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J. E. SMITH
WELL DRILLING PIPE
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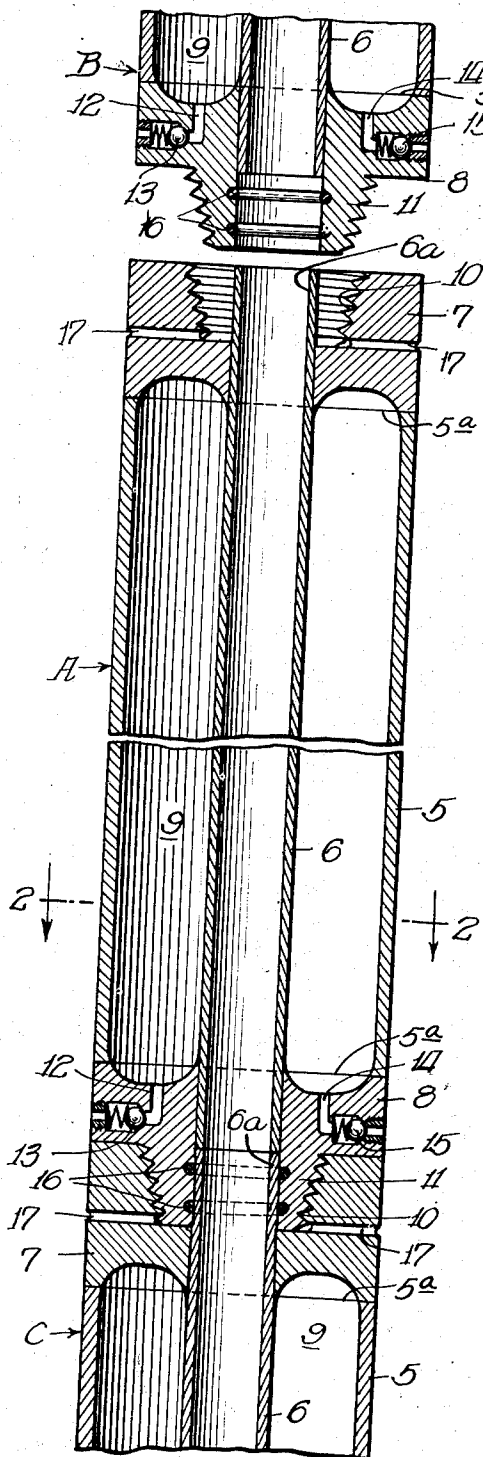


Fig. 1

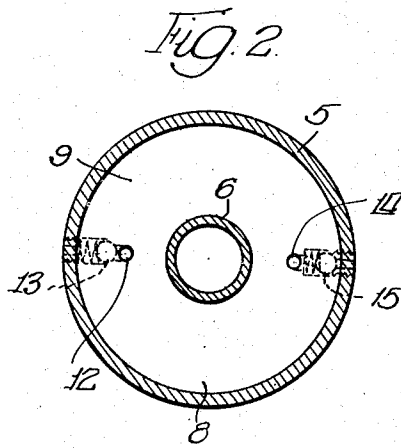


Fig. 2

INVENTOR.
James E. Smith,
BY *G. J. Heidman*
att'y

UNITED STATES PATENT OFFICE

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WELL DRILLING PIPE

James E. Smith, Pasadena, Tex.

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3 Claims. (Cl. 255-28)

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My invention relates to an improved drill pipe more especially intended for drilling oil, gas or other wells and particularly for deep well drilling; and has for its object the provision of what may be termed a floating drill pipe adapted and constructed to be, at least partially, somewhat self-supporting. That is to say, a drill pipe—

which generally consists of a multiple of pipe sections of an accepted predetermined length, wherein each section is constructed to "float" or maintain a certain portion of its weight in floatation while in the fluid or drilling mud employed during well drilling.

The object of my invention is the provision of a drill pipe or drill pipe section of partial weight supporting construction adapted to withstand the hydrostatic or other pressures especially encountered during deep well drilling, with each section having an air space or air receiving chamber and a drilling mud or fluid conveying separate passage; the outer pipe portion being provided with valve controlled communications with the pipe exterior whereby the pressure in the air space or chamber may be automatically varied in keeping with the external pressures encountered at different depths during the well drilling operation. My improved drill pipe is devised to prevent collapsing of the drill pipe by the excessive pressures encountered during deep well drilling.

The objects and advantages of my invention will be readily comprehended from the detailed description of the accompanying drawing wherein:

Figure 1 is a longitudinal sectional view of my improved drill pipe consisting of similar matching sections, with the adjacent or upper end of a subjacent section secured thereto and the lower end of an upper section in position for attachment to the adjacent pipe or pipe section.

Figure 2 is a cross-sectional view taken substantially along the line 2-2 of Figure 1 looking downwardly.

In oil well drilling and particularly in present day deep well drilling considerable difficulty is encountered as a result of the great weight of the composite drill pipe—which greatly increases with each added pipe section—whereby the drilling pipe is subjected to excessive strains and further drilling operations frequently are curtailed.

The particular exemplification of my invention consists of a drill pipe, or pipe sections of predetermined length, having a main or outer cylindrical wall 5, an inner or conduit forming wall 6; the inner wall 6 and outer wall 5 being in-

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tegrally or intimately connected as by welding indicated at lines 5a, at the ends by the end walls or hubs 7 and 8 which maintain the inner and outer walls or pipes in spaced relation to provide the intermediate circumferential air space or chamber 9 between the hubs 7 and 8.

The end walls are of comparative thickness, with the upper end wall 7 provided with an internally threaded hole 10 which preferably is of conical formation and flared outwardly as shown; while the lower hub or end wall 8 is formed with a boss or nipple portion 11, externally threaded and tapered toward the outer end.

The tapered internally threaded hole 10 at the upper end of pipe section A is intended to receive the tapered externally threaded boss or nipple 11 of the superposed or succeeding pipe section of which a portion is shown at B; while the externally threaded boss or nipple at the lower end of pipe section A screws into the upper socketed end 10 of the lower pipe section C. The respective sections of the drill pipe are of similar construction and the sections during the drilling operation are successively screwed together to provide a continuous pipe of required length in keeping with the desired or required depth of the well to be drilled.

I contemplate making my improved drill pipe of suitable metal and preferably welding the inner member 6 and outer member 5 to the end walls or hubs 7 and 8 which are centrally apertured to receive the ends of the inner member. One end of member 6 may terminate substantially in the plane of the outer face of the adjacent end wall or hub 7, as shown at 6a, while the other end of member 6 terminates within the adjacent end wall or hub 8, a distance removed from the outer surface of the hub to receive the end 6a of the member 6 at the opposite end of the pipe section. It will be understood that the respective members of each pipe section are intimately welded together to provide a single unit or pipe section of fluid tight construction.

It will be understood, of course, that the first or initial pipe section at its lower end is provided with a suitable drill bit immovably secured to the first pipe section and provided with the usual openings for passage of the drilling fluid or mud therethrough.

As shown in the drawing, the inner or fluid conveying passage formed by inner wall or pipe 6 extends through end wall 7 of pipe section A and extends into the boss or nipple 11 of the succeeding pipe section B and abuts the lower end of the inner pipe 6 of section B; while the opposite

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or lower end of the pipe 6 terminates within the central passage in the lower end wall 8 and its nipple portion 11 and arranged in abutting relation with the end 6^a of inner pipe 6 of the preceding section C.

With all of the walls welded or intimately united, each unit or pipe section is provided with an air chamber extending throughout the length of the section; the chamber being intended to be provided with air under a predetermined degree of pressure whereby the pipe may have a certain amount of weight compensating or lifting buoyancy.

One of the end walls, preferably the lower hub or end wall 8 of each section, in the shoulder or body portion thereof is provided with a valved outlet or vent port 12, leading from the section exterior to the chamber 9 and provided with a spring controlled ball or check valve as at 13, normally held closed against outward flow from the chamber; the valve being adapted to maintain a predetermined pressure in the chamber 9; said valve, however, moving to open position when the pressure exceeds a predetermined degree.

The opposite side of the end wall or hub 8 also is shown provided with a valve controlled port 14 having a suitable spring controlled ball valve 15, closable against outflow from the pressure chamber 9.

Before lowering the pipe section into the well, air is forced through the valve controlled port 14 and chamber 9 provided with sufficient pressure to prevent collapsing of the outer side walls when the drill pipe is subjected to increased pressures as it recedes into the well.

As the depth of the well increases, the pressure on the fluid in the well also increases. The amount of pressure placed in the air space 9 is intended to be approximately what the pipe section will stand without bursting pipe 5, or collapsing the inner pipe 6; the spring closed valve 13 being provided to give relief of the pressure in chamber 9 before such high pressure is reached that would damage the pipe section. Upon reaching a depth where the fluid pressure in the well exceeds the pressure in air chamber 9, some drilling fluid may enter through intake valve 15, further compressing the air in each pipe section. Upon raising or bringing the pipe out of the well and the pressure on the fluid in the well becomes less than the compressed air in chamber 9, the compressed air in chamber 9 will then expel the fluid through outlet or vent valve 13 until the air pressures in the respective chambers 9 have been lowered to their originally inflated pressure.

Inner pipe sections 6 is extended in the upper or box end of the joint or section and into the enlarged opening in the lower or pin end of the adjoining section.

In order to ensure fluid tight connections between the respective pipe sections I show the pipe receiving opening in the boss or nipple portion 11 of the bottom end wall or hub of each pipe section provided with one or more annular grooves to receive the sealing rings 16 which are adapted to effect snug relation with the inserted end 6^a of the inner pipes of the respective sections.

In the event—due to great pressure—the mud or drilling fluid should leak past the seal rings and the ends of the boss or nipple portions 11 and in order to prevent such leakage about the threaded connections, I provide the nipple receiving end wall 7 with one or more holes or vent ports 17, leading from the threaded interior of

the end wall to the section exterior. With these vent openings 17 the drilling mud or fluid will be prevented from passing about the threaded portions so that the latter will not be subjected to the abrasive action of the fluid or mud which might result in severing the connections or seriously damaging the joints between the respective pipe sections.

I have shown and described what is believed to be the best embodiment of my invention in a more or less buoyant drill pipe but, as is apparent, the specific method shown for providing the desired pressures in the pipe chamber may be varied or altered without, however, departing from the spirit of my invention as defined in the appended claims.

What I claim is:

1. A well drilling pipe composed of cylindrical units of prearranged length adapted to be successively screwed end to end, each unit comprising a fluid conveying pipe extending from end to end, an outer shell surrounding and spaced from the fluid conveying pipe, and end wall members intimately secured to both ends of said pipe and said shell whereby the latter are united in spaced relation and an encircling air chamber provided extending from end to end, one end wall member on its outer end face having an internally threaded socket about the end of the fluid conveying pipe while the other end wall member has an externally threaded boss, correlated to said socket, disposed beyond the end of the fluid conveying pipe a distance corresponding to the depth of the socket at the first mentioned end and adapted to screw into the threaded socket in the end of the adjacent unit and thereby bring the socket surrounded end of the pipe of the succeeding unit into abutting relation with the pipe of the preceding unit; a self-closing valve controlled port in one of said end wall members leading from the wall exterior to said chamber whereby a pressure medium may be introduced into said chamber; and an automatically controlled vent port in said end wall member leading from said chamber to the unit exterior whereby excess pressure in said chamber may automatically vent to atmosphere.

2. A well drilling pipe composed of a plurality of similar sections adapted to be successively screwed end to end, each section consisting of an inner fluid conveying pipe, an outer pipe, and rigid end members whose outside diameters and the outside diameter of the outer pipe are the same so as to provide a smooth uninterrupted outer face, said members being intimately secured to the ends of the outer pipe and bored to receive the ends of the inner pipe and integrally secured to both of said pipes to provide a pressure medium receiving chamber between the pipes, one end member having on its outer face an internally threaded socket about and exposing the end of the inner pipe while the other end member beyond the end of the inner pipe has an externally threaded boss correlated to and adapted to screw into the threaded socket of the opposite end of an adjacent section and bored to receive the exposed portion of the inner pipe of said adjacent section, the bore in said boss having sealing rings for said pipe portion; the end member with said socket being provided with one or more radially disposed ports leading from the bottom of said socket to the member exterior; and self-closing ports in one of said end members leading from the member exterior into said pressure chamber; one of said ports automatically

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closing against outflow from said chamber while the other port is automatically closable against inflow into said chamber.

3. Well drilling pipe sections each formed with an inner fluid conveying conduit member extending from end to end, an outer wall member of greater diameter arranged in spaced relation with said conduit, and end wall members, the outer wall member and the end wall members being of the same external diameters to provide the section with an uninterrupted outer surface; the end wall members being intimately attached to both ends of the conduit member and to the outer wall member whereby a closed cylindrical chamber between the conduit member and the outer member is provided; one end wall member having an internally threaded socket into which one end of the conduit member extends, while the other end wall is provided with an externally threaded and centrally bored boss into which the other end of the conduit member extends partway, said boss also being adapted to receive the opposite end of the conduit member of the adjacent section, said bored boss being

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adapted to screw into the threaded socket of an adjacent section and thereby bring the conduit ends of succeeding sections in abutting relation; and automatically closing ports in one of said end wall members extending from the end wall exterior to said chamber, one of said ports constituting an inlet and the other port constituting an outlet whereby pressures within said chamber and on the section exterior may automatically equalize.

JAMES E. SMITH.

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