SUPPLY HEADER FOR HEATING UNITS HAVING THREE-DIMENSIONAL FLEXIBILITY

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Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7
SUPPLY HEADER FOR HEATING UNITS HAVING THREE-DIMENSIONAL FLEXIBILITY

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This invention relates generally to heating equipment and more particularly to a supply header for heating units for collecting the heating medium generated therein, and distributing the same to the different points of the heating system.

An important object of the present invention is to provide an improved supply header constructed of a series of individual parts adapted for assembly in a predetermined sequence or order to accommodate different arrangements of up-takes and supply lines as required for heating units of different design and capacity, and by means of which the supply header may be assembled and erected in place on the job-site without involving the laborious hand operations of cutting, fitting, and joining the individual parts of the header together.

Another object is to provide a supply header for heating units furnishing heating fluid under pressure to a plurality of outlets, the header having a corresponding number of flanged elbow header members adapted for connection therewith and joined by pre-cut lengths of header line, the header parts being coupled together by means of readily disconnectable slip couplings facilitating increasing or decreasing the capacity of the supply header for connection with a heating unit having a different number of outlets by the addition or removal of certain lengths of the header line and substitution of longer or shorter pre-cut lengths or of additional elbow header members for the parts removed.

A further object is to provide a supply header constructed in accordance with the foregoing, with means providing limited three-dimensional flexibility, to accommodate for expansion and contraction and thus misalignment of the heating system, the heating unit outlet or the header itself.

A more detailed object is to provide multiple sets of tension rods between successive elbow header members of the erected supply header, enabling limited movement of the individual parts making up the header in expansion, upon an excessively high pressure developing in the header, the heating unit, or the heating system in which the unit is connected, and stops arranged internally of the elbow header members both facilitating installation of the lengths of head line in the elbow members and functioning in the erected header to limit telescoping yet enabling limited movement of the individual parts in contraction.

It is a further object of the present invention to provide a supply header for heating units, characterized by ease of assembly since the individual parts making up the header are pre-cut to the length and machined to fit, the header being adapted for erection with a minimum of installation time, and requiring few tools for connecting the individual parts of the header together. It will thus be noted that a feature of the invention is the elimination of large heavy tools for the cutting, joining or fitting of the header parts on the job-site, these operations having been previously performed on the individual parts of the assembly to enable quick and easy installation.

The objects of the invention thus generally set forth, together with other objects and ancillary advantages are obtained by the construction and arrangement shown by way of illustration by the accompanying drawings, in which:

Figure 1 is a side elevation of a heating unit with part broken away, with the supply header attached for collecting heating fluid generated in the heating unit and distributing the same to a heating system;

Fig. 2 is a partial front elevation of the heating unit and supply header shown in Figure 1;

Fig. 3 is a detail fragmentary view of an elbow header member connected by the resilient sealing means to the line section;

Fig. 4 is an enlarged detail view with a portion shown in section, of an elbow header member embodied in the supply header illustrated in Figure 1;

Fig. 5 is a fragmentary detail view of a modified form of the elbow header member shown in Fig. 4;

Fig. 6 is a section taken along the offset plane defined by lines 6—6 of Figure 2 modified by adding a line section on the front end of the header member; and

Fig. 7 is a section taken along the plane of lines 7—7 of Fig. 4.

While the invention is susceptible of various modifications and alternative constructions, there is shown in the drawings and will herein be described in detail certain illustrative forms thereof. It is to be understood, however, that it is not thereby intended to limit the invention to the specific forms disclosed. On the contrary it is intended to cover all modifications, alternative constructions, and equivalents falling within the spirit and scope of the invention as expressed in the appended claims.

Referring more particularly to the drawings, the form of the invention shown for purposes of illustration is embodied in a supply header 10 attached to a heating unit 11 and also connected with a plurality of supply lines 12 and 13, extending to the heating system (not shown). The illustrative supply header in the present instance will be described as attached to a steam boiler furnishing steam under pressure. As illustrated, lines 12 and 13 of the heating system. It will be understood, however, that the supply header 10 will function equally as well in a hot water heating system utilizing a hot water boiler to which the header is attached, and it is not intended that the invention be limited to application in a steam heating system.

As shown in Figure 1, the supply header 10 comprises means for collecting heat medium furnished by the heating unit through a plurality of outlets 14, 15, 16 and 17 or as sometimes termed in the art, uptakes, and distributing the heat medium to the heating system through the plurality of supply lines 12 and 13. The number of such uptakes as well as the size is ordinarily dependent upon the capacity of the boiler, the type of boiler, and upon the size and character of the heating system supplied by the boiler. For purposes of illustration, a heating unit or boiler 11 having four outlets or uptakes is shown, the header 10 being attached directly to these outlets for collecting steam under pressure from the boiler 11. Likewise the number, and also the diameter size of the supply lines connected to the header depends upon the heating unit and the requirements or load of the heating system. As illustrated, two supply lines 12 and 13 are joined to the header 10.

As will appear, one of the features of the present invention is that the header 10 may easily be reconstructed by the addition or removal of parts to accommodate a different number of uptakes or of supply lines. Thus if the heating system is extended, and as a consequence a large capacity boiler is substituted for a small boiler hav-
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The header 10 may be modified quickly and easily for connection with the additional outlets. To like manner, additional supply lines may be connected to the header for distributing steam to the new portions of the extended heating system. Therefore, while the header illustrated in Figure 1 is exemplary, it is connected with four boiler outlets and supplies steam to the system through two headers, it will be understood that a large number of variations of this arrangement are possible and contemplated, all dependent upon the particular heating system in which the header is incorporated.

The heating unit 11 or steam boiler is of conventional construction, and has a plurality of top outlets 14, 15, 16 and 17 as heretofore described, the series of top outlets being substantially aligned both horizontally and along a median line of the boiler.

In accordance with the exemplary form of the invention shown, the supply header 10 is constructed of a series of T fittings, or what may be termed for convenience elbow header members 18, 19, 20 and 21, each of said members being adapted to receive steam under pressure from a respective one of the top outlets of the boiler and these T fittings are coupled together and to the header lines allowing a limited degree of movement in three dimensions, so as to accommodate for temperature and pressure changes which may result in expansion, contraction, and misalignment of the header due to relative movement of its component parts. These header members are ordinarily cast iron, but may be formed as desired, having an upper, generally tubular section 22, T'd to a depending elbow 23 (Figs. 6, 7), the lower end of the elbow including a flange 24 for mounting directly upon a respective top outlet of the boiler. For convenience in mounting, each of the top boiler outlets also terminates in a flanged end, the header members being directly secured to the top outlets by means of bolts or the like. As depicted in Fig. 2, for sealing the joint between the header members and the top outlets a rubber gasket 25 is employed, inserted between the respective flanges.

The upper section 22 of each of the elbow header members 18, 19, 20 and 21 is of generally tubular form defining a steam chamber. Between successive ones of the elbow header members (Figure 1), lengths of header line 26, 27 and 28 are connected in the erection of the supply header 10. The elbow 23 T's into the upper section of the header and is shown in Figs. 4, 5 and 6, the horizontal center line of the member, and preferably even with the lower curved inside surface of the upper section 22 thereof, to provide for automatic draining of the header into the boiler. For closing the header, the front and rear elbow header members (18, 21, respectively) may be capped by means of a front end cap 30 and a rear end cap (not shown) of like construction to the front end cap. The rear end cap may be provided, if desired, with a drainage tapping to accommodate a return to the boiler furnishing additional means for draining the header. Certain of the elbow header members, in the present instance, the two elbow fitting members located to the front of the boiler (18, 19), are connected with the supply lines 12, 13 for furnishing heating medium, i.e., steam, to the heating system.

The contemplated steam supply header assembly 10, thus collects steam generated in the boiler from the top outlets thereof and forms an external steam chest additional to the internal steam chest of the boiler. The steam collected in the steam header is furnished to the heating system by means of a plurality of supply lines 12, 13 connected into the header by means of the flanged elbow header members. One or more of the supply lines to the header is shown in the figures of the drawing. As illustrated, the upper section 22 of the elbow header members receives a tapped bore 31 into which the supply lines may be threaded. Such a convenient arrangement facilitates assembly and installation since the elbow header members solely of the assembled header need be disturbed should it be desired to add additional supply lines, or to remove some of those installed when the header is first erected. It will be understood those elbow header members not attached to the heating system by way of supply lines are capped as with cap fittings 32, the supply lines, it will be understood that the supply lines should the heating system later be extended and additional supply lines required.

In the present instance, the supply header 10 is so constructed as to provide limited three dimensional flexibility to accommodate for misalignment of the supply lines, the top outlets from the steam boiler, or the header members themselves. Flexibility in three dimensions is obtained by allowing movement in three dimensions:

1. Axially between the header line sections 26, 27 and 28, and the header members 18, 19, 20 and 21 to the extent limited by the stops 51 (Figs. 4, 6 and 7) inside the header members, and the tension rods 56 connecting the header members to each other;

2. Laterally between the header line sections 26, 27 and 28 and the header members 18, 19, 20 and 21 due to the annular ring resiliently supporting the line sections 26, 27 and 28 of the header members as viewed in Fig. 3, both horizontally; and

3. Vertically.

For allowing relative lateral and axial movement between the header members and the line sections, it is desirable to employ a means which affords a resilient connection. One coupling having this characteristic is illustrated as a resilient coupling of the "Dresser" type securing the lengths of header line to the elbow header members. Limitation upon the movement permitted of the header parts in the exemplary form shown is provided by stop means operative in conjunction with the lengths of header line and located inside the elbow header members.

Referring to Fig. 3 which depicts one of the intermediate elbow header members 19, the upper cross section 22 of the elbow header member is fashioned with aligned openings 33, 34 sized to receive the header line connecting the elbow header members together. These aligned openings are provided with a beveled or chamfered inside edge 35, 36, affording an opening tapering from the outside of the fitting toward the inside. The tapered openings are provided for receipt of wedge-shaped easseblos, and adapted to be held in position tightly wedged against the beveled edge of the opening in the elbow header member and against the outer surface of the header line received in the opening by means of a pair of follower rings 39, 40 each provided with a like annular rim 41 sealing the respective gaskets. Each follower ring is fastened to the elbow header member by two threaded studs 42, 43 (Figs. 1, 2) received in tapped lugs 44, 45 formed integral with the elbow header member casting. In addition, the pair of follower rings are drawn together by a plurality of draw bolts 46, secured through a like plurality of aligned openings provided in the follower rings. The coupling assembly is of the type known in the art as a "Dresser" coupling, where the asbestos rings afford a packing or sealing means preventing the escape of pressure fluid from the inside of the assembled unit, and where the spaced draw bolts 46 take up and distribute strain by means of the follower rings through which they are inserted.

Relative lateral movement of the header line within the elbow header members is permitted by reason of the flexible or resilient gaskets of the coupling assembly holding the header line to the elbow header members in a resilient coupling allowing separating movement between the header parts members as well as telescoping movement therebetwen. Lateral movement of the header line within the elbow members in the horizontal and vertical
directions is limited automatically. To limit telescoping movement, that is movement of entry of the header line within the elbow header members, in the exemplary form of the invention the inside of each of the elbow members is finished with a plurality of three, equidistantly spaced stops 50, 51, 52 (Figs. 4 and 7), presenting shoulders toward both openings 33, 34, against which the end of the lengths of header line may bear. Thus while the slip coupling assembly permits relative movement between the header parts, the plurality of stops 50, 51, 52 limits telescoping movement thereof, to prevent entry of the header line into the opening that depends on the elbow header members to an extent which would otherwise partially or completely block off the mouth of the depending elbow 23 attached to the top outlet of the boiler and through which steam is collected in the supply header for distribution to the heating system.

Referring again to Figure 1, means are illustrated therein for limiting expansion or longitudinal movement of the header parts, in the present instance shown as multiple sets of locking rods connected between successive elbow header members of the supply header unit. As depicted in Fig. 4, each of the elbow header members is provided adjacent to the elbow shoulder of the upper section 22 thereof, with a lug 53 having spaced openings 54, 55. The lug 53 may be formed integral with the elbow member if cast, or may be welded or otherwise fastened thereto as desired. In the assembled header shown in Fig. 1, the locking rods 56 are connected through the aligned openings of locking lugs 53 on successive elbow header members. Accordingly in the erection of the supply header, the locking rods 56 are inserted through the locking lugs and fastened in place. In the present instance, to facilitate assembly, one end of the locking rod 56 is headed, while the other end has screw threads for receipt of a hex nut or the like. In the form of the invention shown for purposes of illustration, each of the successive elbow header members 18, 19, 20 and 21 are connected with the adjacent members by means of such locking rods 56, one each of said rods extending to the front and the other to the rear (in the case of the intermediate members) for connections with the adjacent members. The entire supply header 10 is thus connected together by means of the sets of locking rods. Accordingly, while the slip couplings allow relative movement between the header line and the elbow header members, the sets of locking rods between the members limit the extent of movement of the assembled parts in expansion. As a consequence, the locking rods restrain the header line lengths from slipping out of the elbow header members where, for example, an excessively high steam pressure is developed in the heating unit, the heating system, and thus in the header.

Although the individual sections of header line may be cut to length on the job site, it is contemplated that all parts of the header will be prefabricated and precut to length, and furnished as a packaged unit of disassembled parts for erection on the job. By eliminating rigid or welded joints between the parts of the header, or conventional pipe threaded joints as in the case of conventional headers, and by substituting slip couplings therefor, the header as a complete unit may be easily assembled with a minimum of installation time.

While the steam supply header illustrated in Figure 1, and as described hereinbefore, includes a front end cap 36, for sealing purposes, it is contemplated that a plurality of sealing units, i.e. boilers, may be connected in tandem or in battery. As shown in Fig. 3 to connect an additional boiler in such a tandem array, the front end cap may be replaced by a connecting fitting 60 adapted to be connected to the slip coupling assembly depicted as a section of header line 61 is clamped to the front elbow header member 18 by means of a follower ring 62. This follower ring is secured by threaded studs 63 and draw bolts 64 in the manner previously described, to the associated elbow header member and to the companion follower ring (not shown). For convenience in assembly and erection, the section of header line 61 may be welded 66 directly to the follower ring 62 to hold the section of line in place, in this instance a resilient asbestos gasket 65 or the like functioning to seal the joint between the section of line and the elbow header member.

Although the multiple sets of locking rods 56 are illustrated in Figs. 1 and 4 as fastened to locking lugs 53 mounted adjacent to but above the elbow 23 of the elbow header member, it is apparent the locking lug may be shifted from this specific location on the member itself. For example, the locking lug may be carried below the elbow, as depicted in Fig. 5 where the locking lug 70 is formed integral with the header member casting. In this instance, the lug 70 is provided with spaced openings 71, 72 for receipt of locking rods for connecting successive elbow header members together as in the manner heretofore described. With the locking lug 70 supported below the elbow 23 as shown in Fig. 5, one lateral edge thereof 73 may be filleted to provide clearance for the one of the draw rods 74 (Fig. 2) passing under the header member to connect the associated follower rings together; eliminating the necessity for an opening 75 (Fig. 4) in the lug, for passage of the one draw rod 76 located just above the elbow 23, and thus weakening the lug. Other arrangements may be found convenient or desirable, as will be clear to a man skilled in the art.

In erection of the steam supply header as described hereinbefore, the series of elbow header members are set in order in keeping with the organization of the top outlets on the steam boiler; the asbestos gaskets and follower rings assembled on the header line lengths; the individual elbow header members and the companion follower rings on the top outlets starting with the one located to the front of the boiler, then the first length of header line, the next successive elbow header member and in sequence until the elbow header member located to the rear of the boiler has been mounted on the last top outlet; the threaded studs and draw bolts securely fastened in place between the follower rings and the header members; and finally the locking rods inserted through the locking lugs of the elbow header members and fastened in place by hex nuts or the like. It has been found that by only hand tightening the nuts securing the locking rods in place, the assembled header has that degree of longitudinal flexibility providing optimum operational characteristics.

It is contemplated that the erected supply header may be modulated to accommodate a different number of outlets from the steam boiler, and to receive a different number of supply lines through which steam may be furnished to the heating system. While in Figure 1, the boiler is shown as provided with four top outlets, and the steam supply header is illustrated as accommodating two supply lines, additional supply lines may be connected to the capped elbow header members 20, 21. Furthermore, in the event the heating system is expanded, for example requiring a larger capacity, the number of outlets may be increased, and the supply header 10 may be reconstructed quickly, easily and inexpensively to accommodate the additional top outlets. This may be accomplished, for example, by substituting an elbow header member and two shorter lengths of header line for the long section of header line 25 found toward the rear of the boiler.

I claim as my invention:
1. In a supply header for heating units furnishing heating fluid under pressure to a plurality of substantially parallel outlet lines, a combination comprising a plurality of elbow header members, each of said header members being adapted to receive heating fluid from a respective one of said outlets, certain of said header members being adapted to supply heating fluid to supply lines extending to the
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7 heating system, header line sections telescopingly connecting successive ones of said header members to each other, said line sections being movably mounted on the header members, resilient sealing means between each of said header line sections and said header members so as to seal against escape of heating fluid under pressure and to allow relative lateral and axial movement therebetween, means limiting telescoping movement of said header line sections relative to said header members, and tension members connecting successive header members to each other so as to limit separating movement of said header members, providing limited three dimensional flexibility of the supply header to accommodate for movement of said supply lines, said outlets or said header members and header line sections.

2. In a supply header for heating units furnishing heating fluid under pressure to a plurality of substantially aligned top outlets, the combination comprising individual elbow header members for connection with each of said top outlets, sections of header line received telescopingly in and connecting successive header members, said sections of line being slidably mounted in the headed members, a resilient member between each of the header members and line sections, said resilient member defining a seal against escape of heating fluid under pressure and allowing relative lateral movement between the sections of line and the header members, means limiting telescoping movement of said sections of header line in said header member, and tension members connecting successive header members to each other so as to limit separating movement of the latter providing limited three dimensional flexibility of the supply header to accommodate for expansion, contraction, and misalignment of the header due to relative movement of the top outlets of the boiler, the header members, or the header line sections.

3. In a supply header for heating units furnishing heating fluid under pressure to a plurality of substantially aligned top outlets, the combination comprising individual elbow header members for connection with each of said top outlets, sections of header line slidably received in and telescopingly connecting successive ones of said header members, said elbow members each curving substantially the same extent in the same lateral direction so that the sections of header line are substantially aligned and are offset from the top outlets, slip couplings securing said sections of header line to said members including a resilient ring between each of the members and line sections, said ring defining a seal against escape of heating fluid under pressure and allowing relative axial and lateral movement therebetween, means limiting entry of said sections of header line into said members for limiting telescoping movement thereof, and tension elements connected between successive elbow header members so as to connect the members to each other for limiting separat-

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8 ing movement of the same whereby to provide limited three-dimensional flexibility of the supply header to accommodate for expansion, contraction, and misalignment of the header due to relative movement of the top outlets of the boiler, the header members, or the header line sections.

4. In a supply header for heating units furnishing heating fluid under pressure to a plurality of substantially aligned outlets, the combination comprising; a series of individual T header members for receiving heating fluid from each of said outlets; header line sections slidably received in and connecting successive header members; an annular resilient ring between each of the T members and line sections so as to seal against escape of heating fluid; and locking rods connecting successive header members to each other; each of said T header members having aligned openings for receiving said header line sections; stop members inside said opening for limiting entry of said header line sections therein; and tensioning rod lugs carried by said members and providing means for securing said locking rod lugs thereto so as to limit separating movement of the members.

5. In a supply header for a heating unit furnishing heating fluid, the combination comprising, a series of aligned T header members for receiving heating fluid from said unit, header line sections slidably received in and telescopingly connecting successive T header members, lugs carried by each said T members having openings therein so arranged as to be aligned on adjacent T members, headed tension rods connected between successive T header members so as to connect the header members to each other and limit separating movement, said rods being mounted in the lug openings so as to allow freedom for telescoping movement of the header members, each of said T header members having aligned openings for receiving said header line sections, said openings tapering from the outside toward the inside of said T header members, stop members inside said openings for limiting entry of said header line sections therein, and annular resilient rings forming gaskets surrounding said header line sections and wedged into said tapered openings whereby to seal the joint between said members and line sections and to allow a limited degree of relative lateral movement.

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