E. L. BARNES.

EXPANSION JOINT.

APPLICATION FILED MAY 12, 1920.

1,367,347.

Patented Feb. 1, 1921.

4 SHEETS—SHEET 1.

Fig. 1.

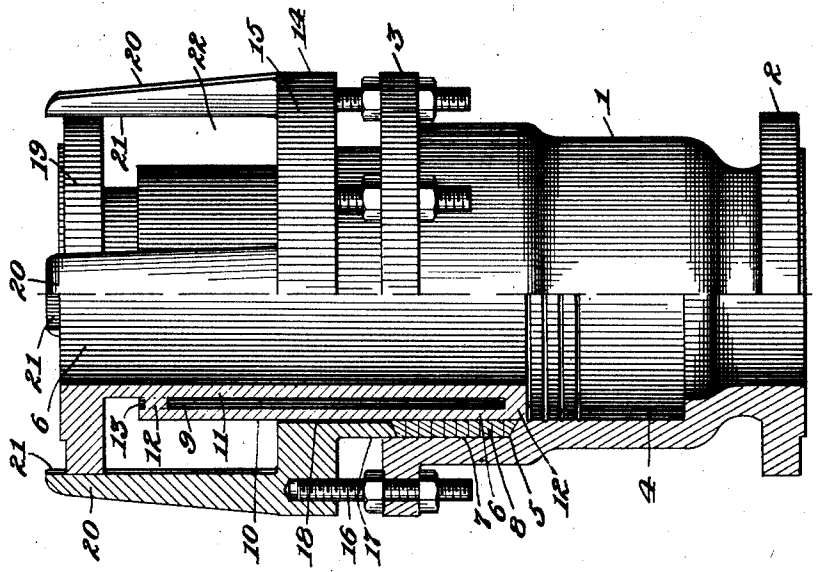


Fig. 2.

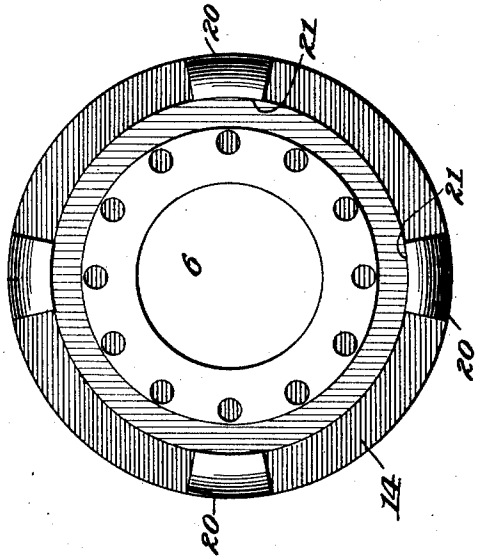
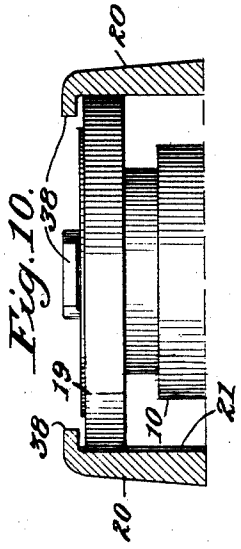


Fig. 10.



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4 SHEETS—SHEET 2.

Fig. 3.

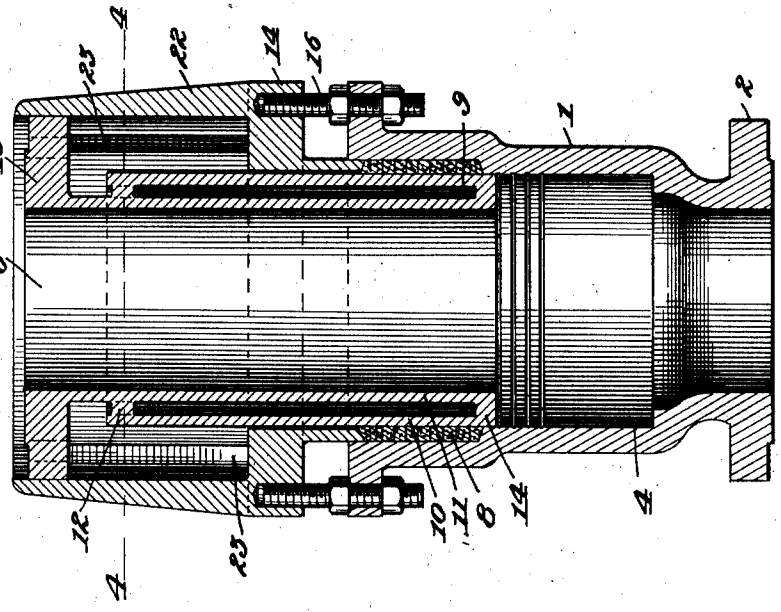
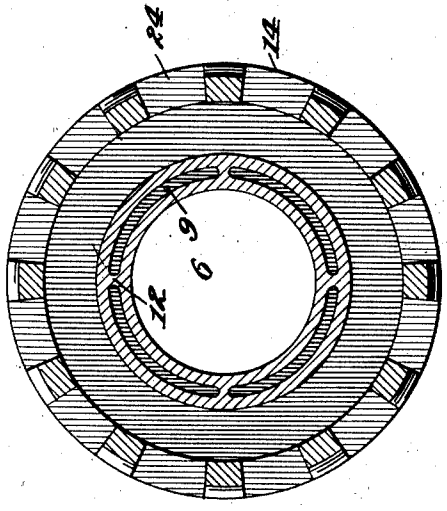


Fig. 4.



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4 SHEETS—SHEET 3.

Fig. 5.

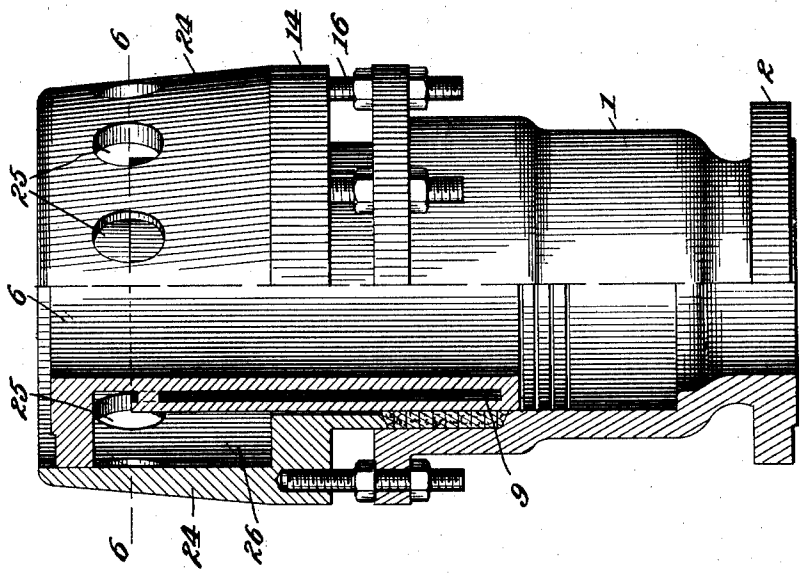
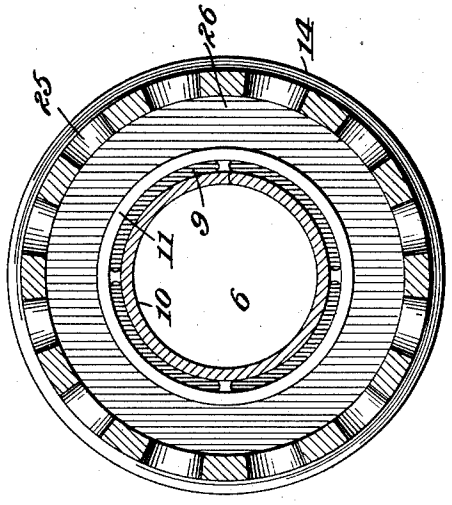


Fig. 6.



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4 SHEETS—SHEET 4.

Fig. 7.

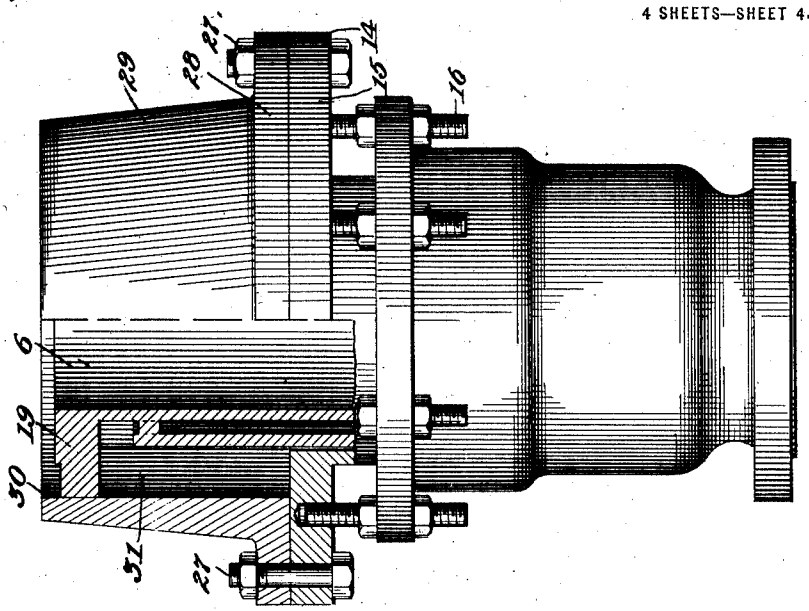


Fig. 8.

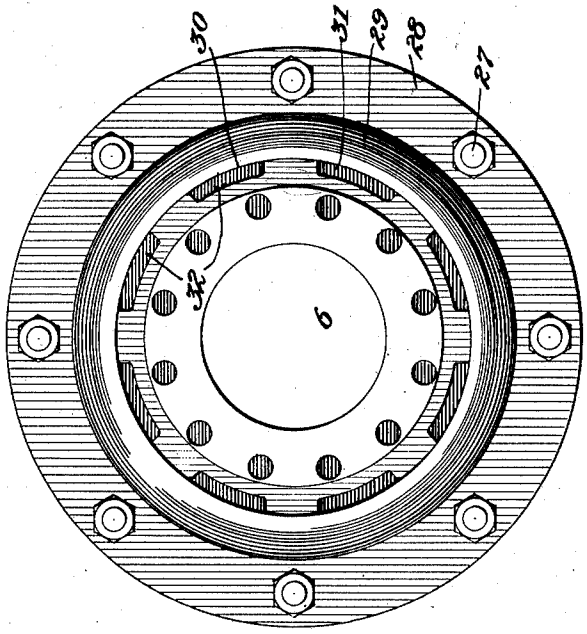
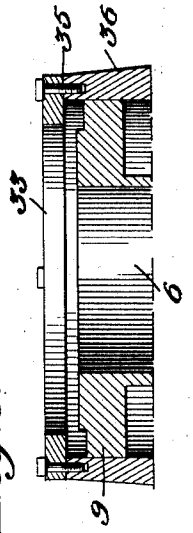


Fig. 9.



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UNITED STATES PATENT OFFICE.

EUGENE L. BARNES, OF BUFFALO, NEW YORK, ASSIGNOR TO AMERICAN DISTRICT STEAM COMPANY, OF NORTH TONAWANDA, NEW YORK, A CORPORATION OF NEW YORK.

EXPANSION-JOINT.

1,367,347. Specification of Letters Patent. Patented Feb. 1, 1921.

Application filed May 12, 1920. Serial No. 380,877.

To all whom it may concern:

Be it known that I, EUGENE L. BARNES, a citizen of the United States, residing at 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, reference being had therein to the accompanying drawing.

This invention relates to expansion structures, also known as slip joints, and is especially adapted for use in connection with steam and similar systems wherein provision must be made for the normal tendency of the associated members of a pipe-line to creep, expand, or contract.

In prior practice, it has been customary, in making slip joints, to provide an inner sleeve in operative association with an outer sleeve, these being slidably arranged with a mass of packing therebetween and with the exterior wall of the inner sleeve disposed in direct contact with the packing. The high temperature of the steam or other expansive medium, as it passes through the joint, has a normal tendency to char the packing and cause it rapidly to deteriorate, resulting in leakage amounting to a substantial loss frequently. It is the primary object of the present invention, therefore, to obviate this objection; and, to that end, contemplates the provision of an insulating air-space between the exterior or bearing wall of the inner sleeve member and the associated packing; and, also, provision for the circulation of air in and around the components of the joint to promote a cooling or substantial decrease in the temperature of that component of the joint which is in direct contact with the packing and which is heated by the medium passing therethrough.

The subject-matter of the present case is an improvement, and a practical advance, on the structure disclosed in my application Serial No. 305,476, filed June 20, 1919. In the structure of that case, the inner or slidable joint member is provided with a guiding flange at its outer extremity, and this has a sliding movement within the bore of a casing member bolted or otherwise secured to an outer sleeve and housed by the casing member; and secured to the outer sleeve is a packing gland. In practice, it has been found that, in order to replace the packing held by the gland, a considerable dismantling of the joint is required. Moreover, the joint includes some components which, for economical as well as practical reasons, cannot well be dispensed with. The structure of the present case differs from that just described in that the casing member is omitted and the gland is so constructed as to constitute a support for and the guiding medium of the slidable member forming a component of the joint. Thus, the gland-element is utilized to perform a dual function, namely, that of maintaining the packing in proper position and, also, the additional function of guiding the movable component of the joint. In consequence, the associated members of the joint are maintained in operative relation, and injury to the contained packing is prevented.

In order that the invention may be entirely understood, I have disclosed the same in the accompanying drawings and as characterized by several embodiments; these being, however, merely illustrative of practical structures and indicating that the invention is susceptible of a wide range of modification and variation without departing from its salient features or underlying principles.

In these drawings:

Figure 1 is a view, partly in elevation and partly in longitudinal section, of an expansion structure made in accordance with my invention, and being one embodiment thereof;

Fig. 2 is a view in end elevation thereof;

Fig. 3 is a view in central longitudinal section of a modification of the structure disclosed in Figs. 1 and 2;

Fig. 4 is a view in vertical transverse section on the line 4—4, Fig. 3;

Fig. 5 is a view, partly in elevation and partly in longitudinal section, of a second modification;

Fig. 6 is a view in transverse section on the line 6—6, Fig. 5;

Fig. 7 is a view, partly in elevation and partly in longitudinal section, of a third modification;

Fig. 8 is a view in end elevation thereof; and

Figs. 9 and 10 are fragmentary views, in section, of means for limiting the movement of the slidable components of the joint.

Referring, now, to these drawings and, first, to the embodiment illustrated in Figs. 1 and 2, it will be noted that the reference-character 1 designates an outer or encompassing joint-member provided, at one end, with a pipe-securing flange 2 and at its other end with a gland-securing flange 3. The member 1 is formed with a bore which, at two points, 4 and 5, respectively, are of different diameters.

Disposed for a sliding movement within the bore 4 of the member 1 is an inner or slidable member 6, this member being, preferably and as shown in Fig. 1, of such exterior diametral dimensions as to have a sliding fit within the bore 4 and of less diameter than the bore 5 so as to provide an annular packing-holding chamber 7 in which a mass of packing 8 is housed, and on which the member 6 has a sliding movement

The member 6 is provided with an air-space or channel 9 formed by two walls or portions 10 and 11 arranged in substantial parallelism and preferably joined at their inner ends, as at 12, and being held spaced apart at their outer ends by sections 12, between which there are apertures 13 for the passage of a cooling medium, such as air, into the space 9. It will now be apparent that the wall 11, being spaced apart from the wall 10, and inasmuch as the latter wall, 10, is always in direct contact with the packing 8, the air in the space 9 insulates the wall 11 from the packing so that the heat of the fluid passing through the joint and imparting its heat to the wall 11 leaves the packing 8 unaffected thereby. In consequence, the life of the packing, being thus unaffected by the heat of the passing steam, is greatly prolonged.

The packing 8 is held within the packing-holding chamber 7 by a gland-element 14 arranged in operative association with the member 1, and includes a body-portion 15 into which are threaded a series of bolts 16 that extend through the flange 3 of the member 1. By reason of the fact that these bolts 16 are all arranged exteriorly of the casing 1 and of the other components of the joint, the gland-element 14 may be adjusted in respect to the packing 8 without dismantling any of the components of the joint. In fact, it is only necessary to turn the nuts of the bolts 16 in one direction or the other, according to whether the compression on the packing 8 is to be increased or decreased.

The body-portion 15 of the gland-element 14 is provided with a packing-engaging-flange or portion 17 which has a close fit within the bore 5 of the member 1. Adjustment of the gland-element by the bolts 16 tends to move the flange 17 inwardly against the packing to compress it or outwardly and away from the same to relieve pressure thereon.

The diameter of the inner wall 18 of the gland-element is slightly greater than that of the outer wall 10 of the slidable member 12, so that this member has a sliding movement on the internal walls of the gland-element and of the bore 4 of the member 1 and also of the packing 8.

In order to guide the slidable member in its movement and to maintain it in accurate alinement with the bearing surfaces of the gland-element 14 and the member 1, I have provided coacting means on the sliding member and on the gland-element as follows: On or adjacent to the outer extremity of the slidable member 6 is an enlargement or portion 19, preferably annular in form and integral with the member 12, though it may be non-integral therewith if desired. Projecting from the body-portion 15 of the gland-element are extensions or guiding portions 20, there being four of these in this instance, arranged equi-distantly apart and having a sliding engagement with the bearing surfaces 21 of the portions 20. Inasmuch as the extensions 20 are, in this instance, spaced apart, they provide a free space 22 whereby air, as from the atmosphere, may have free ingress, through the apertures 13, into the space 9, so that a circulation of air may occur in the air space 9 to maintain the outer wall 10 of the slidable member 6 relatively cool and, thus insulate the packing 8 from the steam or other heating medium passing through the joint.

From this construction, therefore, it will be observed that the components of the joint are maintained in absolute and accurate alinement for a true sliding movement in relation to the packing 8 so that this may not be injured by the relative movement between the member 6 in respect to the packing, to the gland-element 14, and to the encompassing member 1. This construction is an important desideratum of the invention and is characterized, first, by the feature of free circulation of a cooling fluid into the space 9 so that the slidable member acts as an insulator of heat from the packing 8; and, secondly, by the feature that the slidable member is guided in its movement by the gland itself, rather than by a supplemental member secured to the encompassing member 1, as in the structure disclosed in my aforementioned application.

In Figs. 3 and 4, a modified form of structure is disclosed; this modification being, primarily, in the construction and form of the gland-element 14: In this instance, the gland-element is provided with an annular extension or guiding portion 22 formed with a series of elongated apertures 23 arranged in spaced relation to provide spaces 24 for the inflow of air into the air-space 9 in the slidable member 6. The construction of this embodiment is distinguished from that of

Figs. 1 and 2 in that the latter includes a series of circularly-arranged portions or extensions 20 instead of the apertured extension 22 of this embodiment of Figs. 3 and 4.

In Figs. 5 and 6, a second modification is revealed, this resembling somewhat the embodiment of Figs. 3 and 4, except that the gland-element, in this instance, is formed with an annular extension 24 that is provided with a series of ports or holes 25 adapted to permit the ingress of air into the space or chamber 26 and thence into the air-space 9 in the member 6.

In Figs. 7 and 8 a third modification is shown; and in this instance the gland-element 14 has its body portion 15 formed as an annular flange to which is secured, as by a series of bolts 27, the flange 28 of an encompassing element 29 provided with an internal bore 30 against which the portion 19 of the slidable element 6 bears. In this instance, a chamber 31 formed within the element 29, is supplied with air through a series of apertures 32, circularly arranged in the bearing portion 19 of the member 6.

Each of these embodiments may, if desired or required, be provided with means for limiting the outward movement of the slidable member 6, and an example of this is illustrated in Fig. 9, wherein the type of structure illustrated in Figs. 3 and 4, for example, is shown as provided with a stop 33 in the form of an annulus secured as by bolts 34, to the flattened extremity 35 of the guiding portion 36 of the gland-element 37. It will be understood that the bearing enlargement 19 of the slidable member 6 will, if it impinges against the ring 33, be limited thereby against excessive outward movement. In the type of structure shown in Fig. 1, for instance, the extremities of the portions 20 could be angulated, as illustrated in Fig. 10, to provide limiting abutments or stops 38.

From the foregoing, it will be observed that I have provided a simple structure, involving relatively few elements and one which includes means not only for maintaining the packing free from the injurious effect of high temperatures, but one which also has its movable components so guided that they are maintained in proper relation always.

What I claim is:

1. An expansion-structure comprising a plurality of members, one of which has movement in relation to the other and comprises a plurality of spaced-apart portions to form an annular air-space, and a gland-element carried by the other member and provided with a member-guiding portion by which the movable member is supported during its movement.

2. An expansion-structure comprising a plurality of members, one of which has a sliding movement in relation to the other and comprises a plurality of spaced-apart portions to form an annular air-space, and a gland-element carried by the other member and provided with a member-guiding portion by which the movable member is supported during its movement.

3. An expansion-structure comprising a plurality of associated members one of which has movement in relation to the other and channeled to provide an air-space, a gland-element carried by the other member and an extension on the gland-element which the movable member engages and by which it is sustained.

4. An expansion-structure comprising a plurality of associated members between which there is relative movement one of the members including a plurality of spaced-apart portions to form an annular air-space and having a member-engaging portion adjacent its outer extremity and a gland-element carried by the other member and having a guiding extension with which said member-engaging portion has a sliding engagement.

5. An expansion-structure comprising a plurality of associated sliding members one of which comprises a plurality of spaced-apart portions disposed in approximate parallelism to form an annular air-space, and a gland-member carried by one of said sliding members, and provided with a member-guiding extension with which one of the sliding members has a sliding engagement.

6. An expansion-structure comprising a pair of associated members between which there is relative movement, and a gland-element carried by one of the members and provided with an extension, one of the members having a member-engaging bearing-portion or enlargement adjacent its outer extremity disposed in sliding engagement with and supported by said extension.

7. An expansion-structure comprising a pair of associated members between which there is relative movement, and a gland-element carried by one of the members and provided with an extension, one of the members having a member-engaging bearing-portion or enlargement adjacent its outer extremity disposed in sliding engagement with and supported by said extension and formed with an annular air-space in close proximity to the gland-element.

8. An expansion-structure including in operative association a pair of members between which there is relative movement, a gland-element carried by one of the members and in sliding engagement with the movable member, the latter being formed with a pair of spaced-apart portions to provide an annular air-space adjacent the gland-element, and having a bearing enlargement at its outer extremity, and an ex-

tension on the gland with which the enlargement has a sliding engagement.

9. An expansion-structure including a pair of associated members between which there is relative movement, one of the members having a pair of spaced-apart portions to constitute an annular air-space and an enlargement adjacent its outer extremity, and a gland-element carried by one of the members and carrying an extension engaged by the enlargement and maintaining the movable member in functioning relation to the other member and gland element.

10. An expansion-structure including a pair of associated members between which there is relative movement, one of the members having a pair of spaced-apart portions to constitute an annular air-space and an enlargement adjacent its outer extremity and spaced apart from the air-space to permit circulation of air thereinto, and a gland-element carried by one of the members and carrying an extension engaged by the enlargement and maintaining the movable member in functioning relation to the other member and gland-element.

11. An expansion-structure including in operative association a pair of members between which there is relative movement, a gland-element carried by and adjustable on one of the members and in sliding engagement with the movable member, the latter being formed with a pair of spaced-apart portions to provide an annular air-space adjacent the gland-element, and having a bearing enlargement at its outer extremity, and an extension on the gland with which the enlargement has a sliding engagement.

12. An expansion-structure including a plurality of associated joint-members between which there is relative movement, the movable member having a plurality of spaced-apart portions to constitute an annular air-space and having an extension-engaging portion adjacent its extremity and spaced apart from the air-space to permit circulation of air thereinto, and a gland-element mounted on the other member and comprising a body-portion and a flange-portion with which the movable member is in sliding engagement, and having an extension with which the enlargement has a sliding engagement.

13. An expansion-structure including a plurality of associated joint-members between which there is relative movement, the movable member having a plurality of spaced-apart portions to constitute an annular air-space and having an extension-engaging portion adjacent its extremity and spaced apart from the air-space to permit circulation of air thereinto, and a gland-element adjustably mounted on the other member and comprising a body-portion and a flange-portion with which the movable member is in sliding engagement, and having an extension with which the enlargement has a sliding engagement.

14. An expansion-structure including a plurality of associated joint-members between which there is relative movement, the movable member having a plurality of spaced-apart portions to constitute an annular air-space and having an extension-engaging portion adjacent its extremity and spaced apart from the air-space to permit circulation of air thereinto, and a gland-element adjustably mounted on the other member and comprising a body-portion and a flange-portion with which the movable member is in sliding engagement, and having an extension with which the enlargement has a sliding engagement, and packing interposed between and maintained by the flange-portion in place against the gland-supporting member.

15. An expansion-structure including a plurality of associated joint-members disposed in sliding engagement, one of the members being provided with an annular packing-holding chamber, the other member telescoping into the chambered member, and formed with a plurality of spaced-apart portions to constitute an elongated air-space, and having at its extremity an expansion-engaging portion spaced apart from said air-space to permit circulation of air thereinto, and a gland-element comprising a body-portion, an annular flange-portion thereon with which the telescoping member has sliding engagement and extending into said chamber, and an extension with which the extension-engaging portion has a sliding engagement, and packing disposed in said chamber and held in place by the flange-portion and maintained relatively cool by the air in said air-space.

16. An expansion-structure including a pair of associated joint-members one of which telescopes into the other and comprises an elongated air-holding channel and an extension-guided portion at its outer extremity, the other member being formed with an annular bore in which the telescoping member has a sliding movement, and provided with an annular offset-portion, the interior diametral dimension of which is greater than that of the bore, a gland-element adjustably secured to the bored member and having a flange-portion disposed adjacent the offset-portion and forming with it and the exterior wall of the telescoping member a packing-holding chamber or space, and packing housed in the chamber; the gland-element having, also, an outwardly-extending portion with which the extension-guided portion has a sliding engagement and whereby the telescoping-member is maintained approximately true during its longitudinal movement and dam-

age to the packing thereby reduced to a minimum; said air-holding channel functioning to maintain the packing relatively cool and insulating it from the medium passing through the joint-members.

17. An expansion-structure including a pair of associated joint-members one of which telescopes into the other and comprises an elongated air-holding channel and an extension-guided portion at its outer extremity, the other member being formed with an annular bore in which the telescoping member has a sliding movement, and provided with an annular offset-portion, the interior diametral dimension of which is greater than that of the bore, a gland-element adjustably secured to the bored member and having a flange-portion disposed adjacent the offset-portion and forming with it and the exterior wall of the telescoping member a packing-holding chamber of space and packing housed in the chamber; the gland-element having, also, an outwardly-extending portion with which the extension-guided portion has a sliding engagement and whereby the telescoping-member is maintained approximately true during its longitudinal movement and damage to the packing thereby reduced to a minimum; said air-holding channel functioning to maintain the packing relatively cool and insulating it from the medium passing through the joint members, and means on the extension for limiting outward movement of the telescoping-member.

18. An expansion-structure including a pair of associated joint-members one of which telescopes into the other and comprises an elongated air-holding channel and an extension-guided portion at its outer extremity, the other member being formed with an annular bore in which the telescoping member has a sliding movement, and provided with an annular offset-portion, the interior diametral dimension of which is greater than that of the bore, a gland-element adjustably secured to the bored member and having a flange-portion disposed adjacent the offset-portion and forming with it and the exterior wall of the telescoping member a packing-holding chamber or space, and packing housed in the chamber; the gland-element having, also, an outwardly-extending tubular portion with which the extension-guided portion has a sliding engagement and whereby the telescoping-member is maintained approximately true during its longitudinal movement, and damage to the packing thereby reduced to a minimum; said air-holding channel functioning to maintain the packing relatively cool and insulating it from the medium passing through the joint-members.

19. An expansion-structure including a pair of associated joint-members one of which telescopes into the other and comprises an elongated air-holding channel and an extension-guided portion at its outer extremity, the other member being formed with an annular bore in which the telescoping member has a sliding movement, and provided with an annular offset-portion, the interior diametral dimension of which is greater than that of the bore, a gland-element adjustably secured to the bored member and having a flange-portion disposed adjacent the offset-portion and forming with it and the exterior wall of the telescoping member a packing-holding chamber or space, and packing housed in the chamber; the gland-element having, also, an outwardly - extending tubular portion with which the extension-guided portion has a sliding engagement and whereby the telescoping-member is maintained approximately true during its longitudinal movement and damage to the packing thereby reduced to a minimum; said tubular portion being formed with openings to permit passage of air to the air-holding channel; and said air-holding channel functioning to maintain the packing relatively cool and insulating it from the medium passing through the joint-members.

20. An expansion-structure including a pair of associated joint-members one of which telescopes into the other and comprises an elongated air-holding channel and an extension-guided portion at its outer extremity, the other member being formed with an annular bore in which the telescoping member has a sliding movement, and provided with an annular offset-portion, the interior diametral dimension of which is greater than that of the bore, a gland-element adjustably secured to the bored member and having a flange-portion disposed adjacent the offset-portion and forming with it and the exterior wall of the telescoping member a packing-holding chamber or space, and packing housed in the chamber; the gland-element having, also, an outwardly-extending tubular portion with which the extension-guided portion has a sliding engagement and whereby the telescoping-member is maintained approximately true during its longitudinal movement and damage to the packing thereby reduced to a minimum; said tubular portion being formed with openings to permit passage of air to the air-holding channel; and said air-holding channel functioning to maintain the packing relatively cool and insulating it from the medium passing through the joint-members; and bolts carried by the bored member and extending into the gland-element for adjustably holding the element against the packing.

21. An expansion-structure including an outer casing having an internal bore, of dif-

ferent diametral dimensions, a slidable member associated with the casing and having a sliding engagement with the smaller diametral bore thereof and comprising two portions spaced apart to provide an air-space, a gland-element adjustably secured to the casing and comprising, on one side, an annular flange adapted to be associated with the larger diametral bore of the casing and, thus, provide a packing-holding chamber; the element being also provided with circularly-disposed portions forming a guide for the slidable member; the air-space in the slidable member constituting a heat insulator for the packing.

22. An expansion-structure comprising two members adapted to have relative sliding movement, one of the members being encompassed by the other and formed with an air chamber, a packing encompassing the air chamber and disposed between the bearing walls of the two sliding members, and means for guiding and limiting the sliding movement of the members including a gland-element secured to the encompassing member and formed with guiding portions extending from the element in a direction opposite to the position of the encompassing member.

23. An expansion-structure including a plurality of members associated for relative movement one within the other, and an element adjustably secured to one of the members and having a plurality of bearing portions offset from each other and slidably engaging one of the members at unalined, spaced-apart points.

24. An expansion-structure including an encompassing member, a sliding member associated therewith for relative movement therein, and a packing-holding element secured to the encompassing member and having a bearing portion in engagement with the sliding member at a point relatively remote from the encompassing member.

25. An expansion-structure including a slidable tubular member attachable to piping and having a plural-point bearing comprising an encompassing member also attachable to piping and bored to receive and slidably support one end of the tubular member, and a gland element provided with a packing-engaging portion secured to the encompassing member for adjustment in respect to packing therein and for slidably supporting the tubular member and provided, also with a member-guiding portion spaced apart from the packing-engaging portion for supporting and guiding the tubular member.

26. An expansion-structure including a slidable tubular member attachable to piping and of duplex construction to constitute a heat-insulating component and having a plural-point bearing comprising an encompassing member also attachable to piping and bored to receive and slidably support one end of the tubular member, and a gland element provided with a packing-engaging portion secured to the encompassing member for adjustment in respect to packing therein and for slidably supporting the tubular member and provided, also, with a member-guiding portion spaced apart from the packing-engaging portion for supporting and guiding the tubular member.

In testimony whereof I affix my signature in presence of two witnesses.

EUGENE L. BARNES

Witnesses:
HOWARD E. LONG,
H. C. KINSBROUGH.