March 28, 1933. L. M. C. SEAMARK 1,902,906

CASING HEAD EQUIPMENT

Filed Sept. 3, 1931 4 Sheets-Sheet 1

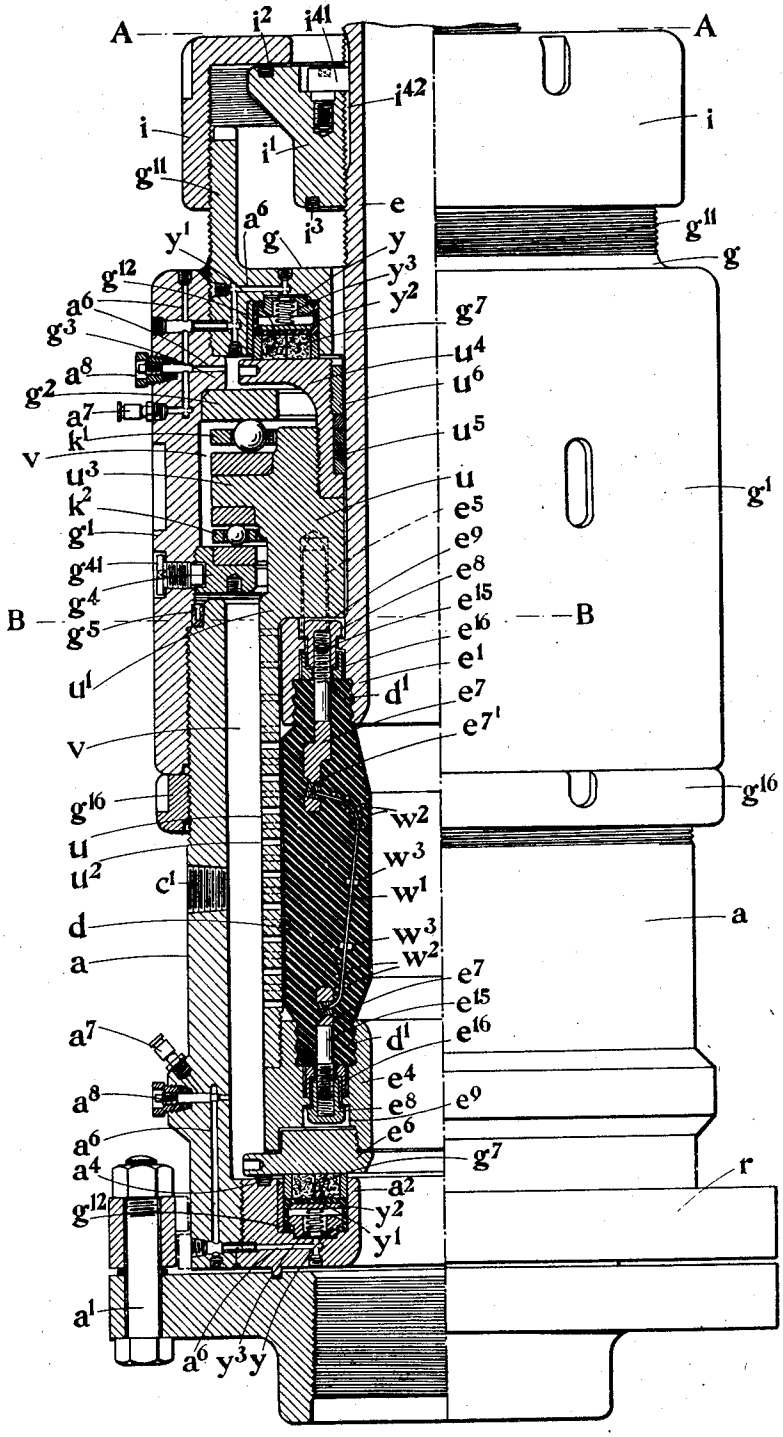


Fig. 1.

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Filed Sept. 3, 1931 4 Sheets-Sheet 2

Fig.2.

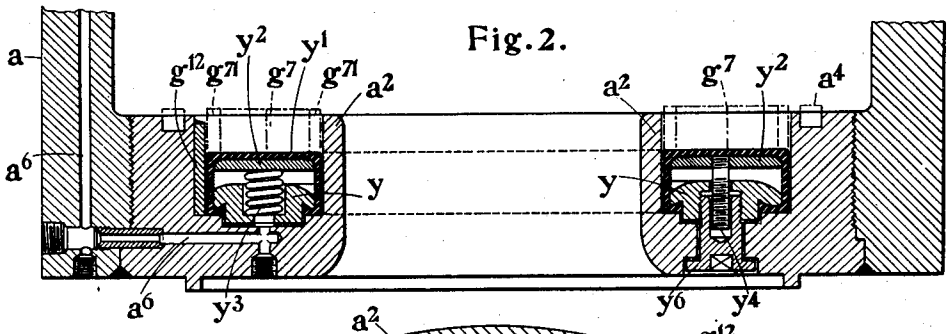
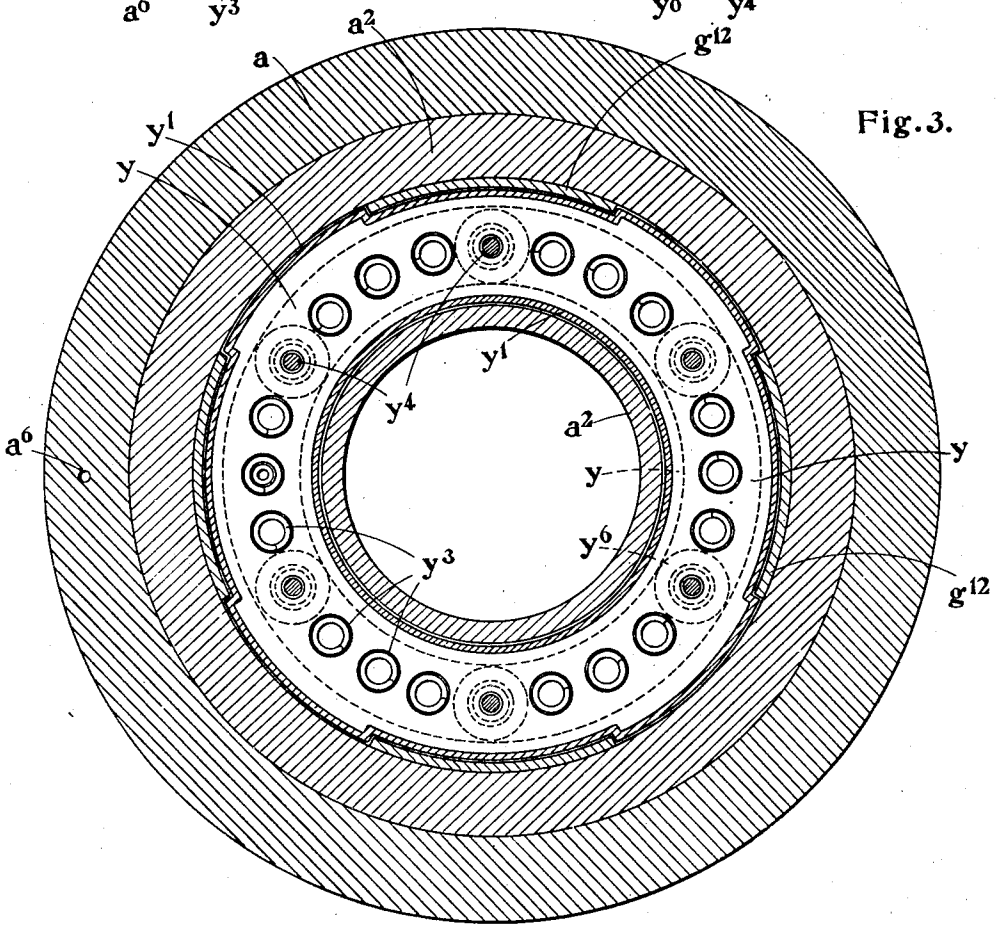


Fig.3.



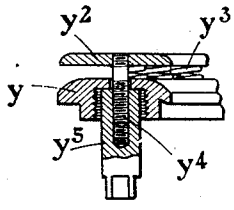


Fig.6.

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CASING HEAD EQUIPMENT

Filed Sept. 3, 1931 4 Sheets-Sheet 3

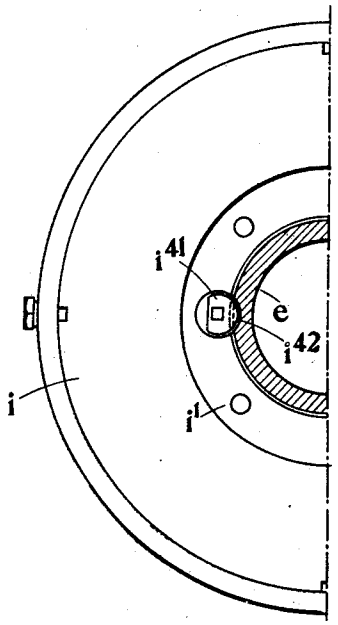


Fig. 4.

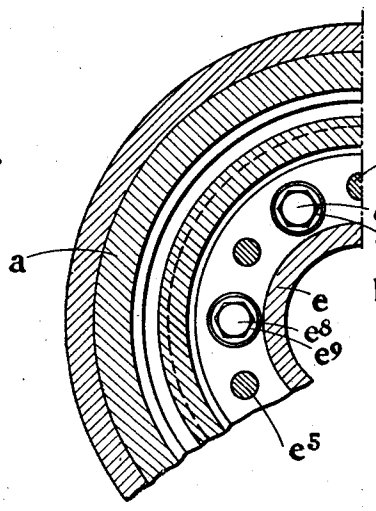


Fig. 5.

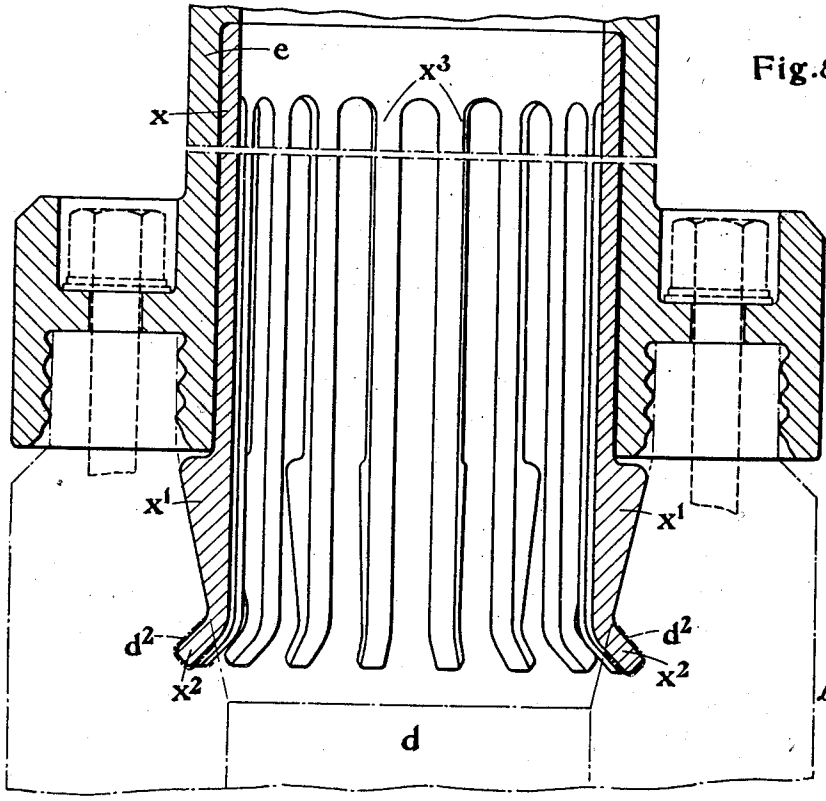


Fig. 8.

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CASING HEAD EQUIPMENT

Filed Sept. 3, 1931 4 Sheets-Sheet 4

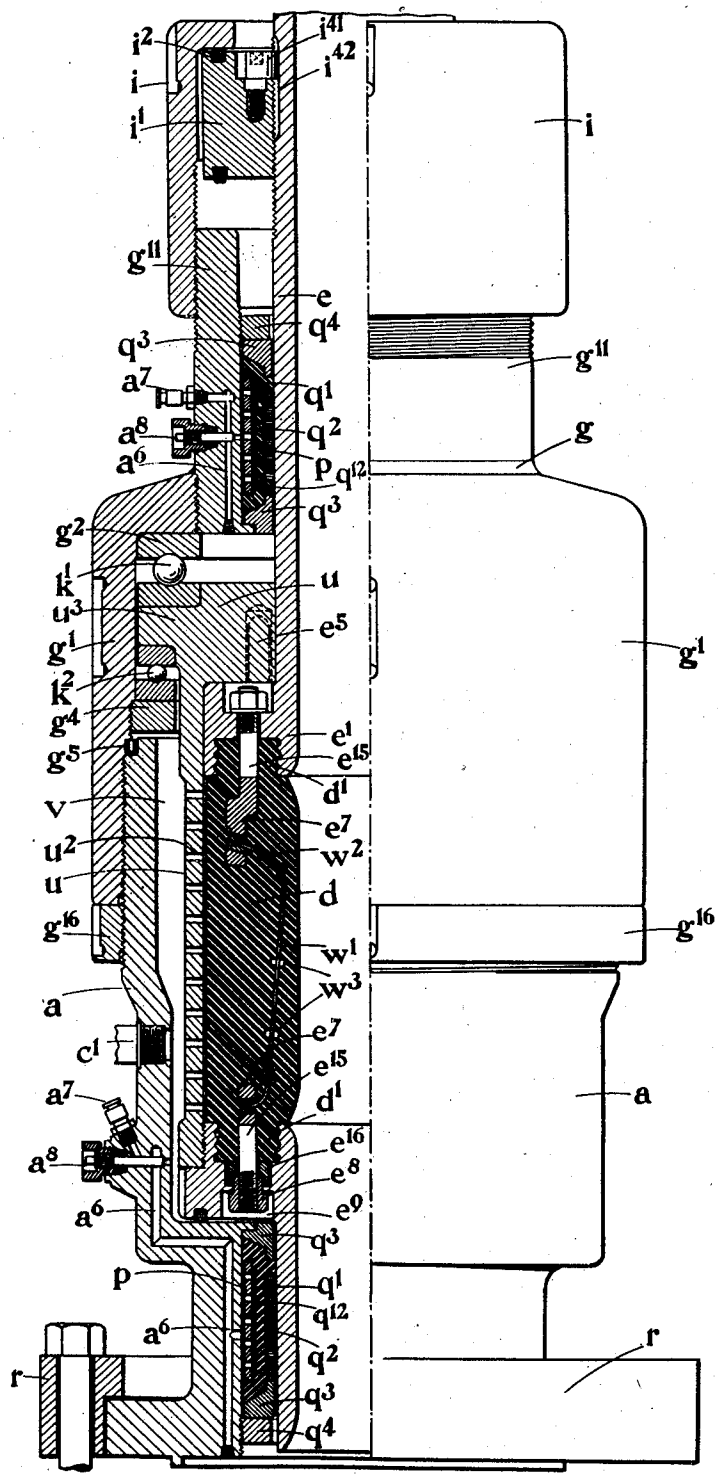


Fig.7.

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UNITED STATES PATENT OFFICE

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CASING HEAD EQUIPMENT

Application filed September 3, 1931, Serial No. 560,993, and in Great Britain August 12, 1931.

This invention relates to casing head equipment for bore holes.

The invention especially relates to the subject-matter of the co-pending application Serial No. 483,290, filed 20th September 1930, and has among its especial objects to provide simple and effective means for packing the horizontal joints of a blow-out preventer of rotary or gyratory type such as described in the specification filed pursuant to the said co-pending application, and which is in part applicable to the joints made in non-gyratory types of blow-out preventer in which horizontal joints are not used; and to provide an improved method of reinforcing the massive elastic sleeve applicable in blow-out preventers and packers such as described in the said specification.

According to the present invention the horizontal joints are made by means of packing accessible to the pressure maintained within the stationary casing of the equipment and means are provided such as helical springs whereby the packing is also subject to the pressure mechanically applied, and thus the horizontal joints are always maintained under the pressure imposed by the helical springs.

According to the invention moreover a pressure bag or receptacle of elastic material is employed which however is held in position by a retaining ring that is adapted to lie within the lower part of the annular cavity provided for its reception in the inwardly extending annular base part of the stationary casing, a similar retaining ring for a similar elastic pressure bag or receptacle being provided within the upper part of the annular cavity provided on the underface of the horizontal part of the cylindrical cap or cover of the stationary casing; and the respective retaining rings are at their lateral edges adapted to extend outwardly to form overhanging flanges at each side that are undercut, so that thus under the pressure of the helical springs the respective outwardly extending flanges of the retaining rings are adapted to engage or to nip the inwardly extending edges of the respective elastic pressure bag.

According to the invention moreover an annular spring bearing plate is mounted within the elastic pressure bag in position coincident with and beyond the retaining ring, and the latter is advantageously provided with holes at intervals for the accommodation of the helical springs whose outer ends thus are adapted to abut against the annular spring bearing plate; and packing is mounted upon the elastic pressure bag to protrude beyond the respective faces of the annular base part of the stationary casing and of the horizontal part of the cap or cover of the casing, and the annular cavity within the respective pressure bags lies in communication with the annular space surrounding the rotating casing, and is thus subject to the hydraulic pressure there prevailing, means however being provided consisting of needle valves by which communication may be cut off when required.

According to the invention moreover, in its application to a rotary and non-gyratory type of blow-out preventer such as described in the specification of the co-pending application, the packing surrounding parts of the rotating casing or the trunnion tubes thereof is so provided as to be subject to the pressure prevailing in the space surrounding the rotating casing, and means provided such as needle valves by which communication with the said space may be cut off. Thus the moulded rubber ring such as described for use in the said bearings may be subject to the said pressure, and the moulded rubber ring may also be surrounded by a thin elastic metal sleeve advantageously split or otherwise formed in such manner that its respective ends may be adapted to slide one upon the other, and the ring thus be adapted to apply pressure upon and around the moulded rubber ring, whereby pressure may thus always be exercised upon the packing by the said elastic sleeve through the said moulded rubber ring.

According to the invention moreover in its application to blow-out preventers in which a massive elastic sleeve is employed such as described in the co-pending specification aforesaid, the massive elastic sleeve is adapted to be moulded or otherwise provided

with end rings at its respective ends to which the respective ends of an internal reinforcement, which may be made of wire, may be secured. For this purpose according to the invention the internal reinforcement is adapted to be disposed at the inner side of the end rings referred to and to have a form and means of connection such as hereinafter described; and the massive elastic sleeve is according to the invention built up or moulded in the manner hereinafter described.

According to the invention moreover a metal reinforcement may be provided external of the massive elastic sleeve, and adapted to extend normally to lie within the upper part of the massive elastic sleeve and adjacent thereto, and the reinforcement may comprise a circular series of elastic prongs or the equivalent adapted to be pressed inwardly under the effect of external pressure upon the massive elastic sleeve, and thus to accommodate the drill pipe and other parts on being lowered through the equipment, in such manner that the upper part of the massive elastic sleeve is protected as well as reinforced by the elastic prongs.

The invention comprises the features of construction and method as hereinafter described.

The present invention is illustrated in the accompanying drawings in which:

Figure 1 is an elevation partly in cross-section of a blow-out preventer similar in construction to that illustrated in Figures 1 and 1*d* of the drawings relating to the said co-pending application and in which the same or similar parts bear similar reference letters.

Figure 2 is a detail sectional elevation on an enlarged scale of the inwardly extending annular base part of the stationary casing, showing the manner in which an elastic bag or receptacle is mounted within the annular cavity in the base provided for the reception of the packing.

Figure 3 is a detail plan view partly in section corresponding to Figure 2.

Figure 4 is a sectional plan view on the line A—A of Figure 1.

Figure 5 is a sectional plan view on the line B—B of Figure 1.

Figure 6 is a detail sectional view showing the manner in which the retaining ring for the elastic bag or receptacle, and the annular spring bearing plate are, with the helical springs between them, held assembled while being mounted in position; while

Figure 7 is an elevation partly in section of a modified construction of blow-out preventer of rotary type.

Figure 8 is a detail sectional view showing a supplementary metal reinforcement external of the massive elastic sleeve which however extends within the central bore thereof.

In carrying the invention into effect as illustrated in Figures 1, 2, 3, 4, 5 and 6 of the accompanying drawings, a cylindrical casing *a* is secured to the well head flange by means of a bayonet flange *r* and bolts a^1 in known manner, by which a tight joint is made with the underside of the casing. At the upper end of this stationary casing *a*, a cylindrical cover *g*, g^1 is applied and at the lower end the cylindrical part g^1 of the cover is internally screw-threaded for application upon the screw-threaded outer periphery of the casing *a* at its upper end. The parts *g*, g^1 may be separately formed and screw-threaded one within the other and permanently secured together by welding, or the parts *g*, g^1 may be integrally formed. Thus the cylindrical cover *g*, g^1 may be adjustably secured in position and locked in that position by means of a locking ring g^{16}.

A massive elastic sleeve *d* is mounted between end rings e^1, e^4 having oppositely disposed annular cavities within which the respective ends of the sleeve *d* may be secured by means such as hereinafter described. The upper end ring e^1 is provided at the lower end of a trunnion tube *e* and is advantageously made integral therewith, so that thus the upper end ring e^1 forms an outwardly extending flange of the trunnion tube with an annular cavity on its underface. The upper end ring engages beneath a massive shoulder u^1 at the upper end of a rotating casing *u*, that is adapted to permit of a slight gyratory movement on the slight eccentric rotation of the drill pipe or the like that passes through the trunnion tube and sleeve. A number of vertical pins e^5 are secured at the upper face of the end ring e^1 in determined position coincident with corresponding cylindrical holes in the massive shoulder u^1. By such means a connection is made of the trunnion tube *e* with the rotating casing *u*, by which they may rotate together and permit of axial displacement of the upper end ring e^1 and of the trunnion tube *e* in relation to the rotating casing *u* under the conditions of operation.

The main part of the rotating casing *u* (Figure 1) encloses the sleeve *d*, and is provided with transverse holes u^2 through which a fluid pressure medium, for example from an hydraulic accumulator may be admitted at c^1 within the stationary casing *a*, the medium being accessible to the external periphery of the sleeve *d*, by which the contraction of the sleeve *d* may be caused to maintain a fluid tight joint between the sleeve and the respective sections of the drilling tool or the like passing through it. The lower end ring e^4 is adapted to be secured within the lower end of the rotating casing *u*, and the end ring e^4 serves to secure the lower end of the sleeve *d* at the lower end of the rotating casing.

The lower end ring e^4 is provided with an

annular cavity on its underface for the reception of the upper reduced part of a bottom ring e^6, the lower part of which extends completely across the end ring e^4 and may be screw-threaded into position to form a contact face on its underside, by which a horizontal joint may be maintained between the lower end of the casing u and the inwardly extending annular base part a^2 of the stationary casing a, it being understood that the internal diameter of the annular base part a^2 may correspond to that of the lower end ring e^4 and of the trunnion tube e, and that the part a^2 may be provided integral with the casing a, or as illustrated may be provided with an external screw-thread by which it may be secured and finally welded within the lower end of the casing.

The rotating casing u (Figure 1) may be provided at its upper end with an outwardly extending overhanging flange u^3 having horizontal top and bottom faces. The flange u^3 serves for mounting the rotating casing u within the casing a whereby the weight of the parts may be taken mainly upon the cylindrical cover g, g^1 and the stationary casing, and for taking the upward thrust when pressures are encountered in the operation of boring. For this purpose ball bearings k^1, k^2 are provided above and beneath the flange u^3, by which the casing u is permitted a slight eccentric or gyratory movement on the rotation of the sleeve d, following the rotation of the drilling tool. A flat ring g^2 is mounted within the cylindrical cover g, g^1 to fit against an overhanging shoulder g^3. This ring g^2 is applied over the flange u^3, the ball bearing k^1 being interposed, while a second ring g^4 narrower than the ring g^2, is disposed beneath and in position beneath the flange u^3. The second ring g^4 may be screw-threaded on its outer periphery and is provided with means whereby it may be set into position beneath the flange u^3, the ball bearing k^2 being interposed. A set screw g^{41} is applied through the wall g^1 to secure the second ring g^4 in its set position. Thus the flange u^3 is held within the cylindrical cover g, g^1 and within the stationary casing a. A fibre ring of a V or other sectional shape, or U leather, g^5 may be fitted beneath the second ring g^4 and between the upper peripheral edge of the casing a, and the inner periphery of the cylindrical cover, g, g^1.

At the upper end the rotating casing u (Figure 1) is provided with a gland ring u^4, screw-threaded externally at its lower end, to fit within an inner annular cavity formed at the upper end of the rotating casing u, and the flange of the gland ring u^4 thus comes to lie immediately over the upper ring g^2 and beneath the top part g of the cylindrical cover g, g^1. Thus the top face of the flange of the ring u^4 serves as the upper horizontal jointing face, while the top face of the base part a^2 of the casing a serves as the lower horizontal jointing face, between which the rotating casing u rotates with the parts carried by it.

Annular cavities are respectively formed on the underface of the part g and on the top face of the part a^2, within which packing g^7 may be mounted.

The inwardly extending top part g of the cylindrical cover (Figure 1) may extend short of the trunnion tube e to permit access to packing u^5 of a conical or other cross-section, and to a screw-threaded retaining ring u^6 by which the packing may be maintained in position.

A narrow annular cavity surrounding the cavity in which the packing g^7 is mounted on the part a^2 may be provided for the reception of a jointing ring a^4, the top face of which extends slightly above the normal face of the part a^2.

An annular space v (Figure 1) is provided between the rotating casing u and the stationary casing a, to extend also between the flange u^3 and the gland ring u^4, and the cylindrical part g^1 of the cylindrical cover g, g^1, by which the slight eccentric or gyratory movement of the rotating casing u, is accommodated, and hydraulic pressure transmitted under regulation through the pipe c^1 may be applied within the annular space referred to, and may be transmitted to the external periphery of the sleeve d, through the transverse holes u^2 in the peripheral wall of the casing u, so that the sleeve may be contracted to maintain an effective liquid and gas tight joint between the sleeve d and parts of the drilling tool or the like.

Means are indicated in Figures 1 and 3 comprising segmental strips g^{12} welded on the outer side, or on opposite sides of the cavities respectively provided for the reception of the packing g^7, by which the annular cavities are adapted for the reception of the packing whereby it may be held immovable therein, and thus the tendency of the packing to creep is avoided or prevented. The packing is first formed so as to be accommodated within the irregular annular spaces thus formed by the welded strips g^{12}.

With a view securely to fasten the ends of the elastic sleeve d (Figure 1) in position within the respective end rings e^1, e^4, end fastening rings e^7 are provided which are incorporated in the elastic sleeve at its respective ends on its being moulded and vulcanized, the ring e^7 carrying vertical and integral pins e^{15} screw-threaded at their outer ends, which extend beyond the respective upper and lower ends of the sleeve d.

A slip ring e^{16} is applied within narrow annular cavities respectively above and beneath those provided in the end rings e^1 and e^4 for the accommodation of the ends of the sleeve d. Holes are provided in determined

positions in the slip rings e^{16} corresponding to the positions of the screw-threaded pins e^{15}, into which the screw-threaded pins may pass, and cavities may be provided in coincident positions in the respective end rings e^1, e^4, corresponding to the positions of the holes in the slip rings e^{16}, for the accommodation of the heads of the internally screw-threaded nuts e^8 for the purpose of drawing through the screw-threaded ends of the pins, and thus tightly to secure the respective ends of the sleeve d within the respective annular cavities within the end rings. The outer parts of the nuts e^8 are accommodated in cavities e^9 in the respective end rings.

According to the present invention the end rings e^7 near the outer ends lying within the reduced end parts of the massive elastic sleeve d are provided with axial or vertical slots of a width corresponding to the diameter of the shanks of the screw-threaded pins e^{15} that are accommodated in the slots. The pins e^{15} are rendered integral with the end rings by being welded in position in the said axial or vertical slots, so that thus their screw-threaded ends may protrude beyond the end faces of the massive elastic sleeve d, it being understood that the shanks of the pins e^{15} are welded at each side to the metal at the faces of the axial or vertical slots in the end rings, so as thus to become firmly and integrally connected therewith, and thus the axes of the screw-threaded pins e^{15} are disposed parallel with that of the massive elastic sleeve when made. The upper end ring e^7 is advantageously cranked at the part moulded in the sleeve d so that thus its inserted part may be disposed nearer to the outer periphery of the massive elastic sleeve d than the main part of the ring. Thus the outer ends of the wire reinforcement w^1 are connected to the respective inner ends of the end rings e^7 and the upper part of the reinforcement w^1 may be so disposed as to extend inwardly from the position of its connection with the inner end of the upper end ring e^7 on the inside, so as then to extend inwardly and downwardly for connection at its lower end to the lower end ring e^7 at the inner side of the end ring as illustrated in Figure 1.

The wire reinforcement w^1 is advantageously provided of a number of strips of braided wire strands disposed in circular series and disposed equidistant apart. A number such for example as 16 may be used. At the outer and upper ends and at the lower ends the strips of braided wire strands are connected together circumferentially by wire w^2 that is woven or laced completely around the strands, while the wires of the braided wire strands at their respective ends are opened out for insertion within cavities $e^{7'}$ set equidistant around the end rings e^7 at their inner sides, the cavities $e^{7'}$ being of wedge shape and narrowing to the inner sides of the rings. The opened out wires of the respective strands of the reinforcement w^1 are inserted in the cavities $e^{7'}$ of the top and bottom end rings e^7, and metal such as Babbitt metal is advantageously run into the wedge shaped cavities, whereby the strands are thus very effectively connected to the respective end rings e^7. Buttons or stopping pieces w^3 are also mounted at intervals in the length of the braided wire strands.

The elastic rubber sleeve d may be built up upon the reinforcement w^1, w^2, w^3 thus provided and which is connected to the end rings e^7, while the reinforcement and the end rings are supported in the position they assume in the finished massive sleeve d. For this purpose unvulcanized rubber sheeting may be applied in layers around the reinforcement until a form is assumed corresponding to that in which the massive sleeve may be moulded. The respective ends of the sleeve d at d^1 are reduced for accommodation within the annular cavities provided for their reception in the respective end rings e^1 and e^4, and the protruding screw-threaded ends of the pins e^{15} are secured in position in the manner hereinbefore described. The oppositely disposed faces of the annular cavities in the respective ends rings e^1, e^4 are advantageously provided with a series of alternate annular grooves and ridges, so that thus on the screw-threaded pins being drawn inward by the nuts e^8, the reduced ends d^1 of the massive elastic sleeve d are drawn into the annular cavities, whereby the elastic material is compressed so as completely to fill the cavities and the alternate grooves at each side thereof.

By such means under the effect of the fluid pressure medium admitted to the annular space v the sleeve d may be contracted tightly to enclose the respective parts of the drill pipe or the like; while the drill pipe may be suspended from the trunnion tube e, whereby it is permitted to fall and thus under the weight of the drill pipe, the sleeve d is adapted to be compressed whereby it contracts so as tightly to enclose the adjacent section of the drill pipe or the like disposed or passing through the sleeve.

With a view further to ensure against leakage at the upper end of the equipment, means for the purpose may be provided above the cylindrical cover g, g^1 (Figure 1). Thus an upwardly extending cylindrical flange g^{11} may be provided integral with the part g of the cylindrical cover g, g^1, and this flange may be externally screw-threaded for the reception around it of an internally screw-threaded cap i. A jointing ring i^1 may be applied upon the upper end of the trunnion tube e, the ring i^1 being screw-threaded internally so as to be applied upon the screw-threaded end of the trunnion tube and beneath the cap i. A jointing ring i^2 may be provided on the top face of the

ring $i1$, and a similar jointing ring i^3 may be provided on its underface, so that thus joints may be made between the top face of the ring i^1 and the cap i and between the underface of the ring i^1 and the top face of the part g. The jointing ring i^1 is adapted to be secured in its adjusted positions upon the trunnion tube e by means of a stud i^{41} (Figures 1 and 4), adapted so that the head of the stud may enter a longitudinal recess i^{42} in the tube, of a circular shape in cross-section as illustrated in Figure 4.

A drive bush fitting may be mounted upon the upper end of the trunnion tube e and have centrally provided therein a hole for the reception of the kelly or grief stem of the same section and the lower part of the fitting and the upper part of the trunnion tube e may be provided with interengaging parts. The drive bush fitting as described in the specification filed pursuant to the co-pending application, may be held in position by convenient means such as a number of spring arms that are adapted to engage a ring threaded or otherwise secured upon the upper end of the trunnion tube e, whereby the drive bush fitting while being removable, is adapted to be firmly secured in position on the trunnion tube in such manner that the rotary movement of the kelly or grief stem is imparted to the rotating casing u and the sleeve d carried by it.

In addition to the internal reinforcement an external reinforcement adapted to extend within the upper part of the central hole in the massive elastic sleeve may be provided for the further reinforcement of the sleeve as well as for its protection. For this purpose such a metal reinforcement may be provided either additional to the internal reinforcement w^1, w^2, w^3 or alternative thereto. This additional reinforcement may take the form of a thin cylindrical reinforcing sleeve x for insertion within the lower end of the upper trunnion tube e, so that the main part of the internal surface of the cylindrical reinforcing sleeve x lies flush with the internal surface of the upper part of the trunnion tube e. The lower part of the reinforcing sleeve x extends below the end ring e^1 in which the upper end of the massive elastic sleeve d is engaged, and the downwardly extending part x^1 of the reinforcing sleeve x is provided of a thickened wedge shaped section with the lower ends x^2 splayed outward and downward so as normally to rest within an internal annular recess d^2 provided in the upper end of the massive elastic sleeve d, the main length of the thickened part x^1 of the reinforcing sleeve x being accommodated by correspondingly inclined recess at the upper part of the massive elastic sleeve. The cylindrical reinforcing sleeve x is provided with a number of slots parallel with its axis and provided at equal distances apart leaving parallel elastic narrow strips of metal x^3 from a position near the upper end to extend completely to the lower end, whereby elastic prongs are provided that are adapted to extend normally to lie within the upper part of the massive elastic sleeve d and adjacent thereof, the part x^1 of thickened wedge shaped section lying adjacent to the upper part of the massive elastic sleeve, whereby the prongs x^3 are forced inwardly under the effect of external pressure upon the massive elastic sleeve d in such manner that the upper part of the sleeve is protected as well as reinforced by the elastic prongs. It will thus be understood that the prongs x^3 are shown in Figure 8 in their innermost positions in which they are adapted to accommodate the passage through them of parts of round, square or other irregular section.

By the means described, the upper part of the reinforcing sleeve d is additionally reinforced to ensure maintenance of a tight joint in case of high well pressures. It will however be understood that without such an external reinforcement the internal reinforcement of the massive elastic sleeve is effective to withstand considerable pressures. Thus while the reinforcing sleeve x is intended as a supplementary reinforcement it may be employed as the sole reinforcement of the massive elastic sleeve.

According to the present invention horizontal joints are respectively provided on the top face of the inwardly extending base part a^2 of the stationary casing a as well as at the under face of the horizontal part g of the cylindrical cap or cover g, g^1 of the stationary casing, and for the purpose annular cavities are in those parts provided, and a narrower annular recess is formed respectively at the upper end of the annular cavity in the horizontal part g of the cylindrical cap or cover and at the lower part of the annular cavity in the annular base part a^2. Thus the respective annular cavities referred to are adapted for the reception of a retaining ring y for the elastic pressure bag or receptacle y^1, whereby in the annular cavity at the top face of the inwardly extending base part a^2 the lower and narrower part of the retaining ring y is accommodated in the annular recess formed at the lower face of the annular cavity, whereby the overhanging outwardly extending lateral edges of the retaining ring are adapted to nip or to press the respective inwardly extending edges of the elastic pressure bag or receptacle y^1.

The elastic pressure bag or receptacle y^1 is advantageously provided of india rubber and is moulded to a shape that is adapted to accommodate segmental strips g^{12} that are welded in position at equal distances apart on the outer sides of the respective annular cavities, it being understood that the elastic pressure bag or receptacle is adapted to be

inserted within the annular cavities so that lateral recesses provided in determined positions at the outer side of the bag or receptacle accommodate the welded metal strips g^{12}. The lower parts of the bag or receptacle (or the upper parts as the case may be) are moulded to extend inwardly to form a central slot of a width equal to the width of the retaining ring y at its narrower part, whereby they are adapted to be nipped by the outwardly extending lateral flanges of the retaining ring y against the adjacent surfaces of the annular cavities.

A spring bearing plate y^2 of a width and diameter corresponding to that of the retaining ring is applied within the upper part of the elastic bag or receptacle y^1 and a number of helical springs y^3 are adapted to be set in position between the retaining ring y and the spring bearing plate y^2 within a corresponding number of cylindrical holes in the retaining ring y, in such manner that the helical springs y^3 extend into the space between the retaining ring y and the spring bearing plate y^2 and cause the spring bearing plate y^2 to be thrust outwards, and thus pressure to be applied through the packing g^7 that is mounted in position above the pressure bag or receptacle y^1 at the lower horizontal joint and beneath the pressure bag or receptacle y^1 at the upper horizontal joint. The packing g^7 may take the form of two or more turns of fibre or other packing set between an inner and an outer packing retaining ring $g^{7'}$ (Figure 2) which may be of metal.

As indicated more particularly in detail in Figure 2 through communication is provided in the retaining rings y at the position at which the cylindrical holes for the helical springs y^3 are provided, so that thus the cavity within the pressure bag or receptacle may communicate with the annular space v surrounding the rotating casing u. For this purpose passages a^6 are drilled in the lower part of the stationary casing a and in the inwardly extending flange a^2 at the lower part thereof, as well as in corresponding positions in the cap or cover adjacent the upper horizontal joint, and a valve a^8 is provided by which communication may be opened or closed between the annular space v surrounding the rotating casing or its connected parts and the cavity within the elastic pressure bag or receptacle y^1, so that by such means the pressure prevailing there is applied upon the packing, while the packing g^7 is always subject to the pressure mechanically applied through the helical springs y^3. It will be understood that the series of communicating passages a^6 are drilled in transverse positions in relation to each other and that at their outer ends they are plugged, and that communication is afforded by one of the passages a^6 being open to the annular space v and being under control of a valve a^8. A release and inlet valve a^7 may be mounted to be operable from without and to lie in communication with the passages a^6.

By such means the horizontal packing g^7 will be subject to the pressure surrounding the rotating casing u and under all conditions of operation a tight joint will be ensured under the pressure imposed by the helical springs, it being understood that the same packing may be provided for the upper horizontal joint as for the lower.

It will be understood that for the purpose of assembling the retaining ring y and the spring bearing plate y^2 may be held in position in the manner illustrated in Figure 6, by which the helical springs y^3 are compressed between the plate y^2 and the ring y by means of a number of screw-threaded pins such as y^4 (Figure 6) set at equal distances apart and connected to the spring bearing plate y^2 and passing through the retaining ring y, their lower screw-threaded ends having special assembly nuts y^5 applied upon them. In assembling the spring bearing plate y^2 and the retaining ring y are fitted within the elastic pressure bag or receptacle and mounted within the blow-out preventer, and the parts of the blow-out preventer are then connected together. The special nuts y^5 (Figure 6) may then be removed and the retaining ring screws y^6 are passed into position to hold the retaining ring y. The screws y^6 are adapted to be inserted within screw-threaded holes provided in determined positions at the under face of the retaining ring, and the ends of the screws y^4 are accommodated within central holes within the screws y^6. On withdrawal of the special nuts y^5 the retaining ring screws y^6 are inserted which serve to draw down the retaining ring y to nip the inwardly extending edges of the elastic pressure bag or receptacle y^1.

In carrying the invention into effect as illustrated in Figure 7 the manner of construction of the rotating non-gyratory casing u, and the mounting of the massive elastic sleeve d is the same as illustrated in Figure 1 and the same reference letters indicate the same parts in the respective figures, but in the construction of Figure 7 the lower end ring e^4 is similar to the upper end ring e^1 and both are integrally provided with the respective trunnion tubes e. The trunnion tubes e are also mounted within bearings, whereby no gyratory movement is possible as in the construction of Figure 1. Thus the upper and lower trunnion tubes e in the construction of Figure 7, are supported in bearings of substantially the same form in which pressure is maintained by a fluid pressure medium within the annular space v in the manner hereinbefore described, with reference to the construction of Figure 1. The

bearings are however mounted within annular recesses respectively provided within the lower part of the casing a and in the upper cylindrical part or flange g^{11} of the cover g, g^1. Thus a moulded rubber ring q^1 is provided in each of the bearings, having on its inner periphery an annular recess for the reception of packing q^2, and the ring q^1 is accommodated between top and bottom end rings q^3 having conical faces, and the respective sets of parts are held by means of the retaining rings q^4. A perforated cylinder p is provided to surround the moulded rubber ring q^1, and behind this a narrow cavity is provided with which the passages, a^6 are in communication, so that thus both bearings or the moulded rubber rings q^1 thereof may be subject to fluid pressure prevailing in the annular space v surrounding the rotating casing, while the moulded rubber rings q^1 are respectively surrounded by a thin elastic metal sleeve q^{12} that is advantageously split or otherwise formed in such manner that these respective ends are adapted to slide one upon the other, and thus the elastic sleeve q^{12} may apply pressure upon and around the moulded ring q^1, whereby pressure may always be exercised upon the packing by the elastic sleeve through the moulded rubber ring.

I claim:

1. A casing head equipment comprising a stationary casing, a rotor within the said casing, a packing device within the said rotor and adapted to be contracted under pressure externally applied, means for the application of pressure externally to the said packing device, jointing faces on parts of the said rotor, packers for the said jointing faces, and means to render the said packers accessible to the pressure applied externally to the said packing device.

2. A casing head equipment comprising a stationary casing, a rotor within the said casing, a packing device within the said rotor and adapted to be contracted under pressure externally applied, means for the application of pressure externally to the said packing device, bearings for the said rotor adapted to maintain the position of the said rotor against axial stresses, jointing faces on parts of said rotor, packers for the said jointing faces, and means to render the said packers accessible to the pressure applied externally to the said packing device.

3. A casing head equipment comprising a stationary casing, a rotor within the said casing, a packing device within the rotor and adapted to be contracted under pressure externally applied, means for the application of pressure externally to the said packing device, jointing faces on parts of the said rotor, packers for the said jointing faces, means to render the said packers accessible to pressure applied to the said packing device, and mechanical means for the application of pressure to the said packers.

4. A casing head equipment comprising a stationary casing, a rotor within the said casing, a packing device within the said rotor and adapted to be contracted under pressure externally applied, means for the application of pressure externally to the said packing device, jointing faces on parts of the said rotor, packers for the said jointing faces, means to render the said packers accessible to the pressure applied to the said packing device, and mechanical means comprising a number of helical springs for the application of pressure to the said packers.

5. A casing head equipment comprising a stationary casing, a rotor within the said casing, a packing device within the said rotor and adapted to be contracted under pressure externally applied, means for the application of pressure externally to the said packing device, bearings for the said rotor adapted to resist axial stresses, jointing faces on parts of the said rotor, packers for the said jointing faces, means to render the said packers accessible to the pressure applied to the said packing device, and mechanical means comprising a number of helical springs for the application of pressure to the said packers.

6. A casing head equipment comprising a stationary casing, a rotor within the said casing, a packing device within the rotor and adapted to be contracted under pressure externally applied, means for the application of pressure externally to the said packing device, jointing faces on parts of the said rotor, packers for the said jointing faces, said packers each comprising an elastic pressure receptacle within an annular cavity provided in parts of the said stationary casing adjacent the said respective jointing faces, a retaining ring adapted to hold the said elastic pressure receptacle at its edges within the cavity, packing mounted upon the said elastic pressure receptacle to contact with the said jointing faces, and means to render the said elastic pressure receptacle accessible to the pressure applied to the said packing device.

7. A casing head equipment comprising a stationary casing, a rotor within the said casing, a packing device within the rotor and adapted to be contracted under pressure externally applied, means for the application of pressure externally to the said packing device, jointing faces on parts of the said rotor, packers for the said jointing faces, said packers each comprising an elastic pressure receptacle within an annular cavity provided in parts of the said stationary casing adjacent the said respective jointing faces, a retaining ring adapted to hold the said

elastic pressure receptacle at its edges within the said cavity, packing mounted upon the said elastic pressure receptacle to contact with the said jointing faces, means to render the said elastic pressure receptacle accessible to the pressure applied to the said packing device, and mechanical means for the application of pressure within the elastic pressure receptacle.

8. A casing head equipment comprising a stationary casing, a rotor within the said casing, a packing device within the rotor and adapted to be contracted under pressure externally applied, means for the application of pressure externally to the said packing device, jointing faces on parts of the said rotor, packers for the said jointing faces, said packers each comprising an elastic pressure receptacle within an annular cavity provided in parts of the said stationary casing adjacent the said respective jointing faces, a retaining ring adapted to hold the said elastic pressure receptacle at its edges within the said cavity, packing mounted upon the said elastic pressure receptacle to contact with the said jointing faces, means to render the said elastic pressure receptacle accessible to the pressure applied to the said packing device, an annular spring pressure plate within the said elastic pressure receptacle, and mechanical means between the said retaining ring and the said annular spring pressure plate for the application of pressure between the said parts and within the said elastic pressure receptacle.

9. A casing head equipment comprising a stationary casing, a massive elastic sleeve and a housing for the said sleeve within the said casing and adapted to rotate therein, the said housing being mounted to permit of the gyratory movement of the housing within the stationary casing, bearings for the said housing, jointing faces on parts of the said housing, packers for the said jointing faces, means for the application of pressure external to the said housing and massive elastic sleeve, and means to render the said packers accessible to the pressure applied to the said housing and massive elastic sleeve.

10. A casing head equipment comprising a massive elastic sleeve, a stationary casing within which the sleeve is mounted, means comprising trunnion tubes for mounting the said sleeve to rotate within the said stationary casing, annular elements one of which is axially movable and formed integral with the uppermost trunnion tube but is incapable of relative rotation with respect to the other, means for the application of pressure external to the sleeve, bearings for the trunnion tubes, packers for the said bearings, and means to render the said packers accessible to the pressure applied to the sleeve.

11. In a casing head equipment as specified in claim 8, means for mounting the spring pressure plate and the retaining ring within the respective cavities in the stationary casing, comprising for each cavity screw-threaded pins carried upon and beneath the spring pressure plate, the retaining ring being adapted by means of holes therein for the passage therethrough of the said screw-threaded pins, means to engage the screw-threaded ends of the said pins in assembling the spring pressure plate and retaining ring in position before introduction into the cavity and within the elastic pressure receptacle, and means for holding the retaining ring within the bottom of the cavity with the edges of the elastic pressure receptacle engaged by the said retaining ring and the spring pressure plate subject to pressure mechanically applied.

12. A casing head equipment consisting of a casing, a massive elastic jointing sleeve within the casing, through which the connected sections and couplings of the drilling tool or casing may pass under substantially pressure tight conditions, annular elements for the reception of the respective ends of the sleeve, means for resisting excessive internal contraction of the sleeve on the application of pressure external to the sleeve, comprising embedded within the sleeve a reinforcement permitting the internal contraction of the sleeve at a position between its ends, means for securing the ends of the said reinforcement within the said annular elements, the said reinforcement at the upper end being so formed at the position of its connection that it extends inwards towards the inner face of the sleeve and thence downwardly, and means for the application of pressure external to the sleeve.

13. A casing head equipment consisting of a casing, a massive elastic jointing sleeve within the casing, through which the connected sections and couplings of the drilling tool or casing may pass under substantially pressure tight conditions, annular elements for the reception of the respective ends of the sleeve, means for resisting excessive internal contraction of the sleeve on the application of pressure external to the sleeve, comprising embedded within the sleeve a reinforcement permitting the internal contraction of the sleeve at a position between its ends, means for securing the ends of the said reinforcement within the said annular elements, comprising fastening rings embedded in the respective ends of the sleeve, to which the ends of the reinforcement are respectively connected at the inner side, the lower part of the upper fastening ring having a cross-section such that a shoulder is formed on the outer face of the fastening ring to lie adjacent the outer circumferential edge of the upper annular element, and means for the application of pressure external to the sleeve.

14. A casing head equipment consisting of

a casing, a massive elastic jointing sleeve within the casing, through which the connected sections and couplings of the drilling tool or casing may pass under substantially pressure tight conditions, annular elements for the reception of the respective ends of the sleeve, means for resisting excessive internal contraction of the sleeve on the application of pressure external to the sleeve, comprising embedded within the sleeve a reinforcement permitting the internal contraction of the sleeve at a position between its ends, means for securing the ends of the said reinforcement within the said respective annular elements, comprising fastening rings embedded in the respective ends of the sleeve to which the ends of the reinforcement are respectively connected at the inner side, slots within the outer ends of the said respective fastening rings and screw-threaded pins mounted and secured within the said slots, the ends of the screw-threaded pins protruding from the outer ends of the said respective fastening rings, and means for connecting the respective pins of the fastening rings to the said respective annular elements.

15. A casing head equipment comprising a stationary casing, a massive internal jointing sleeve within the casing through which the connected sections and couplings of the drilling tool or casing may pass under substantially pressure tight conditions, means for resisting excessive internal contraction of the sleeve on the application of pressure externally to the sleeve, comprising embedded within the sleeve a reinforcement permitting the internal contraction of the sleeve at a position between its ends, and an elastic metal reinforcement applied within the sleeve at its upper end.

16. A casing head equipment comprising a massive elastic internal jointing sleeve through which the connected sections and couplings of the drilling tool or casing may pass under substantially pressure tight conditions, a casing for the sleeve, means for resisting excessive internal contraction of the sleeve on the application of pressure external to the sleeve, comprising an elastic metal reinforcement applied within the central part of the sleeve at its upper end and external thereto.

17. A casing head equipment comprising a massive elastic internal jointing sleeve through which the connected sections and couplings of the drilling tool or casing may pass under substantially pressure tight conditions, a casing for the sleeve, means for resisting excessive internal contraction of the sleeve on the application of pressure external to the sleeve, comprising an elastic metal reinforcement applied within the central part of the sleeve at its upper end and external thereto, said metal reinforcement comprising a circular series of prong-like elements diverted outwardly and normally extending outwardly, the said sleeve having an annular cavity provided therein for the reception of the outwardly diverted ends of the said prongs.

18. A casing head equipment comprising a stationary casing, a rotor within the said casing, a packing device within the rotor and adapted to be contracted under pressure externally applied, means for the application of pressure externally to the said packing device, jointing faces on parts of the said rotor, packers for the said jointing faces within annular cavities in parts of the said stationary casing adjacent the said bearings, the said annular cavities being formed to a non-circular shape, the said packers each comprising an elastic pressure receptacle having a non-circular shape corresponding to the cavities.

19. A casing head equipment comprising a stationary casing, a rotor within the said casing, a packing device within the rotor and adapted to be contracted under pressure externally applied, means for the application of pressure externally to the said packing device, jointing faces on parts of the said rotor, packers for the said jointing faces within annular cavities in parts of the said stationary casing adjacent the said jointing faces, means to render the said annular cavities to a non-circular shape comprising segmental strips applied within the cavities, the said packers each comprising an elastic pressure receptacle having a non-circular shape corresponding to the cavities.

20. A casing head equipment comprising a stationary casing, a rotor within the said casing, a packing device within the rotor and adapted to be contracted under pressure externally applied, means for the application of pressure externally to the said packing device, jointing faces on parts of the said rotor, packers for the said jointing faces, and means to render the said packers accessible to pressure applied to the said packing device, said means comprising controlling valves.

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