Oct. 27, 1925. 1,558,592

D. H. CHESTER

EXPANSION JOINT

Filed May 12, 1922 2 Sheets-Sheet 1

Fig. 1.

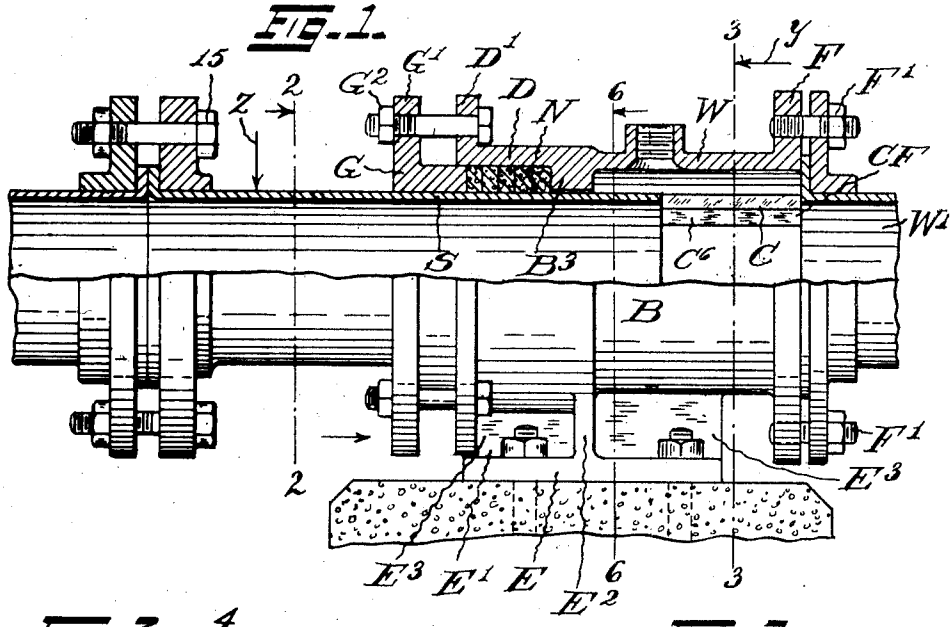


Fig. 3.

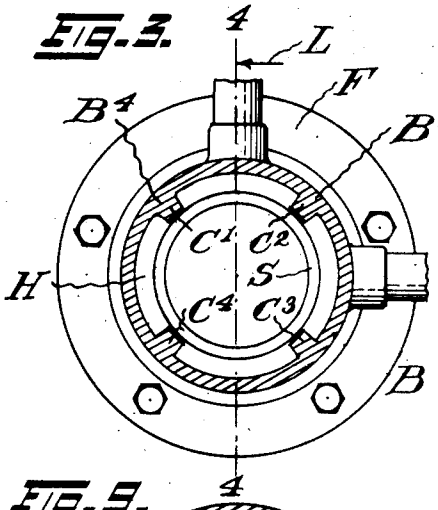


Fig. 2.

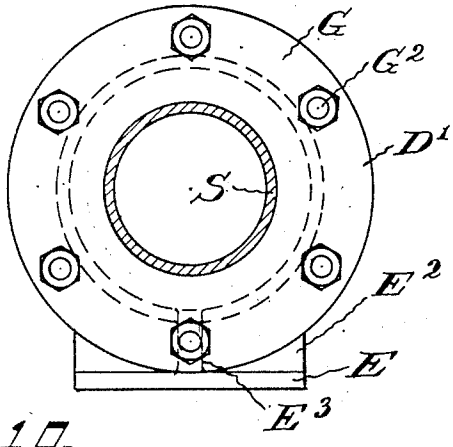


Fig. 9.

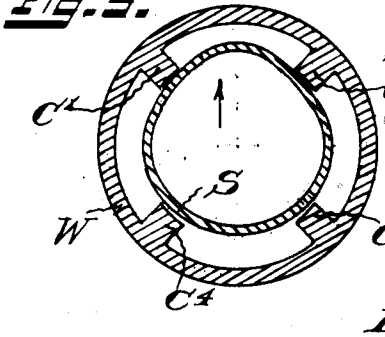
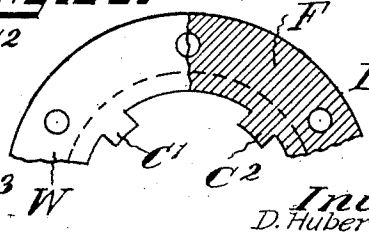


Fig. 10.



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Fig. 4.

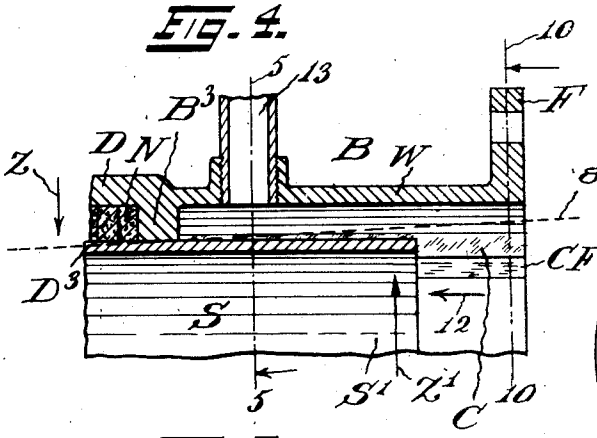


Fig. 5.

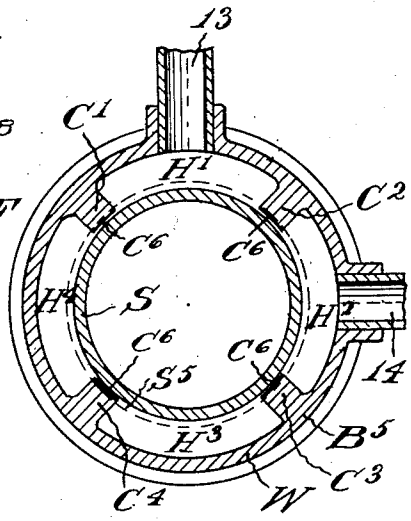


Fig. 6.

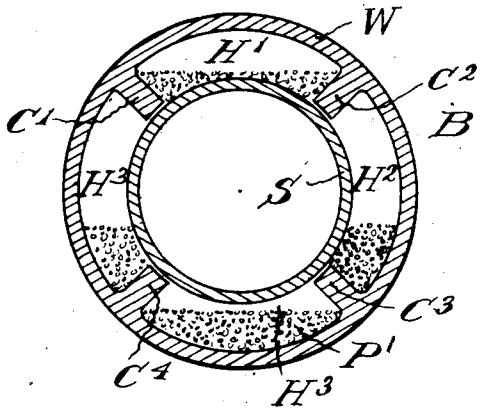


Fig. 7.

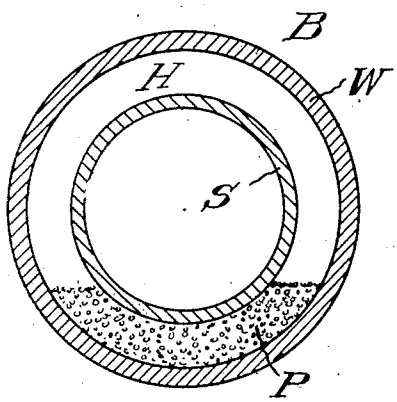
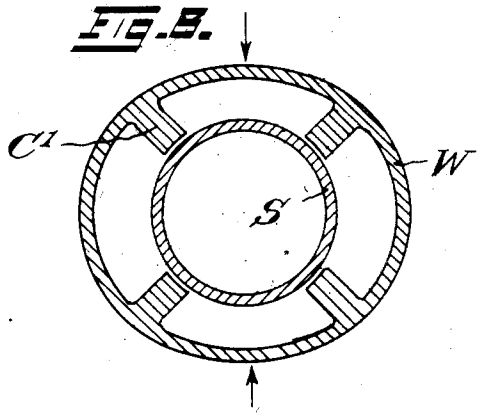


Fig. 8.



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Patented Oct. 27, 1925. 1,558,592

UNITED STATES PATENT OFFICE.

DICK HUBERT CHESTER, OF BUFFALO, NEW YORK.

EXPANSION JOINT.

Application filed May 12, 1922. Serial No. 560,310.

To all whom it may concern:

Be it known that I, DICK HUBERT CHESTER, a citizen of the United States, residing in Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Expansion Joints, of which the following is a specification.

This invention relates to that class of slip-tube expansion joints in which the slidable tube-member is said to be internally guided, that is, guided by the inner end thereof in such manner as to render unnecessary the use of guide-way devices attached exteriorly to the casing of the expansion joint for holding the slip-tube in alinement during the normal range of sliding movement thereof.

A principal object of the present improvements is to furnish,—in an expansion joint of said class,—a casing member provided with suitable packing means and having in the casing and surrounding the inner end of the slip-tube, a series of chambers arranged for restricting the collecting of sediment and for facilitating an automatic dispersal thereof under certain working conditions, as hereinafter more fully explained.

Other objects and advantages are also hereinafter pointed out and explained by reference to the accompanying drawing, in which—

Fig. 1 is a side elevation (drawn on a relatively small scale, of a sliptube expansion joint made in accordance with the present invention, and shown in a preferred form thereof.

Fig. 2 is an end elevation of said expansion joint as seen from the left-hand in Fig. 1 from line 2—2, and is shown drawn on the same scale as Fig. 1.

Fig. 3 is a cross sectional view on line 3—3 of Fig. 1, looking in the direction of arrow Y.

Fig. 4 is a longitudinal and sectional view drawn on a larger scale, and taken on the dotted central line 4—4 of Fig. 3, looking in the direction of arrow L.

Fig. 5 is a sectional view on line 5—5 of Fig. 4, showing certain branch connections, as hereinafter more fully explained.

Fig. 6 is a view similar to Fig. 3, for showing, in a diagrammatic manner, how the collection of sediment is normally restricted, and thereby deposited, a portion only, in each of the chambers of the tube-surrounding series of them.

Fig. 7 is a view similar in part to Fig. 6, for illustrating diagrammatically a normal collection of sediment in a single mass, and which is prevented by the feature and in the manner shown in Fig. 6.

Fig. 8 is a sectional view similar to Fig. 6, showing, in a diagrammatic manner, how the outer casing may be distorted by external pressure, and illustrates a principle hereinafter explained.

Fig. 9 is a sectional view, showing, in a diagrammatic manner, a tendency toward inner tube distortion in accordance with the principle hereinafter more fully explained.

Fig. 10 is a partial end view as seen from the right hand in Fig. 4, and drawn on a reduced scale, for the purpose of illustrating one of the features of integrality; the right hand portion of this view being sectioned on line 10—10 of Fig. 4.

In the drawings, the casing member is designated, as a whole, by B and it preferably comprises a packing chamber portion D, forming one end thereof. The chamber D is shown as having therein an annular space, for a packing material of ordinary ring-form, N, which is shown as being compressible by an ordinary gland, or gland-ring, G, which is provided with the flange G^1, and is operable by bolts G^2, which may connect in any well-known manner clearly illustrated in Figs. 1 and 2. The usual slip tube S is slidable in said gland G and packing N, but in practice should have a greater length than would be necessary for use in the well-known kinds of expansion joints having tube-guiding means external to the casing B, and of similar sizes.

Said casing B comprises, as a principal member or component thereof, the extended tubular wall or barrel W, and between this wall and the slip-tube S, there is an annular space that is divided by longitudinal walls into a series of arc-form chambers, which, together, extend around, or encircle, said tube S. In Fig. 5 (and also in certain other views) said chambers are designated by H^1, H^2, H^3 and H^4, respectively; also, for convenience of description, these chambers are herein sometimes referred to, collectively, as chambers H; and, individually without choice, as chamber H.

The wall W is shown provided on the end thereof opposite to said chamber D, with an encircling flange or head F, and this has several functions; first, it may have means,—as suitable bolts F^1, proper in number and location for attaching to the casing, a connecting length of pipe, of the kinds usual in pipe-lines; second, it serves as a strong reinforcement ring for the end of wall W, and is therefore preferably integral with the wall; third, it connects, as clearly illustrated in Fig. 10, with the wall-end in a manner for also being integrally united through said end of wall W with the ends of the several chambers-separating walls, of which four are shown in Figs. 3 and 5. These latter walls are herein designated individually by C^1, C^2, C^3 and C^4, respectively, but are herein sometimes referred to, collectively, as walls C; and, individually without choice, as wall C. In said views Figs. 2 and 5, these walls C and said chambers H, have been shown placed as follows: the wall C^1 separates the chambers H^4 and H^1; wall C^2 separates chambers H^1 and H^2; wall C^3 separates chambers H^2 and H^3; and wall C^4 separates chambers H^3 and H^4. From the said sectioned portion of Fig. 10, it will be evident how the several said members W, F and C have a continuous integrality from the extreme outer to the extreme inner portions.

Heretofore in this art, it has been a common practice to guide the slip-tube by an extended annular surface fitting the tube closely (in a well-known manner) and extending inwardly from the packing to a distance sufficient to give the required stability. These extended coacting surfaces have the disadvantage of tending to draw in between them, and there retain, gritty substances, such as sand and scale from the pipe surfaces, to such an extent as to interfere with the proper operation of the joints, and sometimes to cause adhesions of a harmful character. To overcome or avoid those objections, the annular slip-tube bearing surface of casing B, see Figs. 1 and 4, is shown unusually narrow, so that the normal movement of the tube S shall be equal to several times the width of the tube-bearing surface of said casing B; thus the quantity of grit which can collect at said surface is not only extremely small, but the relatively long movement of the tube tends to quickly dislodge any such deposit as may momentarily collect there. And, for such an ordinary tube-guidance as above mentioned, the narrow and extended surfaces of the wall-edges are herein substituted, as, and also for the further purposes, elsewhere herein more fully explained.

As will be seen from Figs. 1 and 4, the walls, as C, separating the chambers, H, may be extended from the packing chamber-wall B^3 to a position within the head or flange, as CF, at the opposite end of the casing member B. By this means said casing is made up of a series of T-form portions, as indicated at B^4, B^4, Fig. 3, whereby a greater strength and rigidity of casing is obtained in proportion to the weight of metal. This ribbed form of construction has the further advantage that since the wall may be made thinner, the metal therein naturally has the superior quality normally due to the making of the casting (especially when made of cast iron) of less thickness than otherwise necessary, it being well known that the grades of pig-iron usable for this class of articles, have a higher quality in a thinner plate or wall than in a thicker one. Thus by taking advantage of that circumstance a material saving in cost of manufacture may be effected while insuring (in the foundry work) a casing of relatively high quality; and, at the same time, the reliability of the connection between the end portions of the casing is materially improved. Also, this use of a thinner wall (by the means here described), provides for making the chambers H of greater dimension radially of the tube-axis, without a corresponding increase in the external diameter of said tubular portion W.

Each one of said walls C, as will now be evident, has several functions and features:—it separates from each other, two of the sediment chambers, as H^1, H^2, Fig. 5; it stiffens,—after the well-known manner of a beam-flange,—a longitudinal zone of the wall of casing B; it aids said wall of the casing B in reliably joining the packing-chamber wall B^3 with the end flange W^1, and in accomplishing this object with the use of a minimum amount of metal; and, while serving in those several capacities, it provides on its inner edge, or surface, a tube-guiding face, C^6, which coacts with the annular zone on the inner surface of said packing-chamber wall B^3.

Furthermore, the provision in the casting of said walls C of a sufficient width prior to the machining of the bore to finished size, provides for varying the diameter of said bore to suit slip-tubes of different thickness and this without noticeably affecting the strength and stability of the casing as a whole. This feature is especially important, since, in practice, a given commercial size of expansion joint requires in some instances to have slip-tubes of brass, and in other instances, of steel, and to have these of varying thickness according to the requirements of different kinds of service. Thus in one case a brass slip-tube may be $\frac{1}{8}$ inch thick; and in another case this tube may be of steel and $\frac{1}{4}$ inch in thickness, and both be fitted into casings cast from the same pattern.

By making the guide members, as C, ex-

tend along the interior wall of casing B to a position, as CF, Fig. 1, as far as or beyond the end S^1 of the slip-tube S when this tube is in its farthest position (toward the right-hand in Fig. 4), then any wearing away of the tube-surface due to the friction thereof on said guide-face, becomes distributed along the tube-surface in a favorable manner, and with the result that no abrupt shoulder can be gradually created in such a position in the tube-surface as to be drawn into the packing N, should the slip-tube be drawn outwardly to its extreme working position, as in Fig. 1. Where any damaging amount of wear to the slip tube S where the guides C contact therewith occurs by reason of the joint being under a side strain, this may be corrected by simply revolving the tube S to a new position relative to guide members C and relieving the strain. And, in cases where said guides C are harder than tube S, so that tube S will bear all of the wear from gritty water, etc., either under normal conditions or under side strains, such joint may also be restored to a tight condition by turning the tube S to a new position (not shown) relative to the guides C; said tube S being held in rigid position by bolts 15, Fig. 1.

The practical adaptation of the special construction of casing already described, for being fitted,—or internally finished,—to receive a slip-tube of either a thin or a thick formation, is further illustrated in Fig. 5. In this view the casing B is shown provided longitudinally with the aforesaid radially-disposed walls C which, with the wall zone B^5, forms a T-form portion of the casing B. A relatively thin slip-tube S is shown slidable fitting against the inner face C^6 of said wall C, this being in accordance with the arrangement also shown in Figs. 3, 6 and 8.

If, now, instead of the thin tube S, Fig. 5, the use of a thicker tube shall be required, then it is only necessary to bore out the casing to the required larger size, as for instance, to a diameter indicated by the dotted circle S^5, thus providing for the larger tube-thickness indicated by such dotted circle S^5. By making the wall C of a width suitable for the several functions thereof already pointed out, then the variation in the width thereof (radially of the casing) necessary for receiving slip-tubes within a range of thickness covering all ordinary requirements, is relatively so small as not to essentially modify or reduce the strength or suitability of the casing considered as a whole or impair the utilities and coaction of the described component members thereof.

The structural and founctional features here explained as regards the casing B also result (in the assembled device) in a further utility of peculiar importance. It is well-known that in pipe-lines in general, and especially in high-pressure lines of the larger sizes, (as for instance, from 6 to 30 inches in diameter and for heavy pressures,—a class of service for which the present improvements are deemed to be particularly applicable), the vibrations and stresses to which the expansion-joints of such a line are at times subjected make it desirable,—as a matter of safety,—that the casing wall shall in some portion of its length be capable of being flexed, (but in a resilient manner) to more than a usual extent for reducing an otherwise undue liability to fracture.

For the foregoing reasons, the casing shell W is herein shown so proportioned that when consisting of an iron casting, the inner and outer surface portions, (commonly called the "skin") of the wall W will be left each in its original state of having an extra toughness and strength normal thereto as compared with a mid-zone portion thereof, and thus will not be impaired in said qualities by a removal of such surplus metal on the inner edges of the walls C as would be necessary for fitting them to receive the sliding tube S. In practice, by suitably proportioning the patterns for said casing, the walls C may be made to project inwardly to such an extent that by cutting away different amounts of the inner edges thereof the casing B may be fitted for receiving slip-tubes of a different diameter in one case than may be used in another casting made from the same pattern but bored out to a different internal diameter.

Thus said features herein specially illustrated diagrammatically, provide for a flexing of the resilient tubular wall of the casing B in a manner further illustrated in Fig. 8. In this view the four guide-faces C^6 of the chamber walls C are shown (in end view thereof) contacting with the enclosed slip-tube, as S, this being shown of circular form. If, now, a pipe-line lateral stress (either vertically or otherwise) of sufficient force to normally endanger the casing B be concentrated upon the wall portion W thereof, this wall (unless limited or resisted by other means not shown) may be sprung into a non-circular or elliptical form, (here illustrated in an exaggerated manner for the purpose of clearness), thereby in a measure yielding to said stress or pressure, and so by temporary deformation minimize the danger of, or tendency to, fracture.

From the foregoing description it will be evident that, as seen in the sectional views, each of the inwardly projecting guide walls being integrally connected with the wall W may be said to form with the immediately adjacent portions of said wall, a T-form member of the casing B, this casing comprising a series of such members located at

successive positions. In the case of a distortion, such as illustrated in Fig. 8, these T-form components of the casing wall are naturally somewhat deflected through the described flexing action, but not sufficient to be of material importance since the described action does not tend to rigidly grip the slip-tube.

The mode of deformation by resiliency and flexure as indicated in Fig. 8, may be restricted, or limited, in practice, by means of a connection or jointure as between the lower portion of the wall of the casing B and a base-plate, as E, Fig. 1. In this view the base member E (here shown in the form of a plate) is integrally connected at one end, at E^1, to the packing chamber D; and, a further connection is made by a cross-wall E^2 at, or near, the end-wall B^3 of said packing chamber, while a longitudinal center wall, E^3, serves as a further jointure for reinforcing and extending said connection. The right-hand portion of this center-wall, E^3, does not extend to the end-portion F of the annular wall W, and hence can only have a small limiting effect as regards the flexing action thereof described in connection with Fig. 8.

Another feature of the mode-of-action is diagrammatically illustrated in Fig. 9. It will be remembered that in many instances a pipe-line settles, or is depressed, either temporarily or otherwise, in some part of its length and thus tends to deflect the slip-tube downwardly at its outer end if the tube were a lever supported on a fulcrum and subjected to a force acting thereon at arrow Z, Fig. 1. Such a force acting under said conditions, would force the inner end of the tube S upwardly as indicated by arrow Z^1, Fig. 4. The normal result of that action is of a character indicated in Fig. 9, which shows said inner tube-end forced upwardly between the guide-walls C^1 and C^2, to the extent of flexing said tube-end into a distorted outline; and, at the same time spaces are formed between the tube-end and the lower guide-walls C^3 and C^4.

Furthermore, this action takes place primarily and to the greatest extent at the extreme inner end of the tube, whatever may be the distance by which the tube extends into the casing, since the said guide-walls by extending a longer distance thus always furnish the necessary bearing-faces for producing the described mode of action. In this manner, when the tube is of the usual relatively small thickness, a slight but important degree of yielding action is obtained at a time and under conditions when this action serves to relieve shocks and stresses which otherwise would be harmful.

When a leverage strain is put upon the pipe, S, by a force acting in direction of arrow Z in Fig. 4, the tendency of such a force is to shift the pipe toward the inclined position of dotted line; but, in practice, this shifting and deflection of alinement is resisted by the pipe-end S^1 impinging against the two guides C, with a result symbolically illustrated in Fig. 9. In many instances, the slip-tube S is made of thin metal, which is thus considerably flexible in the end portion thereof, (under such strains as here indicated), so that a deformation of the normal tube-form is readily effected by the pressures arising as here explained. In Fig. 9, for instance, the said leverage and strain is represented as tending to shift the circular end S^1 of said pipe upwardly, but this movement being resisted at the two guides C^1, C^2, an upper mid-portion of this pipe-end between the guides C^1 and C^2 is thereby forced up to a more curved position, while the two sides of the tube between guides C^1 and C^4 and C^2 and C^3 tend to deflect outwardly, and the bottom portion between C^4 and C^3 to move slightly upward; and, by this yielding of the tube,—which also may occur in connection with the shell-deformation shown in Fig. 8,—the intensity and otherwise normal injuriousness of said leverage action are largely reduced and prevented.

A common arrangement in concentric positions, of the casing-wall, as B, and the slip-tube S, is shown in the cross-sectional view Fig. 7, in which a considerable deposit of sediment in the lower portion of the annular space H, is indicated by the cross-shading at P. In practice, and under a variety of conditions, such deposits normally form into a relatively compact mass, and this often tends to gradually harden and become permanent and thus to operate on the lower tube-surface in an injurious manner. For overcoming such a result, by preventing the same, said annular space H, Fig. 7, is shown in Fig. 6 separated into a tube-surrounding series of sediment chambers, for thereby causing the total quantity of sedimentary deposit to be separated into several portions, and thus prevented from forming a single and compact deposit such as indicated in said Fig. 7. Also in Fig. 6, said sediment chambers, here designated by H^1, H^2, H^3 and H^4, respectively, are separated by walls having tube-guiding edge-surfaces, as and for the further purposes elsewhere herein more fully described.

Said chambers-separating walls, may be positioned (or located) in some instances at the top, one at the lower side, and one at opposite sides of the casing. In this arrangement, the sediment naturally would collect in the four chambers formed by said walls C, and the total collection would be thus separated into four portions.

However, the placing of said walls on "the quarters," as shown in Fig. 6, has the advantage of separating said sediment col-

lections, or deposits, not only into four portions, but doing this in a more effective and desirable manner. In this arrangement, the lower deposit P^1, is not only the larger one, but it is widely spread out and thus does not normally impinge against the under tube-surface, unless such deposit becomes excessive also, such a lower deposit is more accessible to, and more readily removable by, the strong eddy-currents which, (as is well-known) normally occur in the casing interior, and adjacent to the tube-end S^1 in all the longitudinal positions of the tube S. And, this action for removal of any such deposit at P^1 is not obstructed by the presence of a centrally-located wall, as it would be were the walls positioned at the top, bottom, and sides.

It will be evident that such sediment depositing as indicated in Figs. 6 and 7 will in some instances occur in greater volume when the liquid stream is moving slowly in the pipe-line, and especially when moving in the direction of the arrow 12, Fig. 4, and, also, when the tube S is so lengthened by heat as to extend far into the casing W, as shown for instance in Fig. 4. If, under these conditions, the said deposits become of a considerable volume, then on the withdrawal of said tube-end to position as indicated in Fig. 1, the flow of liquid normally operates to dislodge and rapidly carry away much of the material so collected before it becomes abrasive. These modes of action normally occur in all the said chambers to an extent sufficient, under all usual conditions, for keeping the casing free from, and to prevent the forming therein, of any compact mass of sedimentary material which could materially injure the tube-surface by reason of having a grinding, or abrasive action thereon.

The locating of said chamber-separating walls C on said quarter positions (instead of on the sides and at top and bottom) has the further advantage of providing for supplying (by flowage through the chambers) branch pipes leading out from the casing. For instance, two such branches are shown at 13 and 14, in Fig. 5. In practice, any branches leading to or from such a casing are nearly always connected thereto at the top, bottom, or to one side, and this arrangement is specially provided for by the construction herein illustrated. Also, it will be noted, a stream of fluid flowing in either direction through such a branch pipe, and also passing through one of said chambers, thereby tends to keep the chamber free of deposits. And for making this action more complete, the branch pipe may be placed near to the inner end of the chamber, as indicated for instance, at 13, Fig. 4.

Thus the chamber H^1, Fig. 5, serves as and constitutes a conduit leading from the interior of the pipe line to the branch pipe 13, at whatever position the slip-tube S may have within its range of longitudinal movement. And it will be evident that when such a branch or branches are to be of relatively large diameter, the casing may be made of a slightly greater diameter than would otherwise be needful, and thus provide for said chambers being, as passage-ways, of ample cross-sectional area for the requirements, in any such particular instance, and without requiring any lengthening of the casing on such account.

Having thus described my invention, I claim:

1. An expansion joint, comprising a casing having an encircling integral inwardly extending wall portion near one end thereof, and a plurality of longitudinally disposed casing-wall reinforcing members integral with said wall and casing extending from said wall to the opposite end of said casing.

2. An expansion joint, comprising a casing having an encircling inwardly-extending wall near one end thereof and a flange at its opposite end, and a plurality of ribs integrally connecting said wall, casing and flange.

3. An expansion joint, comprising a tubular casing having an encircling inwardly extending wall near one end thereof, rib members extending from said wall toward the opposite end of said casing, and a tube longitudinally movably mounted within said casing and maintained in axial alinement therewith by said ribs.

4. An expansion joint, comprising a tubular casing having an inwardly-projecting encircling wall near one end thereof and a flange at the opposite end, and a plurality of longitudinally disposed members along the inner surface of said casing to form with said wall an internal annular bearing.

5. An expansion joint, comprising a tubular casing having an encircling inwardly-projecting wall near one end thereof and a flange at the opposite end, a slip-tube adapted to be inserted into said casing, and a plurality of longitudinally disposed ribs integral with said casing, wall and flange, arranged to form with said wall an annular bearing in the casing, and thereby provide a casing adapted to be internally finished to receive different size slip-tubes.

6. An expansion joint, comprising a tubular casing having an encircling radially extending wall near one end therof, a tube adapted to be inserted into said casing bearing against the inner face of said wall, and longitudinally disposed members between said casing and tube forming a series of arc-form chambers surrounding said tube, thereby providing space for distortion of said tube when under strain.

7. A joint of the class described, comprising a tubular casing having a pipe connecting flange at one end and an encircling radially extending wall near its opposite end dividing said casing into a packing chamber and a tube receiving chamber, a slip-tube having a pipe-joining flange at one end and adapted to be longitudinally movably inserted into said casing bearing against said wall, the tube bearing face of said wall being of less longitudinal extent than the longitudinal movement of said tube, packing in said packing chamber, a packing compressing and retaining member adjustably connected to said casing, and longitudinally disposed ribs integral with said casing wall, flange and encircling inwardly-extending wall portion, arranged to reinforce said casing wall and maintain said casing and tube in axial alinement.

8. An expansion joint comprising a casing; a slip tube in the casing and concentric thereto; and dependent walls in the casing forming with adjacent portions of the casing a plurality of chambers having substantially T-form wall portions for providing strength and rigidity for the casing, said walls extending radially from said casing, whereby to contact with the slip tube.

9. An expansion joint comprising a casing; a slip tube in the casing arranged concentrically thereof; and dependent walls in the casing forming with adjacent portions of the casing a plurality of chambers having substantially T-form wall portions for providing strength and rigidity for the casing, the end faces of said walls being in direct contact with the slip tube for guiding the same in its forward movement.

10. An expansion joint comprising a casing; a slip tube in the casing arranged concentrically thereof; and dependent ribs in the casing extending longitudinally thereof and positioned relative to the axis of the casing, when the casing is viewed in cross-section, for forming with adjacent portions of the casing and slip tube chambers for sediment.

11. An expansion joint comprising a casing; a slip tube in the casing arranged concentrically thereof; and dependent ribs in the casing extending longitudinally thereof and positioned relative to the axis of the casing, when the casing is viewed in cross-section, for forming with adjacent portions of the casing and slip tube chambers for sediment, the end faces of said ribs providing guiding means for the slip tube.

12. An expansion joint comprising a casing; a slip tube in the casing arranged concentrically thereof; and dependent ribs in the casing extending longitudinally thereof and positioned at angles of approximately forty-five degrees relative to the axis of the casing, when the casing is viewed in cross-section, for forming with adjacent portions of the casing and slip tube chambers for sediment.

13. An expansion joint comprising a casing; a slip tube in the casing arranged concentrically thereof; and dependent ribs in the casing extending longitudinally thereof and positioned at angles of approximately forty-five degrees relative to the axis of the casing, when the casing is viewed in cross-section, for forming with adjacent portions of the casing and slip tube chambers for sediment, the end faces of said ribs providing guiding means for the slip tube.

14. An expansion joint comprising a casing; a slip tube in the casing arranged concentrically thereof; dependent ribs in the casing extending longitudinally thereof and positioned relative to the axis of the casing, when the casing is viewed in cross-section, for guiding the slip tube and forming with adjacent portions of the casing and slip tube chambers for sediment; and branch pipes in the casing communicating with some of said chambers.

15. An expansion joint comprising a casing; a slip tube in the casing arranged concentrically thereof; dependent ribs in the casing extending longitudinally thereof and positioned relative to the axis of the casing, when the casing is viewed in cross-section, for guiding the slip tube and forming with adjacent portions of the casing and slip tube chambers for sediment; and branch pipes in the casing communicating with sediment chambers at the top and side of the casing.

16. An expansion joint comprising a casing having an annular recess for packing; a slip tube in the casing arranged concentrically thereof; packing in said recess cooperating between the casing and slip tube; and dependent ribs in the casing extending longitudinally thereof and having faces providing guide means for the slip tube and forming with adjacent portions of the casing and slip tube chambers for sediment.

17. An expansion joint comprising a casing; dependent ribs in the casing extending longitudinally thereof and forming with adjacent portions of the casing substantially T-form wall portions for providing strength and rigidity for the casing; and means appurtenant to the lower portion of the wall of the casing for restricting and limiting deformation of the casing by resiliency and flexure.

18. An expansion joint comprising a casing; a slip tube in the casing arranged concentrically thereof; dependent ribs in the casing extending longitudinally thereof and having faces for guiding the slip tube, said ribs forming with adjacent portions of the casing substantially T-form wall portions of the casing and forming with wall portions of the casing and slip tube sediment cham-

bers; branch pipes in the casing communicating with some of said chambers; and means appurtenant to the lower portion of the wall of the casing for restricting and limiting deformation of the casing by resiliency and flexure.

19. An expansion joint comprising a casing; a slip tube in the casing arranged concentrically thereof; dependent ribs in the casing extending longitudinally thereof and having faces for guiding the slip tube, said ribs forming with adjacent portions of the casing substantially T-form wall portions of the casing and forming with wall portions of the casing and slip tube sediment chambers; branch pipes in the casing communicating with sediment chambers at the top and side of the casing; and means appurtenant to the lower portion of the wall of the casing for restricting and limiting deformation of the casing by resiliency and flexure.

20. An expansion joint comprising a casing having an annular packing chamber; a slip tube in the casing arranged concentrically thereof; packing in said chamber cooperating between the casing and slip tube; dependent ribs in the casing extending longitudinally thereof and having faces for guiding the slip tube, said ribs forming with adjacent portions of the casing substantially T-form wall portions of the casing and forming with the wall portions of the casing and slip tube sediment chambers; and means appurtenant to said packing chamber and the lower portion of the wall of the casing for restricting and limiting deformation of the casing by resiliency and flexure.

21. An expansion joint comprising a casing having an annular packing chamber; a slip tube in the casing arranged concentrically thereof; packing in said chamber cooperating between the casing and slip tube; dependent ribs in the casing extending longitudinally thereof and having faces for guiding the slip tube, said ribs forming with adjacent portions of the casing substantially T-form wall portions of the casing and forming with wall portions of the casing and slip tube sediment chambers; means appurtenant to said packing chamber and lower portion of the wall of the casing for restricting and limiting deformation of the casing by resiliency and flexure; and branch pipes in the casing communicating with sediment chambers at the top and side of the casing.

22. An expansion joint comprising a casing having an annular recess for packing; a slip tube in the casing arranged concentrically thereof; packing in said recess co-operating between the casing and slip tube; dependent ribs in the casing extending longitudinally thereof to provide guiding means for the slip tube and forming with adjacent portions of the casing and slip tube chambers for sediment, and branch tubes in the casing adjacent to one end of the sediment chambers and communicating with the sediment chambers at such end.

23. An expansion joint comprising a casing having an annular recess for packing; a slip tube in the casing arranged concentrically thereof; packing in said recess co-operating between the casing and said tube; dependent ribs in the casing extending longitudinally thereof from said annular recess throughout the entire length of the casing and forming sediment chambers with adjacent portions of the sediment chambers and slip tube; and branch tubes in the casing at the end of the sediment chambers adjacent to the annular recess and communicating with the sediment chambers at such end.

24. An expansion joint comprising a casing having an inner wall adjacent to one free end of the casing to form an annular recess for packing; a slip tube in the casing arranged concentrically thereof; packing in said recess co-operating between the casing and slip tube; dependent ribs in the casing extending longitudinally thereof from said inner wall to the said free end of the casing to form with adjacent portions of the casing and slip tube chambers for sediment: and branch tubes in the casing at the end of the sediment chambers adjacent to the inner wall and communicating with said sediment chambers at such end.

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