

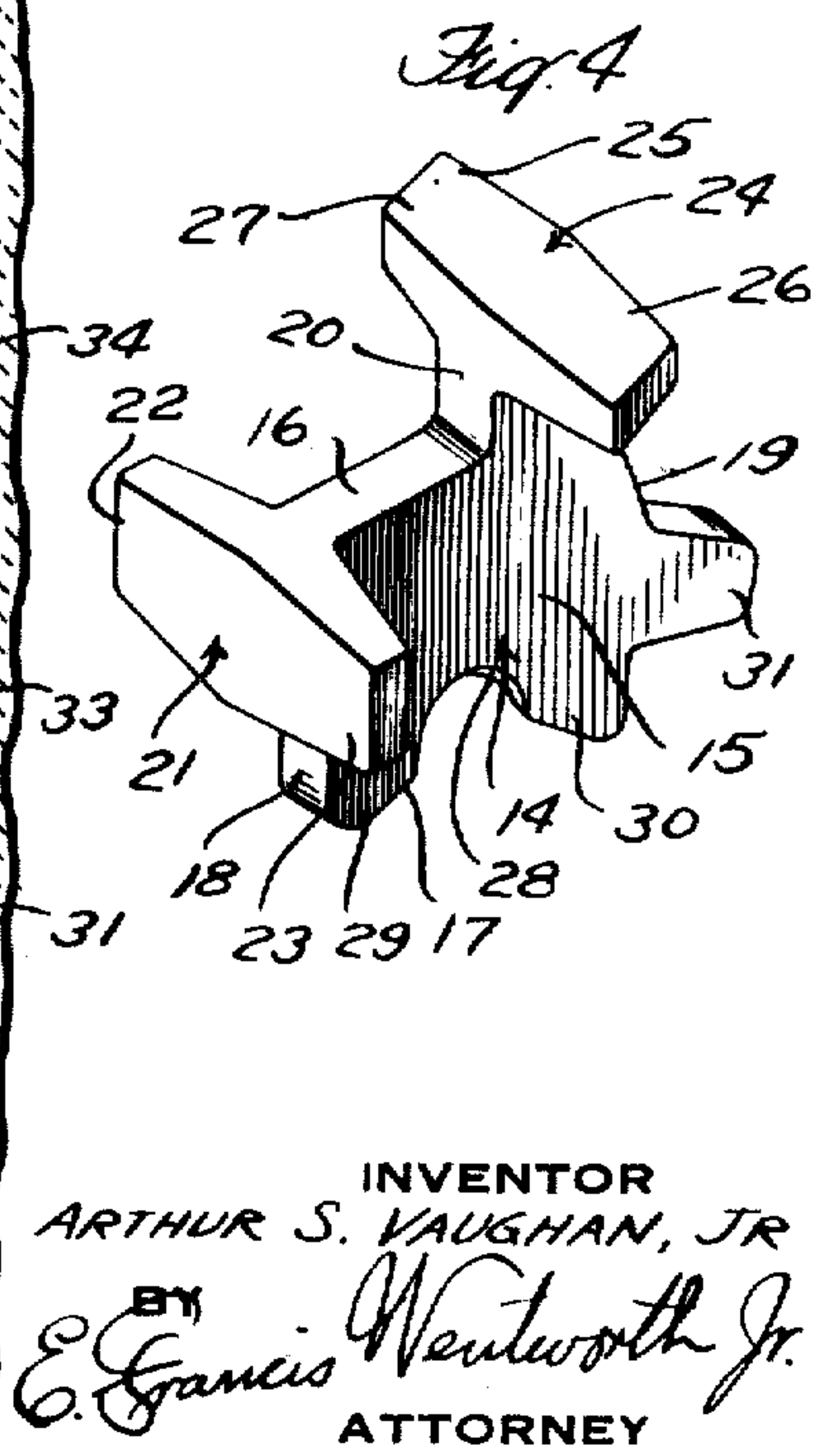
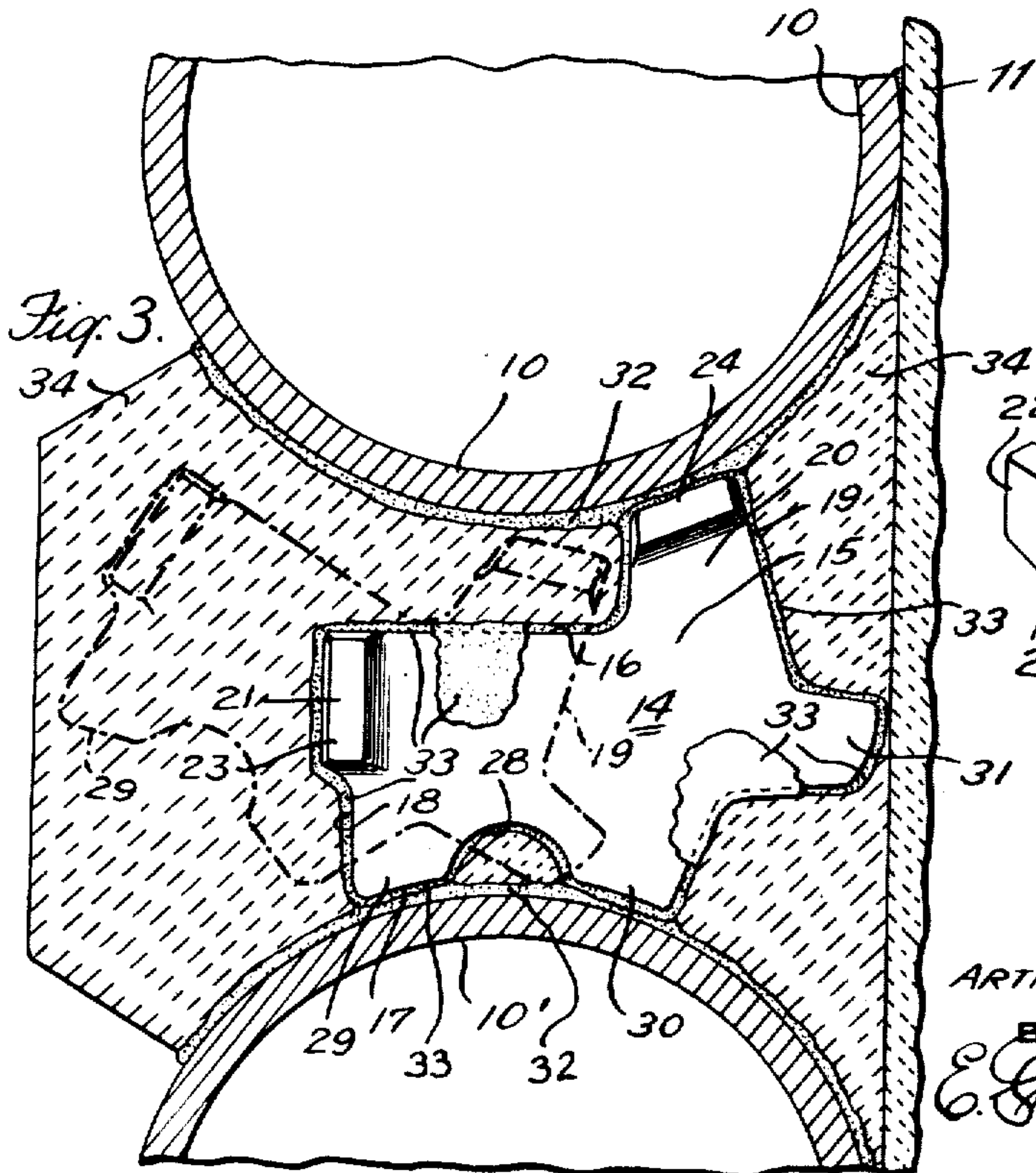
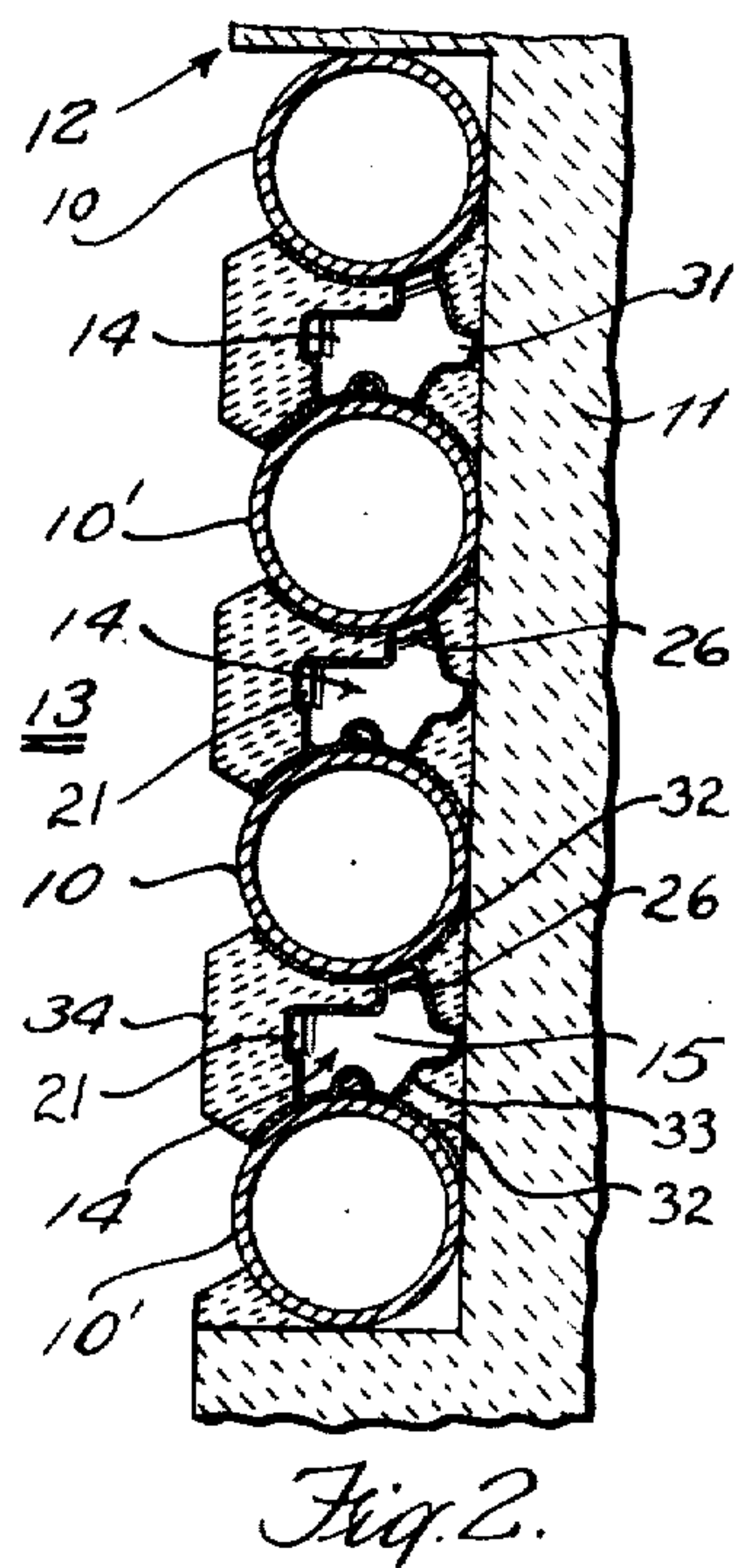
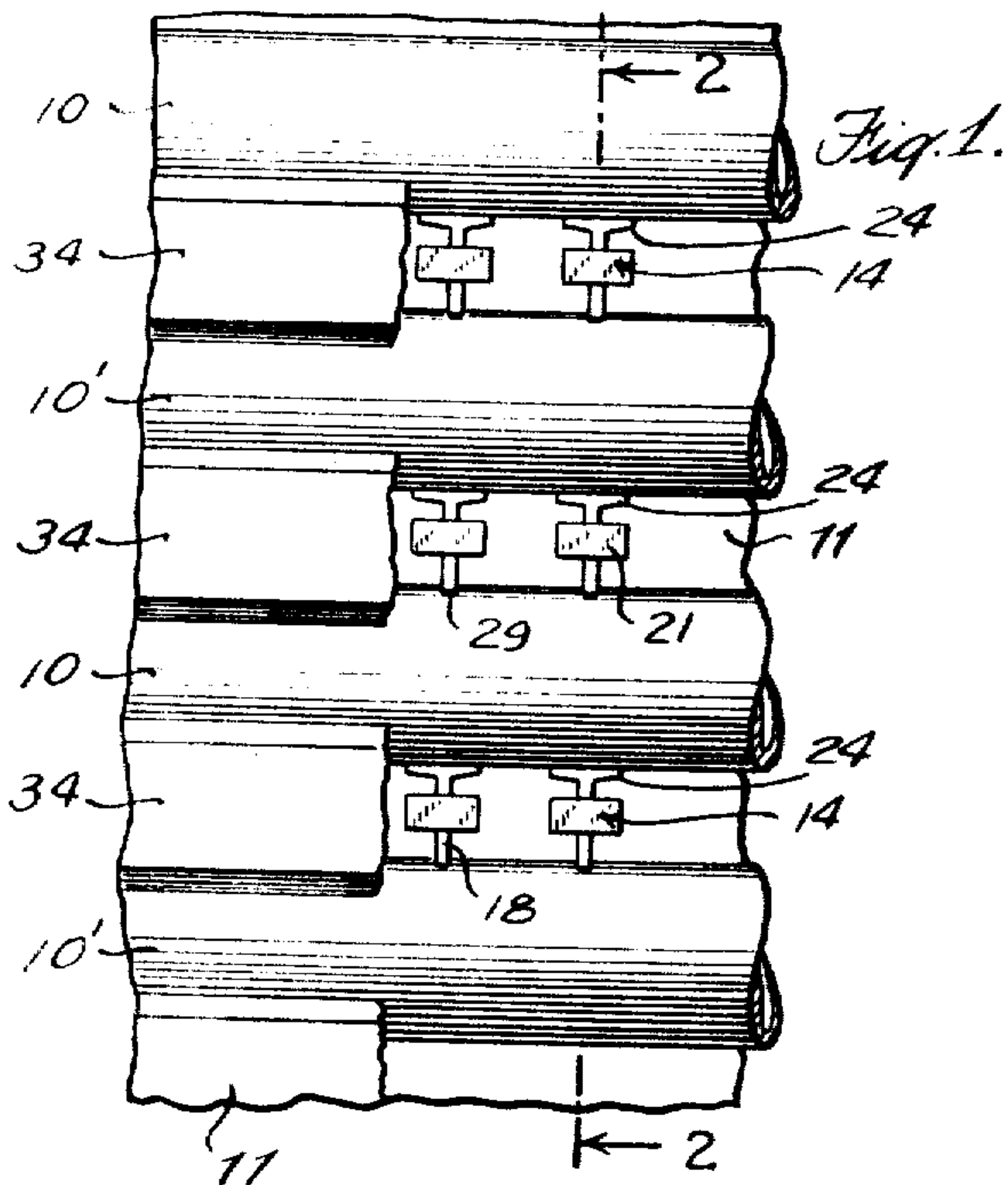
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FURNACE

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This invention relates to furnaces, and more particularly to a method of, and means for, retaining refractory material between spaced tubular members in a furnace.

The present invention provides a method of, and means for, anchoring refractory between tubular members which anchor is relatively inexpensive. The anchors of the present invention are readily set in place after the tubular members are in position and derive their support from the tubes without involving welding or rigid mechanical attachment to the tubes. The method and means of the present invention also permit expansion and contraction of the tubular members without damage to the refractory material anchored adjacent thereto.

The invention will be understood from the following description when considered in connection with the accompanying drawing forming a part thereof, and in which:

Fig. 1 is a partial elevational view of a furnace wall taken on the furnace chamber side thereof;

Fig. 2 is a sectional view taken on the line 2-2 of Fig. 1;

Fig. 3 is an enlarged sectional view of portions of two of the adjacent tubular members shown in Fig. 2, and

Fig. 4 is an isometric view of a refractory anchor of the present invention.

Like characters of reference refer to like parts throughout the several views.

Referring to the drawings, tubular members 10 are disposed in a row along a wall 11 of a furnace setting 12 having a furnace chamber 13. Adjacent tubular members 10 are spaced apart and, as shown, extend in horizontal planes.

In order that refractory material may be inserted in the spaces between the tubular members 10 and retained within said spaces, a plurality of anchors 14 are inserted in each of said spaces. An anchor 14, as shown more particularly in Fig. 4, comprises a body portion 15 having opposite side edges 16 and 17 and opposite end edges 18 and 19. The distance between the side edges 16 and 17 is less than the distance between adjacent tubular members 10 with which the anchor is to be associated, while the distance between opposite end edges 18 and 19 is less than the diameter of said tubular members. End edge 18 has a head 21 which extends transversely of the edge 18 and forms anchoring lugs 22 and 23 extending on opposite sides of the body 15. Side edge 16 has a leg 20 adjacent end edge 19 which leg projects away from the body 15 and has a foot member 24 extending in a direction trans-

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versely of the leg 20 and body 15 forming extensions 25 and 26 on opposite sides of the body member. The distance between the upper surface 27 of the foot 24 and the side edge 17 is slightly less than the distance between the outer peripheral surfaces of adjacent tubular members 10. Side edge 17 is curved to conform to the periphery of a tubular member and, as shown, has a cut-out portion 28 adjacent thereto in the body 15 intermediate the end edges 18 and 19 thereby forming legs 29 and 30 adjacent edges 18 and 19 respectively. As shown, an extension 31 projects away from the end edge 19.

As shown more particularly in Fig. 3, the peripheral surface of each of adjacent tubular members 10 bordering the space between said adjacent members is coated with a viscid substance 32, for example, tar or pitch, while the surfaces of the anchor 14, including the surfaces of the opposite side edges 16 and 17, end edges 18 and 19, the surfaces of the head 21 and foot 24 and the extension 31, are coated with a coating 33 of viscid substance.

In the erection of a furnace embodying the present invention, the tubular members 10 are placed in position adjacent to or in contact with the furnace side of the wall 11, adjacent tubular members being spaced from one another. The portion of the peripheral surface of each tubular member adjacent said space is coated with the viscid substance. A plurality of anchors 14, after said anchors are dipped in a viscid material so that the surfaces of the anchors are coated with said substance, are then positioned in the space between adjacent tubular members, the anchors in a space being spaced from each other axially of the tubes 10, as shown in Fig. 1. The anchors are positioned in said space by inserting them from the furnace side of the tubes, the end edge 19 having the extension 31 first being inserted in said space. As shown in dot and dash lines in Fig. 3, the anchors are tilted so that the extension 31 is closely adjacent one of the members 10'. The anchor is then moved toward the wall 11 until the extension 31 is closely adjacent to or in engagement with the wall 11 after which the anchor is turned toward the member 10' until the coated surface 27 of the foot 24 engages the coated surface of the member 10 and the coated surface of the legs 29 and 30 engage the coated surface of the member 10'. Refractory material 34 is then applied between the adjacent tubular members 10 filling the space between said members. When the anchors are properly positioned, the space between adjacent

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tubular members is filled with plastic refractory. The lugs 25 and 26 of the foot 24 prevent the anchor from tilting when refractory is being applied while the lugs 22 and 23 of the head 21 anchor the refractory on both sides of the body 15 of said anchor. The coating of viscid material on the tubular members, for example and not by way of limitation, would be approximately $\frac{1}{8}$ " while the coating on the anchor surfaces 32 and 33, since they are viscid, provide expansion space between the anchors and the refractory and the tubes and the anchors thereby preventing cracking or breaking of the refractory upon movement of the tubes or anchor in relation to the refractory, for example through expansion and contraction of the tubes, after the refractory has become hardened. The coatings also act as a medium for holding the anchors in position until the refractory material is applied.

Since changes may be effected in the form of the invention selected for disclosure and in the method steps without departing from the principles thereof, it will be understood that the invention is not to be limited excepting by the scope of the appended claims.

What is claimed is:

1. In a furnace, a row of spaced tubes, the opposing peripheral semi-circular portions of adjacent tubular members defining the lateral extremities of the space between the tubes, an anchor disposed entirely within the space between said tubes for maintaining refractory material in the space, the anchor having a body portion of a length less than the diameter of the tubular members, the body portion comprising opposite sides, opposite side edges and opposite end edges, a member supported by the body portion along one side edge thereof, the member extending in a plane transverse to the plane of said body portion, and lugs extending from said opposite sides of the body portion, the distance between said member and the side edge of the body portion opposite said one side edge being less than the maximum lateral dimension of the space defined by said semi-circular portions and greater than the minimum lateral dimension of said space, said distance being such that the anchor can be inserted in the space between the tubes from one side of said row and positioned in said space with said member and said opposite side edge contiguous respectively to the periphery of the opposing walls of adjacent tubes within the lateral extremities of the intertube space.

2. In a furnace, a row of spaced tubes, the opposing peripheral semi-circular portions of adjacent tubular members defining the lateral extremities of the space between the tubes, an anchor disposed entirely within the space between said tubes for maintaining refractory material in the space, the anchor having a body portion of a length less than the diameter of the tubular members, the body portion comprising opposite sides, opposite side edges and opposite end edges, a member supported by the body portion along one side edge thereof, the member extending in a plane transverse to the plane of said body portion and substantially parallel to the longitudinal axis of said tubes, and lugs extending from said opposite sides of the body portion, the distance between said member and the side edge of the body portion opposite said one side edge being less than the maximum lateral dimension of the space defined by said

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semi-circular portions and greater than the minimum lateral dimension of said space, said distance being such that the anchor can be inserted in the space between the tubes from one side of said row and positioned in said space with said member and said opposite side edge contiguous respectively to the periphery of the opposing walls of adjacent tubes within the lateral extremities of the intertube space.

3. In a furnace, a row of spaced tubes, the opposing peripheral semi-circular portions of adjacent tubular members defining the lateral extremities of the space between the tubes, an anchor disposed entirely within the space between said tubes for maintaining refractory material in the space, the anchor having a flat body portion of a length less than the diameter of the tubular members and of a thickness less than its length, the body portion comprising opposite sides, opposite side edges and opposite end edges, a member supported by the body portion along one side edge thereof, the member extending in a plane transverse to the plane of said body portion, the opposite side edge having a part thereof at least conforming in shape to the peripheral surface of one of adjacent tubes in said row, and lugs extending from said opposite sides of the body portion, the distance between said member and the side edge of the body portion opposite said one side edge being less than the maximum lateral dimension of the space defined by said semi-circular portions and greater than the minimum lateral dimension of said space, said distance being such that the anchor can be inserted in the space between the tubes from one side of said row and positioned in said space with said member and said opposite side edge contiguous respectively to the periphery of the opposing walls of adjacent tubes within the lateral extremities of the intertube space.

4. In a furnace, a row of spaced tubes, the opposing peripheral semi-circular portions of adjacent tubular members defining the lateral extremities of the space between the tubes, an anchor disposed entirely within the space between said tubes for maintaining refractory material in the space, the anchor having a body portion of a length less than the diameter of the tubular members, the body portion comprising opposite sides, opposite side edges and opposite end edges, a member supported by the body portion along one side edge thereof, the member extending beyond the opposite sides of said body portion in a plane transverse to the plane of said portion and substantially parallel to the longitudinal axes of said tubes, the side edge of the body portion opposite said one side edge having a part thereof at least conforming in shape to the peripheral surface of one of adjacent tubes in said row, and lugs extending from said opposite sides of the body portion, the distance between said member and the side edge of the body portion opposite said one side edge being less than the maximum lateral dimension of the space defined by said semi-circular portions and greater than the minimum lateral dimension of said space, said distance being such that the anchor can be inserted in the space between the tubes from one side of said row and positioned in said space with said member and said opposite side edge contiguous respectively to the periphery of the opposing walls of adjacent tubes within the lateral extremities of the intertube space.

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5. In a furnace, a row of spaced tubes, the opposing peripheral semi-circular portions of adjacent tubular members defining the lateral extremities of the space between the tubes, an anchor disposed entirely within the space between said tubes for maintaining refractory material in the space, the anchor having a body portion of a length less than the diameter of the tubular members, the body portion comprising opposite sides, opposite side edges and opposite end edges, a member supported by the body portion in spaced relationship laterally from and adjacent one side edge thereof, the member extending in a plane transverse to the plane of said body portion, and lugs extending from said opposite sides of the body portion, the distance between said member and the side edge of the body portion opposite said one side edge being less than the maximum lateral dimension of the space defined by said semi-circular portions and greater than the minimum lateral dimension of said space, said distance being such that the anchor can be inserted in the space between the tubes from one side of said row and positioned in said space with said member and said opposite side edge contiguous respectively to the periphery of the opposing walls of adjacent tubes within the lateral extremities of the intertube space.

6. In a furnace, a row of spaced tubes, the opposing peripheral semi-circular portions of adjacent tubular members defining the lateral extremities of the space between the tubes, an anchor disposed entirely within the space between said tubes for maintaining refractory material in the space, the anchor having a flat body portion of a length less than the diameter of the tubular members and of a thickness less than its length, the body portion comprising opposite sides, opposite side edges and opposite end edges, a member adjacent one of said end edges and supported by the body portion in spaced relationship laterally from and adjacent one side edge thereof, the member extending beyond the opposite sides of said body portion in a plane transverse to the plane of said portion and substantially parallel to the longitudinal axes of said tubes, the side edge of the body portion opposite said one side edge having a part thereof at least conforming in shape to the peripheral surface of one of adjacent tubes in said row, and lugs extending on opposite sides of the body portion adjacent the end edge opposite to said one end edge, the distance between said member and the side edge of the body portion opposite said one side edge being less than the maximum lateral dimension of the space defined by said semi-circular portions and greater than the minimum lateral dimension of said space, said distance being such that the anchor can be inserted in the space between the tubes from one side of said row and positioned in said space with said member and said opposite side edge contiguous respectively to the periphery of the opposing walls of adjacent tubes within the lateral extremities of the intertube space.

7. In a furnace, a row of spaced tubes, the opposing peripheral semi-circular portions of adjacent tubular members defining the lateral extremities of the space between the tubes, an anchor disposed entirely within the space between said tubes for maintaining refractory material in the space, the anchor having a body portion of a length less than the diameter of the

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tubular members, the body portion comprising opposite sides, opposite side edges and opposite end edges, a member supported by the body portion along one side edge thereof, the member extending in a plane transverse to the plane of said body portion, the side edge opposite said one side edge of the body portion being arranged to provide spaced legs shaped to conform to the peripheral surface of one of adjacent tubes in said row, and lugs extending from said opposite sides of the body portion, the distance between said member and the side edge of the body portion opposite said one side edge being less than the maximum lateral dimension of the space defined by said semi-circular portions and greater than the minimum lateral dimension of said space, said distance being such that the anchor can be inserted in the space between the tubes from one side of said row and positioned in said space with said member and said opposite side edge contiguous respectively to the periphery of the opposing walls of adjacent tubes within the lateral extremities of the intertube space.

8. In a furnace wall structure comprising a wall having a row of spaced tubes adjacent thereto, the opposing peripheral semi-circular portions of adjacent tubular members defining the lateral extremities of the space between the tubes, an anchor disposed entirely within the space between said tubes for maintaining refractory material in the space, the anchor having a body portion of a length less than the diameter of the tubular members, the body portion comprising opposite sides, opposite side edges and opposite end edges, a member supported by the body portion along one side edge thereof, the member extending in a plane transverse to the plane of said body portion, lugs extending from said opposite sides of the body portion, the distance between said member and the side edge of the body portion opposite said one side edge being less than the maximum lateral dimension of the space defined by said semi-circular portions and greater than the minimum lateral dimension of said space, said distance being such that the anchor can be inserted in the space between the tubes from one side of said row and positioned in said space with said member and said opposite side edge contiguous respectively to the periphery of the opposing walls of adjacent tubes within the lateral extremities of the intertube space, and an extension projecting from the end edge of said anchor adjacent the wall to a point contiguous with said wall.

9. In a furnace, a row of spaced tubes, the opposing peripheral semi-circular portions of adjacent tubular members defining the lateral extremities of the space between the tubes, an anchor disposed entirely within the space between said tubes for maintaining refractory material in the space, the anchor having a body portion of a length less than the diameter of the tubular members, the body portion comprising opposite sides, opposite side edges and opposite end edges, one side edge having a portion adjacent one end edge of the body extending laterally from said side edge, lugs extending from said opposite sides of the body portion, the distance between said portion of one side edge and the side edge of the body portion opposite said one side edge being less than the maximum lateral dimension of the space defined by said semi-circular portions and greater than the minimum lateral dimension of said space, said

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distance being such that the anchor can be inserted in the space between the tubes from one side of the row and positioned in the space with said portion of the one side edge and the opposite side edge contiguous respectively to the periphery of the opposing walls of adjacent tubes within the lateral extremities of the intertube space, and a viscid substance between the opposing peripheral walls of said tubes and the parts of said anchor contiguous thereto.

10. In a furnace, a row of spaced tubes, the opposing peripheral semi-circular portions of adjacent tubular members defining the lateral extremities of the space between the tubes, an anchor disposed entirely within the space between said tubes for maintaining refractory material in the space, the anchor having a body portion of a length less than the diameter of the tubular members, the body portion comprising opposite sides, opposite said edges and opposite end edges, one side edge having a portion adjacent one end edge of the body extending laterally from said edge, lugs extending from said opposite sides of the body portion, the distance between said portion of one side edge and the side edge of the body portion opposite said one side edge being less than the maximum lateral dimension of the space defined by said semi-circular portions and greater than the minimum lateral dimension of said space, said distance being such that the anchor can be inserted in the space between the tubes from one side of the row and positioned in the space with said portion of the one side edge and the opposite side edge contiguous respectively to the periphery of the opposing walls of adjacent tubes within the lateral extremities of the intertube space, and a coating of viscid substance on said anchor.

11. In a furnace, a row of spaced tubes, the opposing peripheral semi-circular portions of adjacent tubular members defining the lateral ex-

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terminities of the space between the tubes, an anchor disposed entirely within the space between said tubes for maintaining refractory material in the space, the anchor having a flat body portion of a length less than the diameter of the tubular members and of a thickness less than its length, the body portion comprising opposite sides, opposite side edges and opposite end edges, one side edge having a portion adjacent one end edge of the body extending laterally from said side edge, lugs extending from said opposite sides of the body portion, the distance between said portion of one side edge and the side edge of the body portion opposite said one side edge being less than the maximum lateral dimension of the space defined by said semi-circular portions and greater than the minimum lateral dimension of said space, said distance being such that the anchor can be inserted in the space between the tubes from one side of the row and positioned in the space with said portion of the one side edge and the opposite side edge contiguous respectively to the periphery of the opposing walls of adjacent tubes within the lateral extremities of the intertube space, and a coating of viscid substance on the anchor and on the opposing walls of adjacent tubes.

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