Oct. 25, 1932. B. WOYNAROWSKI 1,884,481

SUPERHEATER HEADER

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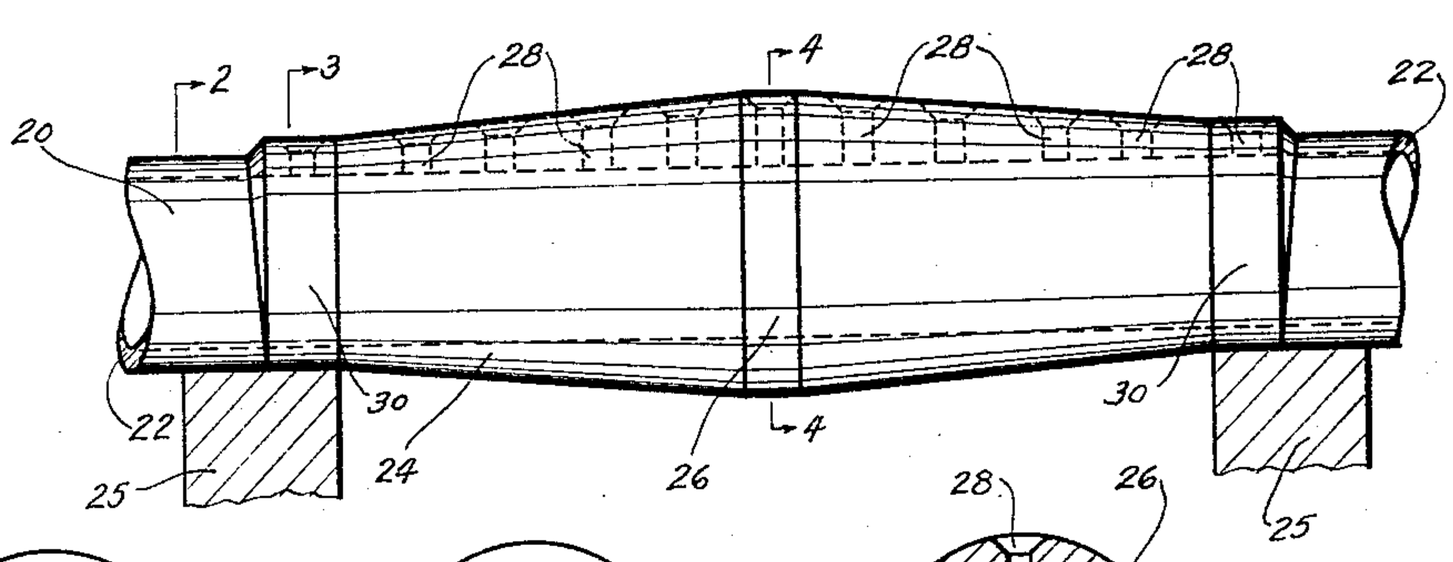
Fig. 1.



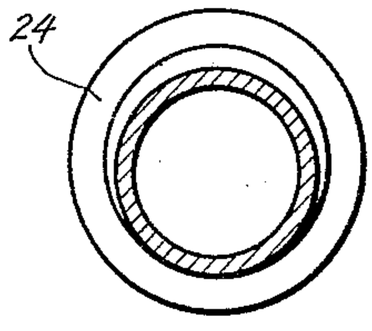


Fig. 2.

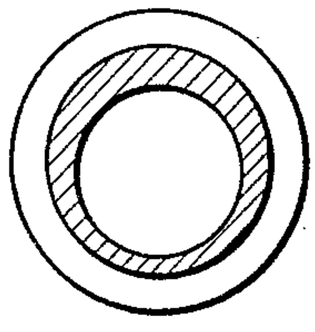


Fig. 3.

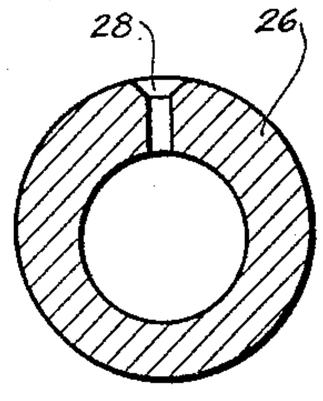
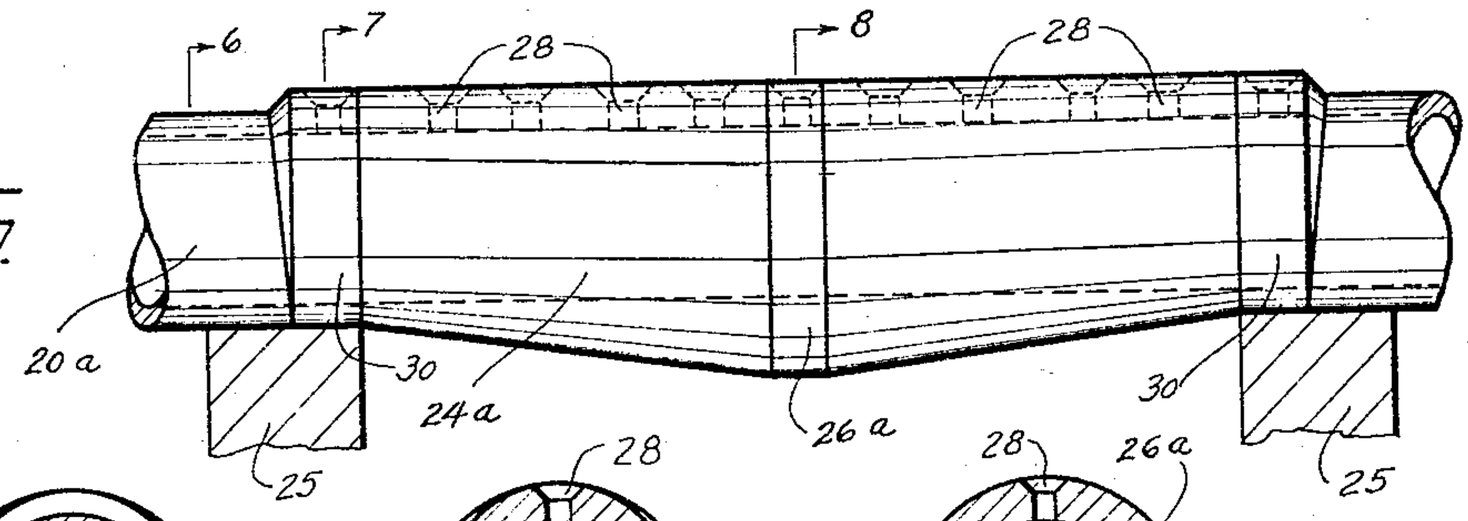


Fig. 4.

Fig. 5.



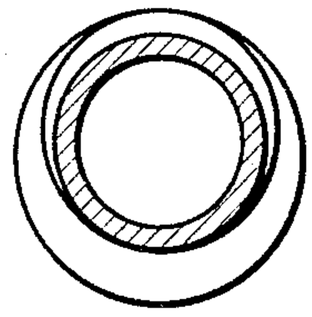


Fig 6

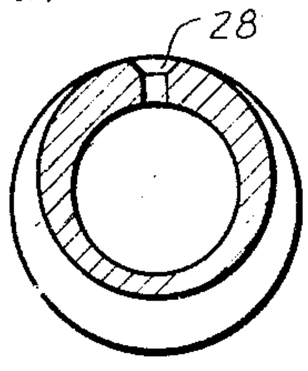


Fig. 7.

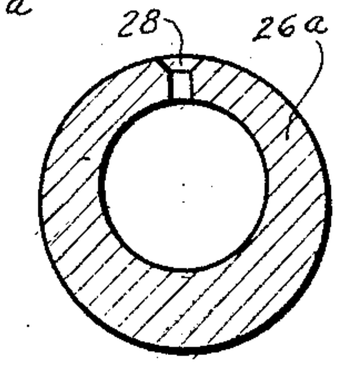


Fig. 8.

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SUPERHEATER HEADER

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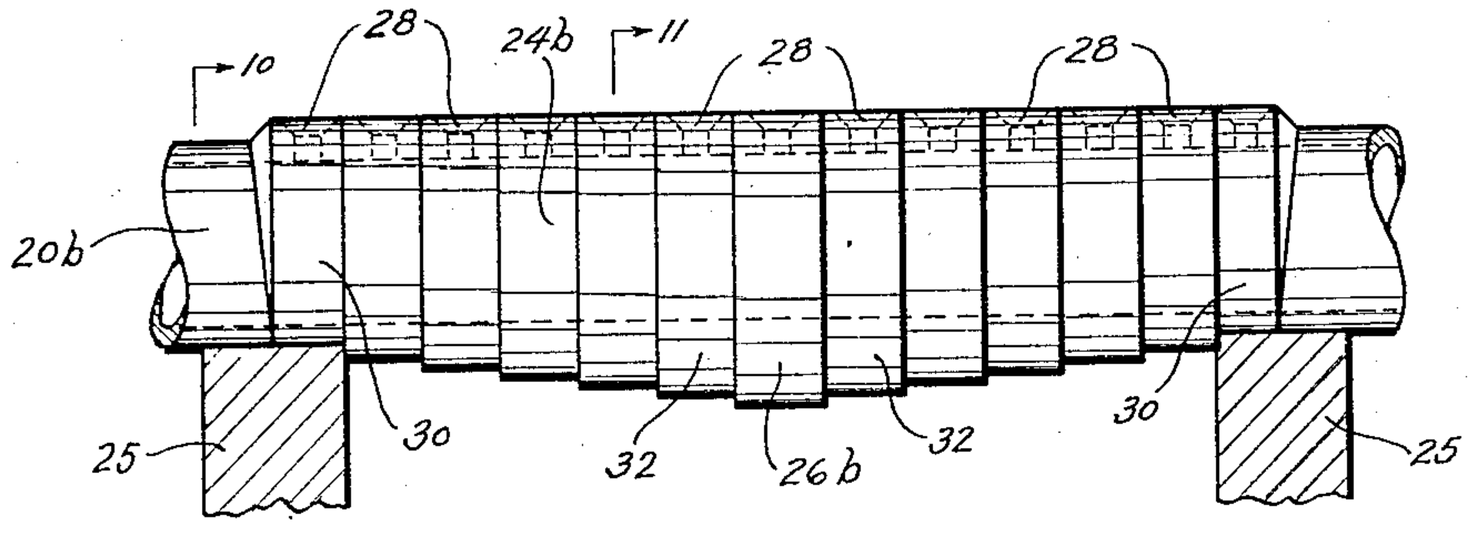

Fig. 9.

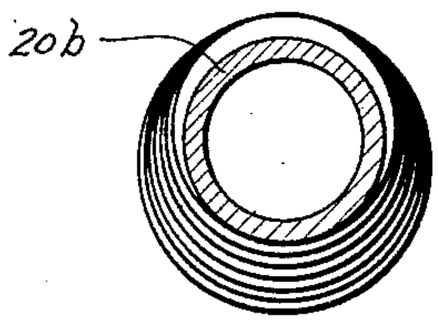

Fig. 10.

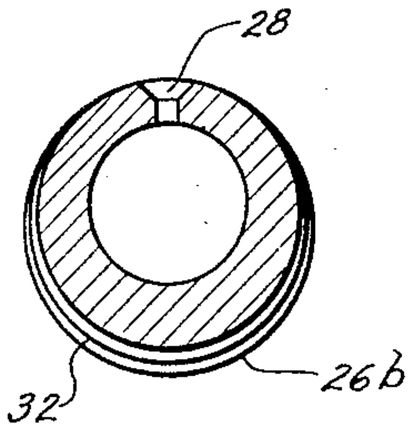

Fig. 11.

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UNITED STATES PATENT OFFICE

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SUPERHEATER HEADER

Application filed March 14, 1931. Serial No. 522,600.

My invention relates to header pipes and aims to provide a design for such pipes well adapted for long spans between supports.

In superheater and like installations it is a common practice to run header pipes for superheaters from one side wall to the other of the boiler setting and to support the headers at their ends. When the boiler setting has more than a given width, however, it has been necessary in addition to support the headers at one or more intermediate points. Such intermediate supports ordinarily involve considerable cost or trouble in one way or another.

In accordance with my invention, the intermediate supports for the headers are eliminated or their cost much reduced by so designing the header itself as to increase its strength.

In order that my invention may be clearly and readily understood, I will now describe in detail, in connection with the accompanying drawings, three individual headers forming as many illustrative embodiments of my invention. In said drawings,

Fig. 1 is an elevation of one form of my invention.

Figs. 2, 3 and 4 are sections on the lines 2—2, 3—3 and 4—4 of Fig. 1.

Fig. 5 is an elevation illustrating a second form of my invention.

Figs. 6, 7 and 8 are sectional views taken on the lines 6—6, 7—7 and 8—8 of Fig. 5.

Fig. 9 is an elevational view illustrating a third form of my invention.

Figs. 10 and 11 are sectional views taken on the lines 10—10 and 11—11 of Fig. 9.

Referring more particularly to Figs. 1, 2, 3 and 4, I have illustrated therein a header 20 which will be understood to be supported at the ends in the usual manner. The end portions of header 20 have a uniform thickness indicated at 22 and dictated primarily by the pressure of the steam for which the header is intended. It is assumed, however, that header 20 is of such length that it would require intermediate supports when in use if its wall were of the same cross-section throughout as its end portions. In order to minimize or avoid the need for intermediate supports for the header 20, I have shown it as having a portion 24 extending between supports 25, 25 and having its walls thickened in proportion to the distance from a support to resist the large bending moments at points removed from the supports without increasing the unit stresses. The wall of portion 24 is shown as of maximum thickness at the central section 26 of such portion as illustrated in Fig. 4. From the central section, the wall of portion 24 tapers gradually in each direction until it merges into relatively short cylindrical shouldered sections 30, 30 at its ends. It will be observed, however, that the wall of portion 24 is thicker on its upper side along its entire length. This thickening is along the line where it is desired to connect superheater units to the header. The openings for connecting such units are indicated in dotted lines at 28, 28. The cross section of one shouldered section 30 is shown in detail in Fig. 3 and it will be seen also from this figure that shouldered sections 30 have the same wall thickness as the end portions of pipe 20 along their bottoms, but are considerably thicker than the end portions of 20 along their tops so that openings 28 may be placed therein, if desired. This results in the exteriors of shoulders 30 being eccentric with respect to the exteriors of such end portions.

In Fig. 5 I have illustrated a header 20*a* whose central portion 24*a* is also tapered in each direction from its central section illustrated in Fig. 8, the form of header differing, however, from that illustrated in Fig. 1 in that the top longitudinal element of the portion 24*a* lying in the central vertical plane of 20*a* is straight, as appears clearly in Fig. 5. The cylindrical shouldered sections 30 employed, however, in the arrangement shown in Fig. 5 are identical with those in Fig. 1. It will be noted that in both pipe 20 and pipe 20*a* the sections 30 are eccentric to the opening through the pipes, as is clearly shown in Figs. 3 and 7. The connections for the tubular superheating elements are, as indicated, along the line of uniform thickness.

The portion 24 of header illustrated in Fig. 1 can be readily turned in a lathe, but has the drawback that the apertures for pipe con-

nections must be cut through a great thickness of metal. This drawback is obviated in the form illustrated in Fig. 5, but such form is difficult to machine owing to the fact that one longitudinal element of its surface is parallel to the axis while all other elements are inclined to the axis.

The embodiment of the invention illustrated in Figs. 9, 10 and 11 is free of both the objections just mentioned.

In the header illustrated in Fig. 9, the header 20*b* has its end portions identical with those of headers 20 and 20*a* and has also the shoulders 30 having a form identical with those of said pipes, but the portion 24*b* of 20*b* is formed of a succession of cylindrical sections of differing sizes, all, however, having a common longitudinal element along their tops so that the entire top of the portion 24*b* is a straight line similar to the top of portion 24*a* of header 20*a*, Fig. 5. The mid section 26*b* of pipe 20*b* is illustrated in Fig. 11 and has the maximum diameter of any section of portion 24*b*. On each side of section 26*b* is a cylindrical section 32 the top of which is in alignment with that of section 26*b* but whose outside diameter is somewhat less than that of 26*b*. Similarly the successive small sections of the portion 24*b* have an external cylindrical form of progressively decreasing diameter eccentric to the opening through the pipe 20*b*, but having uniform thickness of wall at their tops so that their bottoms form a series of steps extending from the mid-section 26*b* to the end sections 30 as clearly illustrated in Figs. 9, 10 and 11. It will be seen that the various sections 26*b*, 32, etc. of the portion 24*b* can be readily turned in a lathe, although the centre of rotation of the pipe needs to be varied in turning each successive section. The form shown in Fig. 9 approximates that shown in Fig. 5, but is composed of a number of cylindrical portions each of which can be turned in a lathe.

It will be seen that a header in accordance with my invention has substantially uniform strength or unit stress throughout the portion between the supports so that the weight is kept down to nearly a minimum. It has been found also that considerable spans between supports may be negotiated without having to increase unduly the weight of the header. Assuming a distance between supports of twenty-seven feet and seven inches and wall thicknesses the same throughout the part of the header between supports and proportional to those shown in Fig. 3, the deflection midway of the supports has been estimated as 0.768 inches, whereas with the form of header shown in Figs. 1, 2 and 4 the deflection at the centre for the same distance between supports is computed to be only 0.22 inches. The showing of the type shown in Figs. 5, 6, 7 and 8 is even more favorable. In this case, the deflection mid-way between supports for a span of 27 ft. 7 in. is computed to be 0.21 inches while the weight of material is less than that of the header of Figs. 1, 2, 3 and 4. The form of header shown in Figs. 9, 10 and 11 cannot have exactly uniform strength, but it approximates this result closely enough for practical purposes. It will be understood, therefore, that while my invention permits making headers of uniform strength that I do not limit my invention to this.

What I claim is:

1. The combination with horizontally spaced supports, of a header thereon having the wall of the portion intermediate said supports thickest at the point midway between the supports and of progressively decreasing thickness toward the supports, said header having apertures therein for permitting flow between the header and pipes to be connected thereto and arranged along a line lying in the vertical plane determined by the central longitudinal axis of the header.

2. The combination as set forth in claim 1 and in which the thickness of the wall of the header tapers substantially uniformly toward the supports.

3. The combination with horizontally spaced supports, of a header thereon having the wall of the portion intermediate said supports thickest at the point midway between the supports and of progressively decreasing thickness toward the supports, and having a single straight element along the top centre line of its external surface parallel to the axis of the header, said header having apertures therein for cooperating with pipes to be connected thereto and arranged along said straight element.

4. The combination with horizontally spaced supports, of a header thereon having the portion intermediate said supports composed of a series of sections of externally cylindrical outline having progressively smaller diameters on each side of the central section, said sections having a common external longitudinal element parallel to the axis of the header.

5. The combination as set forth in claim 1 and in which the wall thickness is so proportioned that the unit stresses in the metal are substantially uniform in the portion of the header between the supports.

6. The combination as set forth in claim 3 and in which the wall thickness is so proportioned that the unit stresses in the metal are substantially uniform throughout the portion of the header between the supports.

BAZIL WOYNAROWSKI.