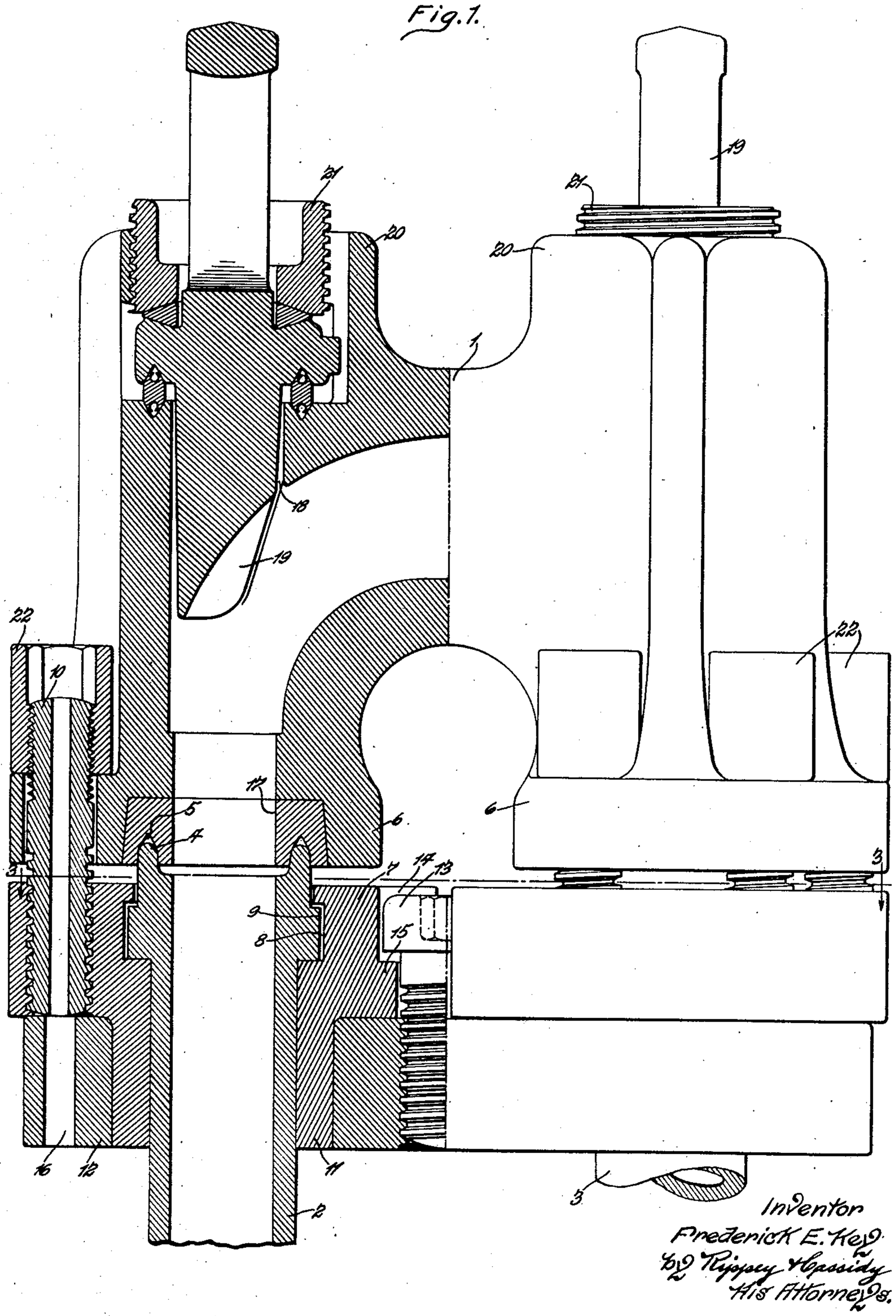
Feb. 28, 1939. F. E. KEY 2,148,863

RETURN BEND

Filed Nov. 20, 1936 2 Sheets-Sheet 1

Fig. 1.



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Filed Nov. 20, 1936 2 Sheets-Sheet 2

Fig. 2.

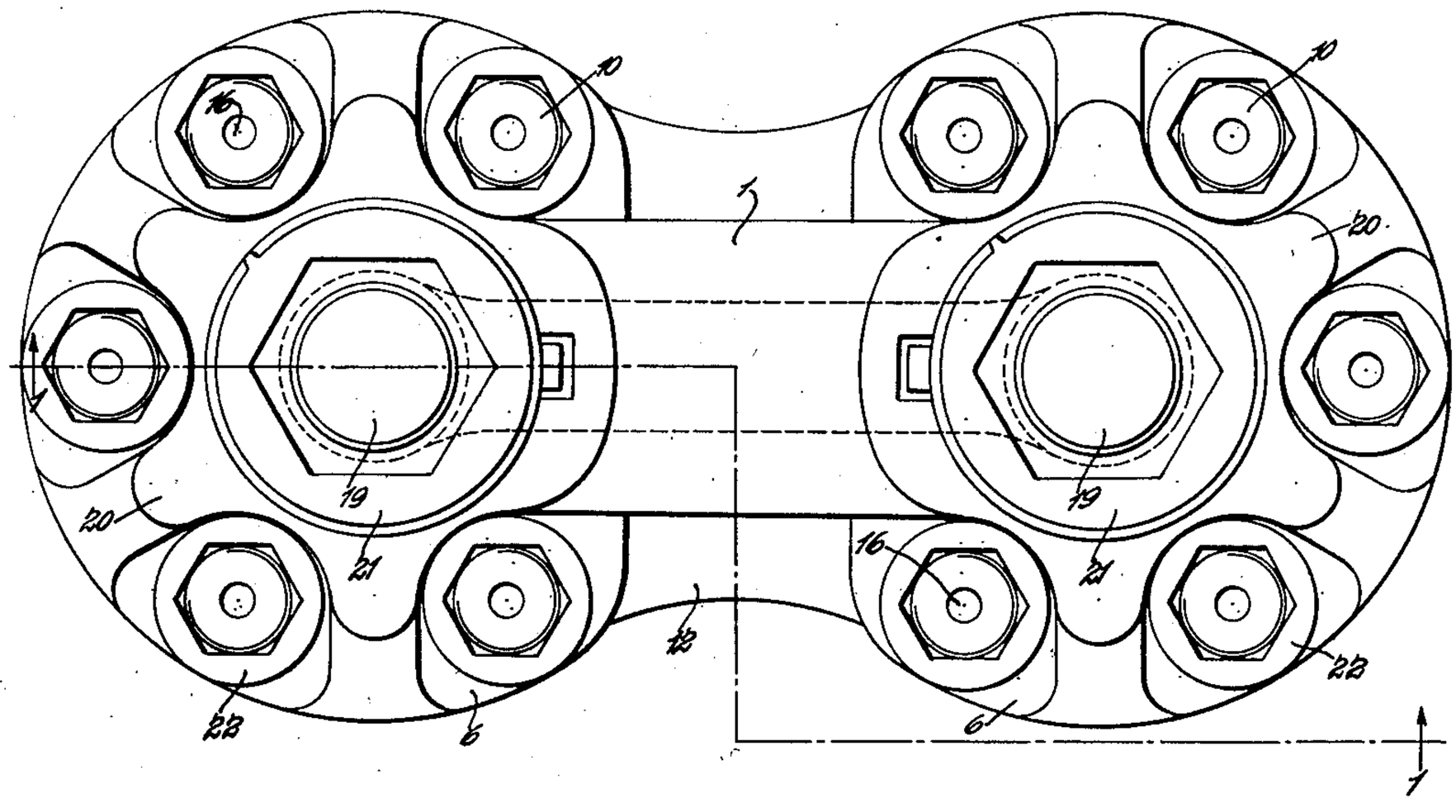
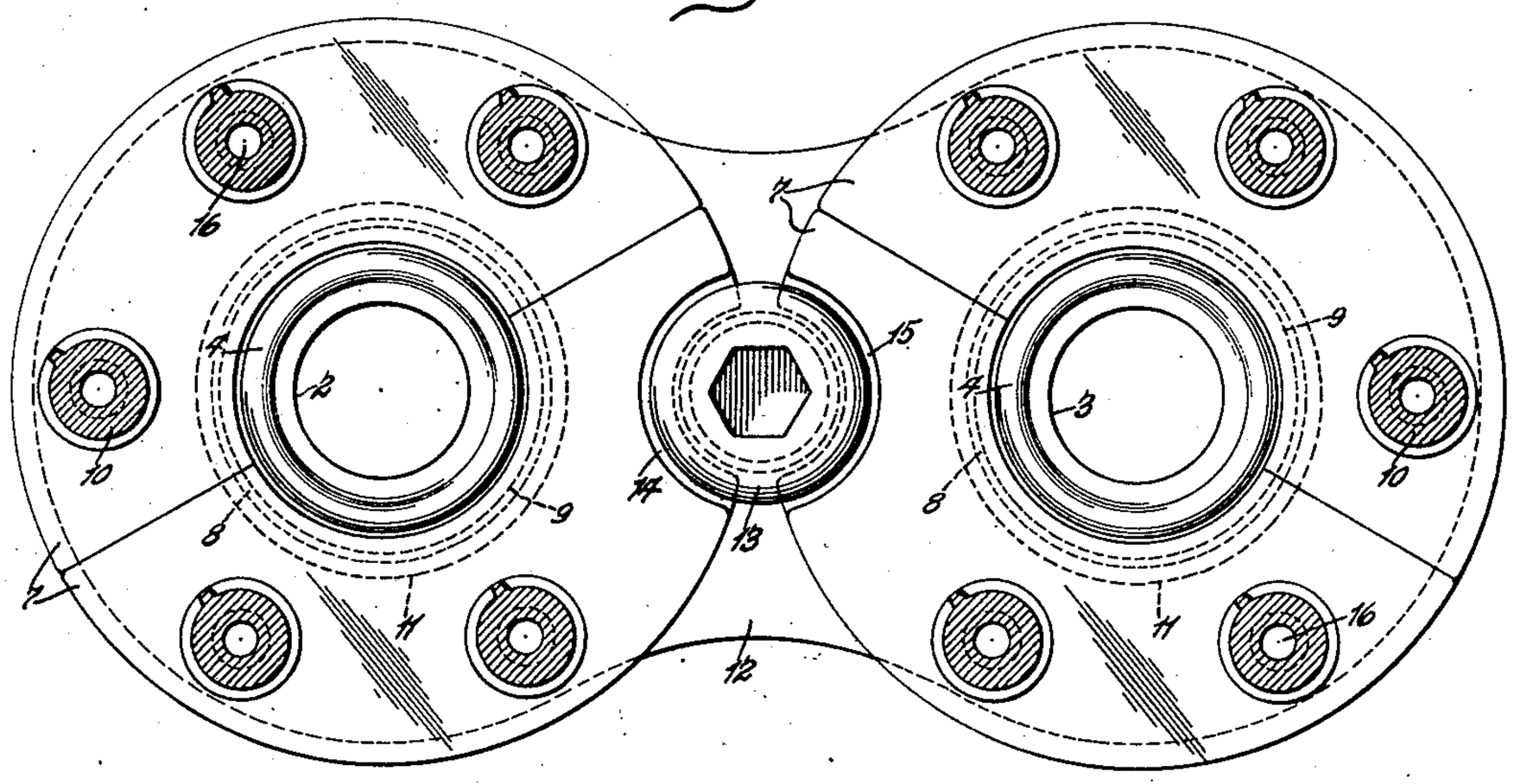


Fig. 3.



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Patented Feb. 28, 1939

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UNITED STATES PATENT OFFICE

2,148,863

RETURN BEND

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Application November 20, 1936, Serial No. 111,834

1 Claim. (Cl. 285—20)

This invention relates to return bends forming passages between the ends of the tubes, and is of particular utility in oil stills which are subject to high temperatures and high pressures.

The fundamental object of the invention is to provide a return bend assembly in which the joints between the ends of the connecting member (or U-bend) and the tube ends may be made gas-tight and secured in this position under the adverse conditions of oil cracking stills.

One of the objects of this invention is to provide means for holding sectional collars together and in alignment and to prevent relative spreading, lateral movement and twisting while permitting limited relative longitudinal movement, in that type of return bend assembly in which flanges on the U-bend are secured to the collars and the collars engage shoulders on the tubes.

Another object of the invention is to provide a novel bushing on the ends and at the face of the U-bend and including that portion intended to contact the tube ends, thus providing for the ready repair of the U-bend at its place of major wear.

Another object of the invention is to provide a U-bend assembly in which the bolts or clamping means are so constructed and arranged that leaks due to unequal cooling of the U-bend parts may be eliminated or reduced.

Other objects of the invention will be apparent from the following description, taken in connection with the accompanying drawings.

Fig. 1 is a side elevation partly in section, taken approximately on line 1—1, Fig. 2, showing a return bend assembly embodying the invention;

Fig. 2 is an end view; and,

Fig. 3 is a section on line 3—3, Fig. 1.

A U-bend or connecting member 1 has its ends engaging the ends of tubes 2 and 3 to form a communication between the tubes. The joint between the tubes and the U-bend is formed by an annular ridge 4 at the end of each tube which engages in an annular groove 5 formed in the face of each of the ends of the U-bend.

The tubes are seamed to the U-bend by means which include flanges 6 about each end of the bend and sectional collars 7, each having an internal annular groove 8 to receive a circumferential flange 9 about the tube near its end. Bolts or studs 10 connect the flanges 6 and the collars 7.

To hold the sections of the collars together and to control the relative movement of the two collars, they have shanks or reduced cylindrical portions 11 at their inner ends which slidingly fit in proper bores in a link 12. The arrangement is such that the collars 7 and thereby the tubes 2 and 3 are held substantially against relative lateral, spreading or twisting movements, whereas relative longitudinal or parallel motion is permitted.

To limit the relative longitudinal movement of the collars 7 a set screw 13 is threaded in the link 12 and has a head which, for economy of space, is positioned in a socket or sockets 14 in the collars but which is adapted to engage the shoulders 15 at the bottom of the socket 14. The set screw 13 is not tightened completely against the bottom of the socket but the bottom of the head is allowed to remain slightly above the bottom of the socket 14, as clearly shown in Fig. 1. This permits a relative but limited longitudinal movement between the parts.

The bolts 10 are hollow and passageways 16 are provided in the link 12 to register with the holes through the bolts 10. Thus a circulation of air through the bolts is permitted to keep them as cool as practicable and prevent spreading at the joint between the U-bend and the tubes.

Preferably, a bushing 17 as shown in Fig. 1 is inserted by a pressed fit in each of the two bends. The outer face of the bushing is flush with the face of the end of the U-bend and contains the groove 5, and except for purposes of repair the bushing functions as an integral part of the U-bend.

The foregoing is a description of the outstanding features of the invention, while the following detail description will assist in understandng the construction and operation of the return bend.

The return bend of this invention is one which is particularly adapted to that form of construction in which removable plugs are provided in line with the bores of the tubes for access in cleaning the tubes. With such a type of connection it is unnecessary to remove the return bend for cleaning. The construction and arrangement of the plugs are best shown in Fig. 1. The U-bend 1 has openings 18 in axial alignment with the tubes when the U-bend is in place and are closed by plugs 19. The U-bend is provided with outward extensions 20 concentric with the openings 18 and are threaded to receive a jamb nut 21 which holds the plugs 19 in position. The particular construction of the plug and its sealing members are no part of this invention, but will be clearly understood by those skilled in the art from the accompanying drawings.

The bolts 10 are arranged as close to the openings of the tubes as is practicable. To this end

the bolts 10 are provided with circular nuts 22 having polygonal sockets to accommodate a wrench. To provide a bolt which may be readily removed and which at the same time can be properly tightened, the bolt 10 has on one end Acme threads to engage similar threads in holes on a collar 7. The outer end of the bolt 10 is provided with S. A. E. threads for engagement with internal threads on the nut 22. Bolts used in such environment are apt to gall and stick necessitating their being cut when removed. The Acme threads, which are of high pitch, provide for the ready removal of the bolt, while the S. A. E. threads, being of low pitch, enable the device to be properly tightened.

The circumferential flange 8 on the tube has an outer as well as an inner shoulder, as clearly shown in the drawings Fig. 1. This necessitates the collar 7 being formed in two or more parts, as clearly shown in Fig. 3. The inner shoulder forms an abutment for the collars in order that the collars may hold the tubes in engagement with the return bend. The outer shoulder enables the collars to hold the tubes in assembly when the return bend is removed.

The link 12, as previously described, is of substantial thickness and has a pair of accurately machined holes to receive the shanks 11 of the collars 7. Thus when the link 12 is brought into position so that the shank 11 of the collar 7 is in an opening in the link the two sections of the collar 7 will be held in proper position and when the two shanks of the collars 7 are engaged in the two holes respectively of the link 12, these collars together with the tubes will be held against lateral, spreading or twisting movement except, of course, such minor movement as may be permitted by clearances provided in manufacture. At the same time, relative longitudinal movement of the collar 7 and of the tubes is permitted. This relative longitudinal movement permits the U-bend being clamped in place on the tubes to secure a tight joint without distortion of the U-bend.

While longitudinal movement is permitted, still it is desirable to limit the amount of that longitudinal movement so that when the U-bend is off, the tubes will nevertheless be held approximately in proper relationship. To secure this result the set screw 13 engages in the link 12 and is screwed down so that the inner face of the head will have a substantial clearance above the bottom of the sockets 14 in the collars 7. It will be seen, therefore, that when the screw 13 is in position, as shown in Fig. 1, the U-bend may be removed but the tubes will still be held in proper alignment, and in approximately the proper longitudinal position while a limited relative longitudinal movement is permitted so that the joints between the U-bend ends and the tube ends may be made properly without distortion of the U-bend, notwithstanding minor imperfections due to tolerances permitted in manufacture, and due to wear or use. It will also be apparent that the arrangement of the collars and the link are such as to permit one tube in a pair to be replaced without disturbing the other tube.

From the foregoing description it will be seen that the invention accomplishes its objects. Parts of the invention may be used without the whole and various changes may be made in the details of construction, within the scope of the appended claim, without departing from the spirit of this invention.

I claim:

In a return bend assembly a U-bend, an annular flange about each end of the U-bend, a pair of collars adapted to engage shoulders on tubes to be connected to said U-bend, bolts having longitudinal bores therethrough for connecting said flanges and collars and adapted to be threaded in holes through the collars, and a link for said collars positioned adjacent the inner ends of said holes through the collars and having holes therethrough positioned to register with the bores through the bolts to allow a circulation of air through the bolts.

FREDERICK E. KEY.