

April 15, 1930.

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1,754,350

STEAM BOILER

Filed Nov. 21, 1925

2 Sheets-Sheet 1

Fig 1

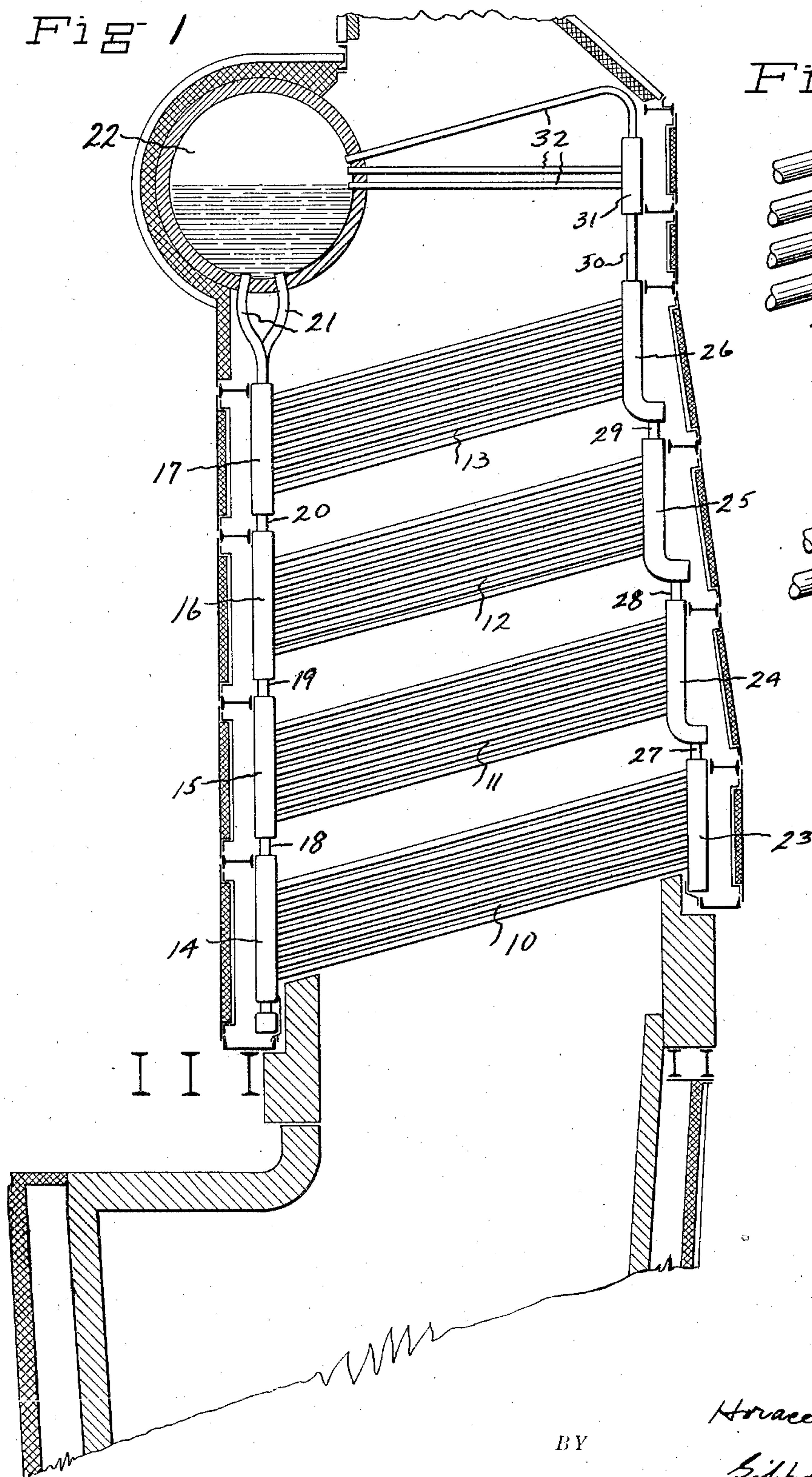
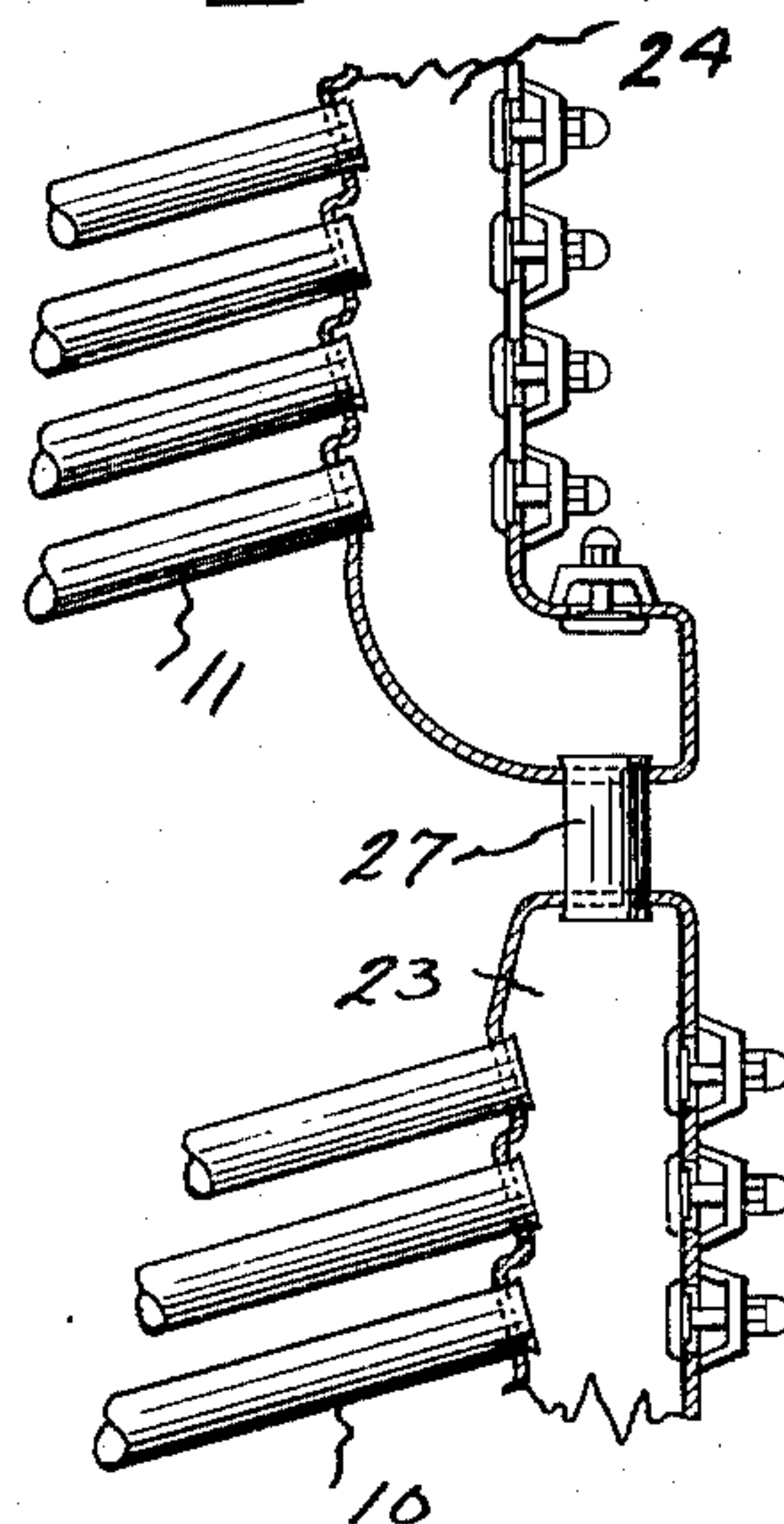


Fig 2



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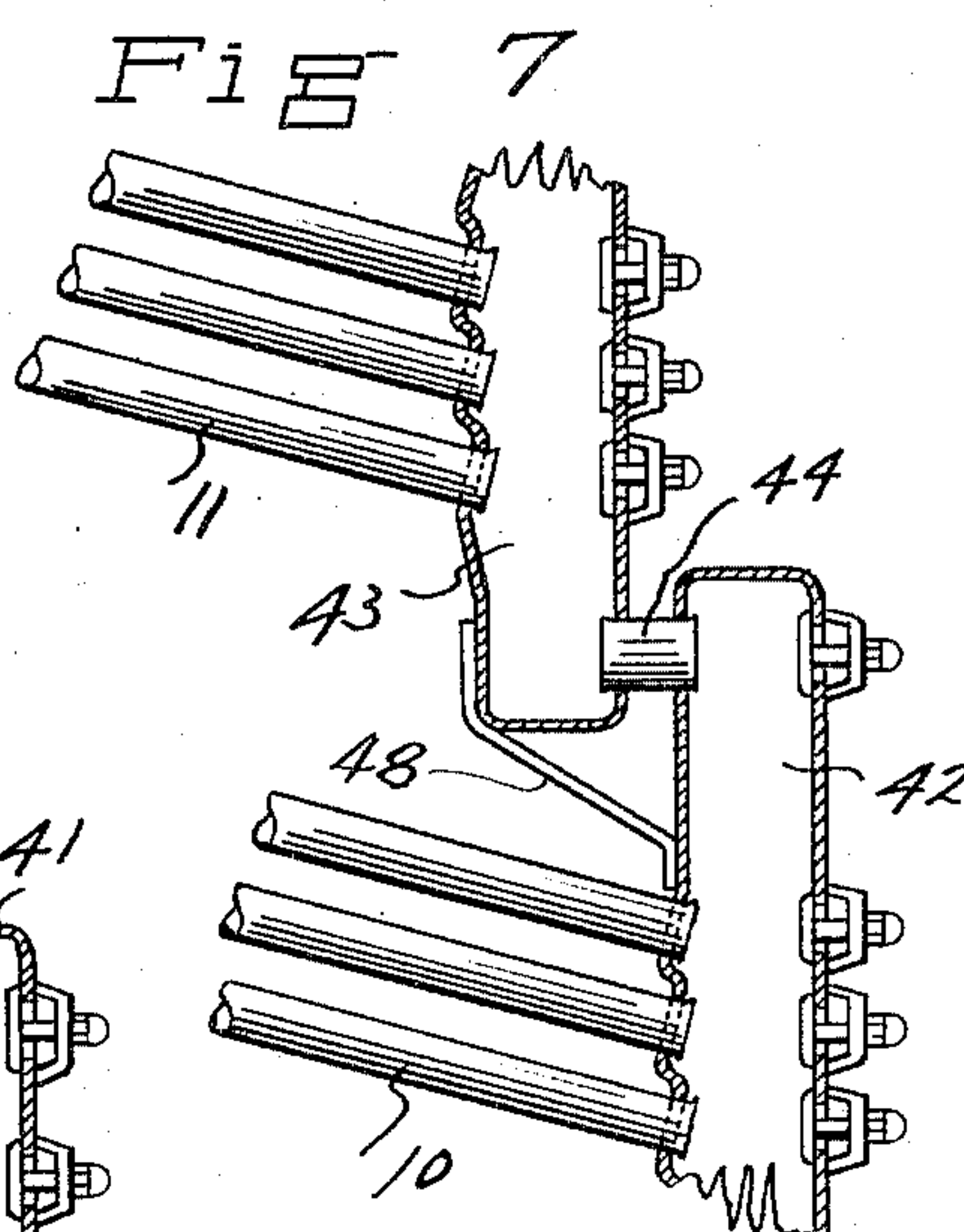
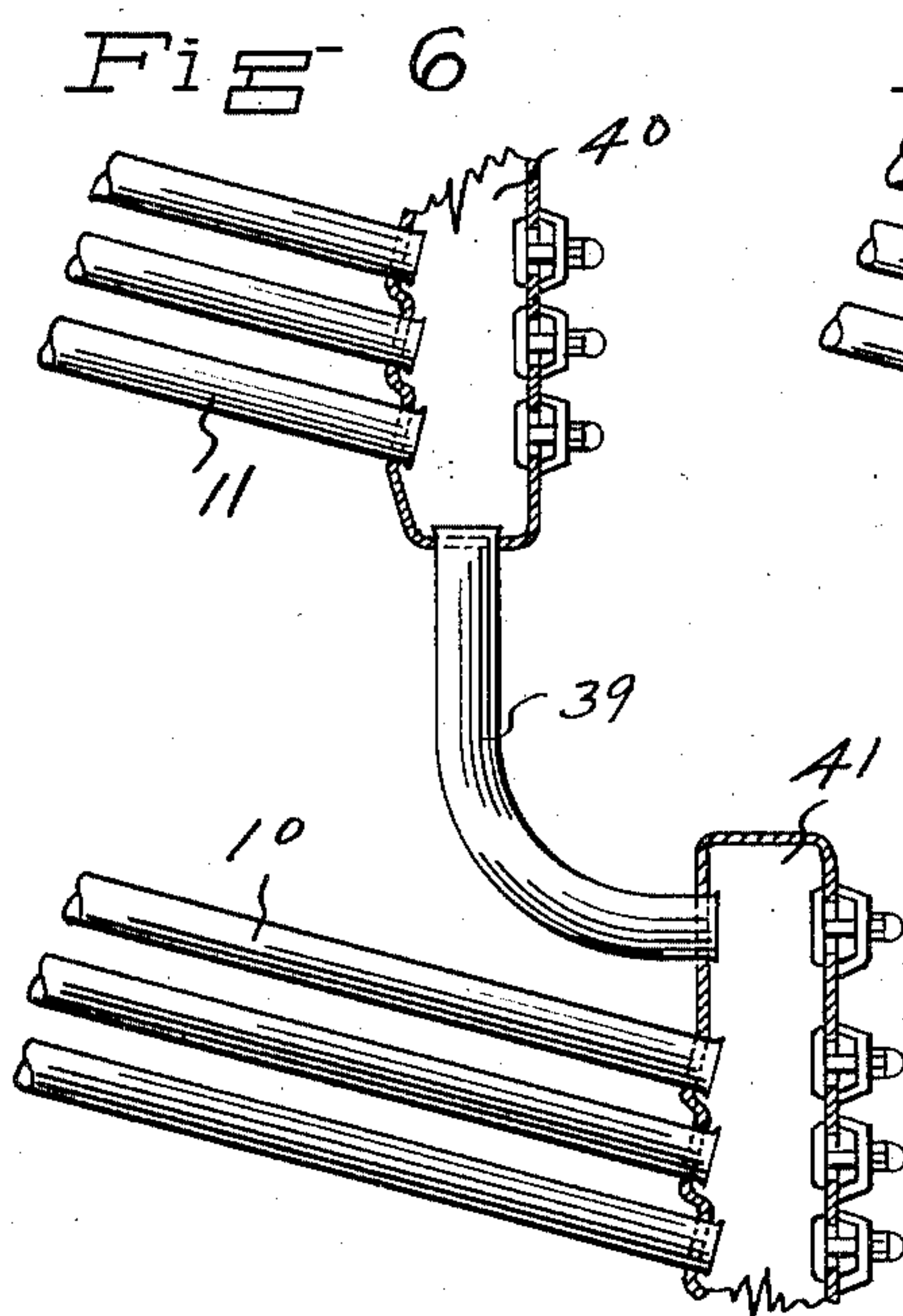
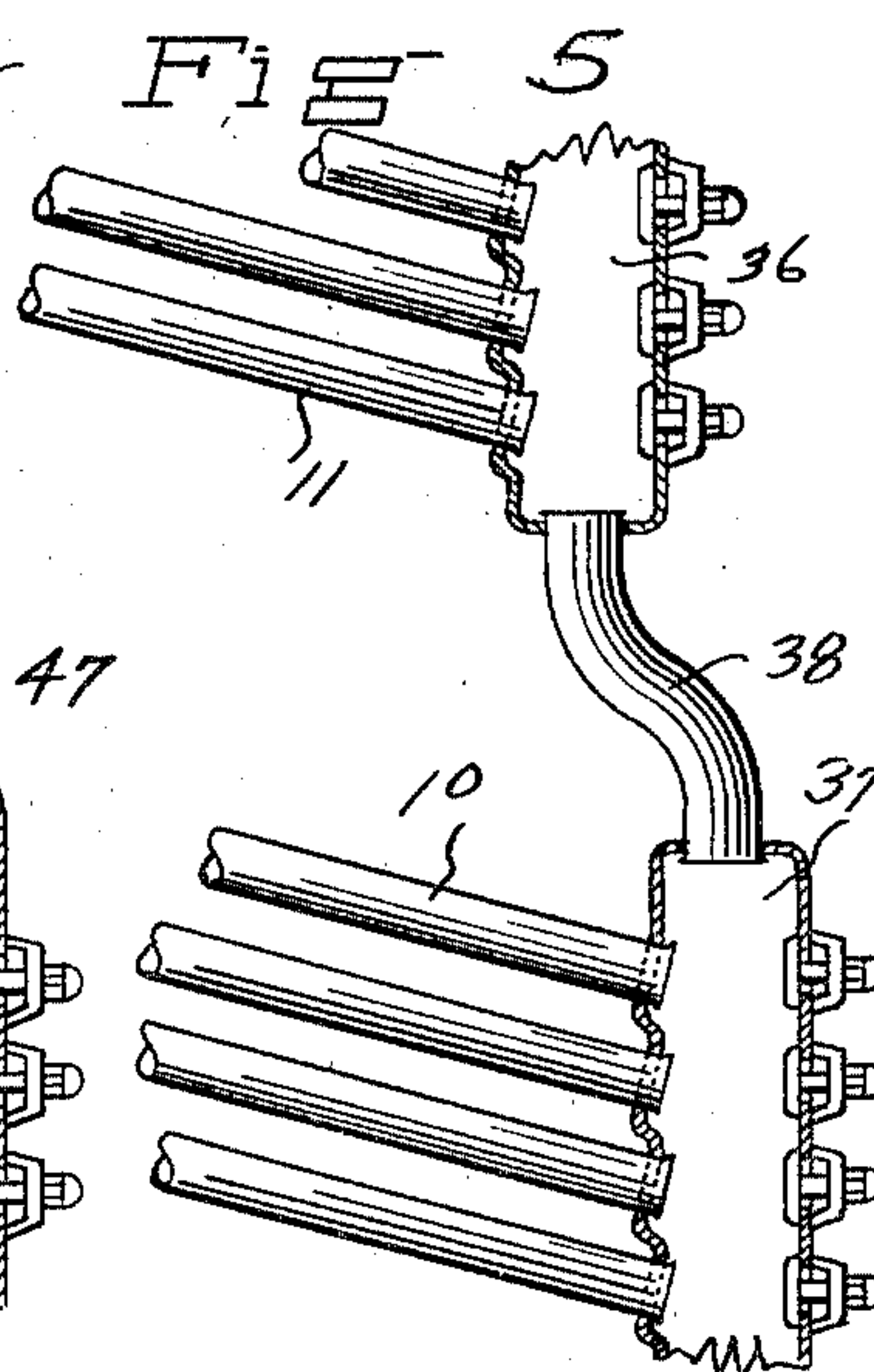
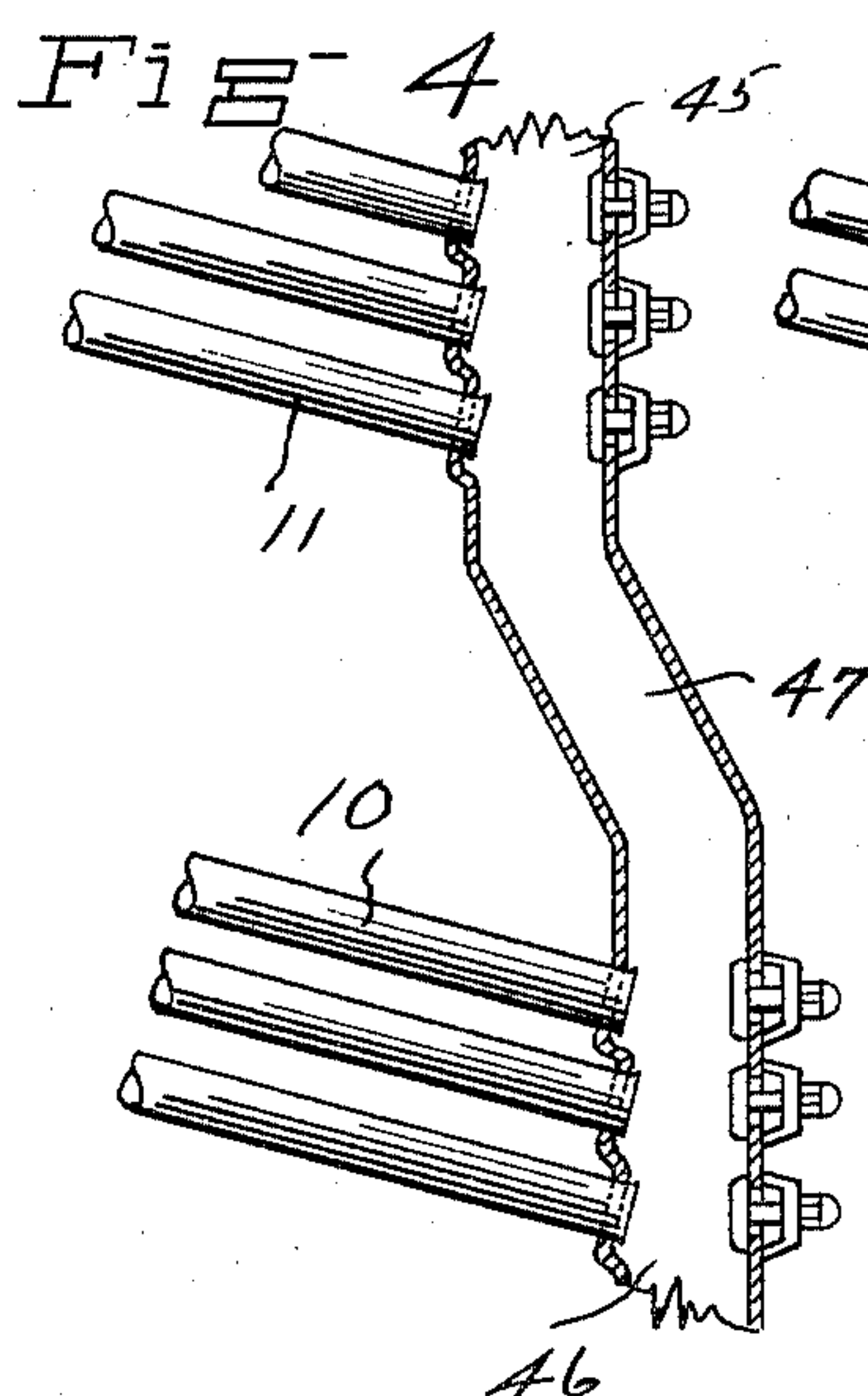
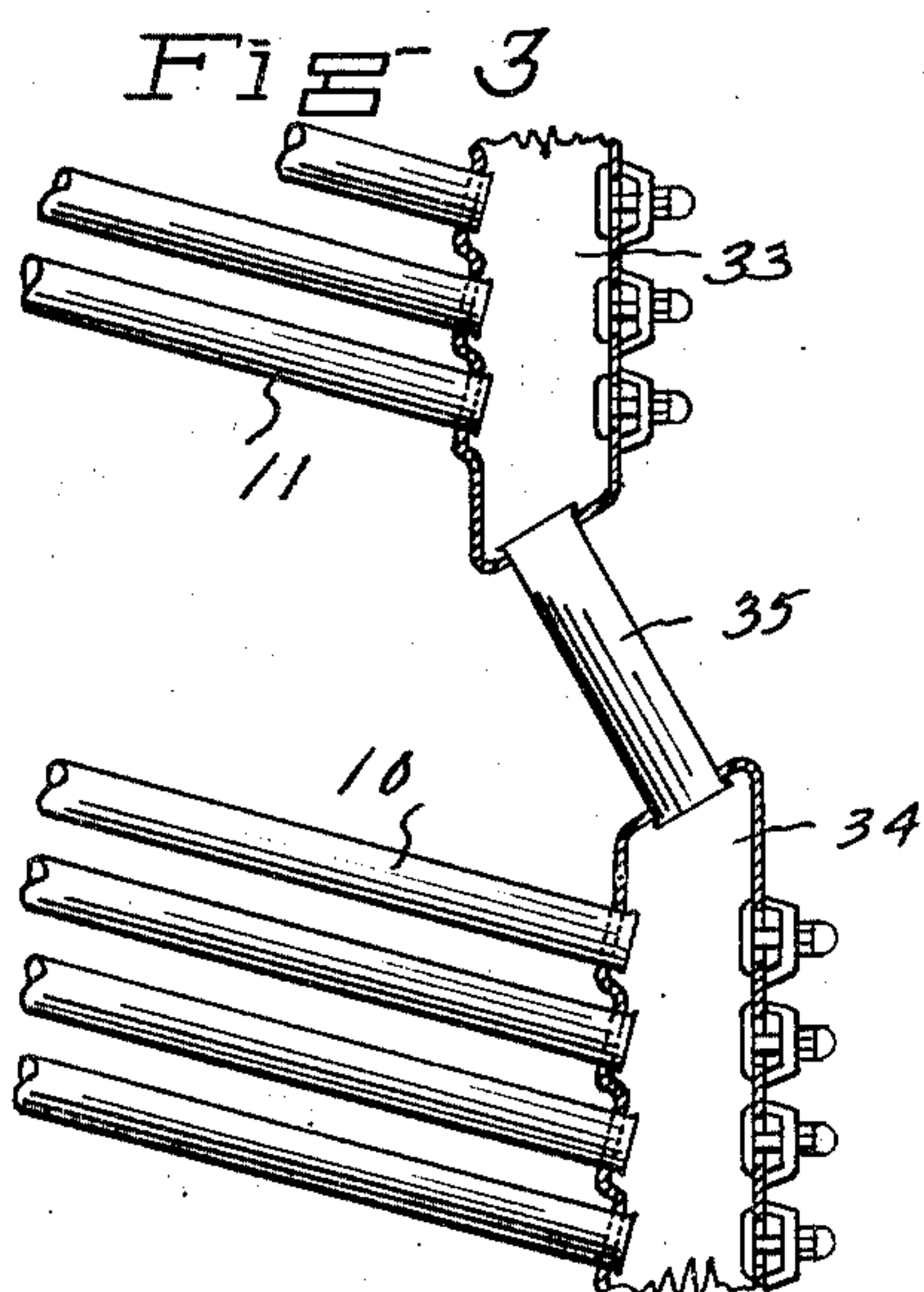
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2 Sheets-Sheet 2



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STEAM BOILER

Application filed November 21, 1925. Serial No. 70,488.

My present invention relates to water tube steam boilers, and more particularly to that type of such boiler in which the water tubes are of different lengths, and will be best understood from the following description and the annexed drawings, in which Fig. 1 is a vertical longitudinal section of an illustrative form of steam boiler (more or less diagrammatic) embodying my invention; Fig. 2 is an enlargement of a portion of Fig. 1, with the parts broken away to show the construction; Figs. 3, 4, 5, 6 and 7 are each views similar to Fig. 2, but each showing a modification of the construction which may be used in place of that shown in Fig. 2.

Like reference characters indicate like parts in the several views.

In the illustrative form of boiler, the water tubes are horizontally inclined and arranged in banks one above another, with the length of tube in each bank shorter than that of the length of tube in the bank below and with water chambers defining a single gas pass upward over the several banks of water tubes. In the boiler illustrated, these banks are indicated at 10, 11, 12 and 13, though it will be understood that the boiler may have any number of banks more than one. To the lowermost ends of the tubes in the several banks are connected respectively downtake water chambers 14, 15, 16 and 17, these water chambers being arranged in vertical alinement and connected through nipples 18, 19 and 20 to form a continuous downtake water chamber. Nipples 21 connect the upper water chamber 17 with the steam and water drum 22.

The upper ends of the water tubes in the several banks are connected respectively to uptake water chambers 23, 24, 25 and 26, these water chambers being connected by nipples 27, 28 and 29 to form a continuous uptake water chamber which, in turn, is connected through the nipples 30, header box 31 and circulating tubes 32 with the drum 22.

It will be noted that all of the tubes in a bank are of the same length and that the continuous uptake water chamber is arranged in steps with the steps parallel to each other.

In the form illustrated in Figs. 1 and 2, the connection between the several water cham-

bers on the uptake side is made by bending the lower portion of the water chamber at substantially right-angles to the face entered by the water tubes, and the short nipple, as 27, for instance, then enters the horizontal face of this outwardly turned portion and also the top of the next lower water chamber. By this arrangement the lower end of the water chamber is so disposed that the gases passing through the boiler will not impinge there-against. It will be understood, of course, that the water chambers are provided with the usual handholes and their covers for access to the water tubes, and it will also be understood that the several water chambers may be made either with a continuous water space extending across the boiler or of individual headers nested together to form the water chamber.

It will be noted that the construction described enables the building of a single-pass horizontally-inclined water tube boiler with a narrowing gas pass which may be designed to conform to the contraction of the gases by the abstraction of heat therefrom and which, at the same time, does not require a large number of different lengths of tubes. It will also be understood that, if desired, either the uptake or the downtake water chamber may be formed in steps, or, indeed, both may be so formed, if desired, and that my arrangement would be useful also in other types of boilers than those having horizontally inclined tubes. Thus, for some purposes, the water chambers may be substantially horizontal and the water tubes more or less vertical.

It has heretofore been proposed to build water tube boilers with a single gas pass but in which both water chambers were each in substantially a single plane and inclined toward each other, these inclined water chambers defining the narrowing gas pass. But in such constructions, each row of tubes would necessarily be shorter than the tubes in the row next below and this is undesirable from a construction and a maintenance standpoint. With the arrangement which I have described, it will be obvious that the number of lengths of tubes is enormously decreased,

while, at the same time, obtaining the benefit of the narrowing gas pass defined by the water chambers.

In the modification shown in Fig. 3, the headers 33 and 34 have their bottoms and tops, respectively, formed at an angle to the faces of the headers and a straight nipple 35 is inserted in these faces.

Fig. 5 is somewhat similar to Fig. 3, except that the tops and bottoms of the headers 36 and 37 are at right-angles to the faces of the headers and the bent nipple 38 connects the headers through these horizontal faces.

Fig. 6 is another modification in which the curved nipple 39 extends from the bottom of the header 40 into the side of the header 41.

In Fig. 7, the upper part of the header 42 has been carried up past the lower part of the header 43, so that a straight horizontal nipple 44 serves to connect them. A plate or plates 48 may be provided to protect the lower end of each water chamber 43 and thereby prevent impinging of the gases against that end, and the consequent possible burning thereof.

In Fig. 4, the upper header 45 and the lower header 46 are made integral, the connecting portion 47 being bent at the necessary angle for this purpose. It will be understood that if the boiler has more than two banks of tubes, the form shown in Fig. 4 may be used for a limited number of banks only with the headers of other banks connected thereto by any of the methods shown in the other figures. This would avoid making a very long continuous header by forging, as would be required with the arrangement of Fig. 4, if no separate nipples were used.

I claim:

1. In a steam boiler having a tapered pass, a plurality of banks of tubes disposed in said pass and spaced apart longitudinally thereof, each bank comprising a plurality of tubes of substantially equal length disposed in rows spaced apart longitudinally of the pass and the length of tubes in the successive banks decreasing from one end of the pass toward the other, vertically extending substantially straight water chambers disposed at opposite ends of the tubes in each bank and connected thereto, the chambers on at least one side of the pass being stepped with respect to each other, means connecting the chambers of successive banks to form continuous chambers at opposite sides of the pass, a steam and water drum, and connections from the upper ends of said chambers to said drum.

2. In a steam boiler having a tapered pass, a plurality of banks of tubes disposed in said pass and spaced apart longitudinally thereof, each bank comprising a plurality of tubes of substantially equal length disposed in rows spaced apart longitudinally of the pass and the length of tubes in the successive banks

decreasing from one end of the pass toward the other, vertically extending substantially straight water chambers disposed at opposite ends of the tubes in each bank and connected thereto, the chambers on one side of the pass being stepped with respect to each other, and those on the other side being disposed in substantially the same plane, means connecting the chambers of successive banks to form continuous chambers at opposite sides of the pass, a steam and water drum, and connections from the upper ends of said chambers to said drum.

3. In a steam boiler having a tapered pass, a plurality of banks of tubes disposed in said pass and spaced apart longitudinally thereof, each bank comprising a plurality of tubes of substantially equal length disposed in rows spaced apart longitudinally of the pass and the length of tubes in the successive banks decreasing from one end of the pass toward the other, vertically extending substantially straight water chambers disposed at opposite ends of the tubes in each bank and connected thereto, the chambers on at least one side of the pass being stepped with respect to each other, means connecting the chambers of successive banks to form continuous chambers at opposite sides of the pass, means preventing the gases flowing through said pass from impinging against the ends of said chambers, a steam and water drum, and connections from the upper ends of said chambers to said drum.

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