interior 25.

The Figures 2, 3, 5 and 6 contrasted with the Figures 4, 7 and 8 are not intended to represent primary and secondary construction, but are given to show the adaptability of our invention as being capable of using a fewer number of tubes in boreholes of less diameter. Figure 9 however shows a multitubular unit of secondary form comprising the central conduit which corresponds to the tube 21 and the cellular conduits 26 set off from each other by the webs 27 disposed radially in the annular space between the exterior of the tube 21 and the interior of the casing C, said webs obviously extend throughout the length of the unit and are adapted to cooperate with the respective coupling elements A and B to provide means to convey a plurality of individual fluid substances throughout a string of similar units.

In Figure 1 we show an elevational view of coupled multitubular units of our invention in relation to a borehole 28 provided with a conventional rotary apparatus 29, having the wedge slips 30 and the elevator 31 coactable against the shoulder 6 of the coupling elements A. As so coupled fluid can pass from unit to unit through the individually related tubes and fluid passage is assured from the spaces 25 of one unit to another through the respective holes 22 and 23.

It is believed that the construction, operation and advantages of the invention will now be clearly understood. The present embodiments of the invention have been disclosed in detail merely by way of example, since in actual practice they attain the features of advantage set forth as being desirable in the statement of the invention and the above description.

Numerous changes in the details of construction, and in the combination and arrangement of parts may be resorted to without departing from the spirit or scope of the invention as hereinafter claimed or sacrificing any of its advantages.

We claim:—

1. As a new unitary article of manufacture, a multitubular pipe comprising an outer casing, a plurality of longitudinal internal tubes traversing the casing and rigidly mounted therein, a coupling element at each end of the casing having an outwardly disposed contact table and external shoulders on the coupling elements outwardly of the contact tables normally spaced when the tables are contacting to permit further adjustment of the elements to compensate for wear.
2. As a new unitary article of manufacture, a multitubular pipe comprising an outer casing, a plurality of longitudinal internal tubes traversing the casing and rigidly mounted therein, a coupling element at each end of the casing having an outwardly disposed contact table and external shoulders on the coupling elements outwardly of the contact tables normally spaced when the tables are contacting to permit further adjustment of the elements to compensate for wear, each coupling having a closed wall provided with bores into which the ends of the tubes are set.

3. As a new unitary article of manufacture, a multitubular pipe comprising an outer casing, a plurality of longitudinal internal tubes traversing the casing and rigidly mounted therein, a coupling element at each end of the casing having an outwardly disposed contact table and external shoulders on the coupling elements outwardly of the contact tables normally spaced when the tables are contacting to permit further adjustment of the elements to compensate for wear, each coupling having a closed wall provided with bores into which the ends of the tubes are set, and one of said couplings having an arcuate groove extending from each bore to assure registration of the tubes of adjacent casings.

In testimony whereof we affix our signatures this 19 day of January 1931.

FRANCIS H. DAVIS.
FRANK F. DAVIS.