

No. 682,299.

Patented Sept. 10, 1901.

J. W. WALSH.  
BOILER TUBE.

(Application filed Jan. 28, 1901.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

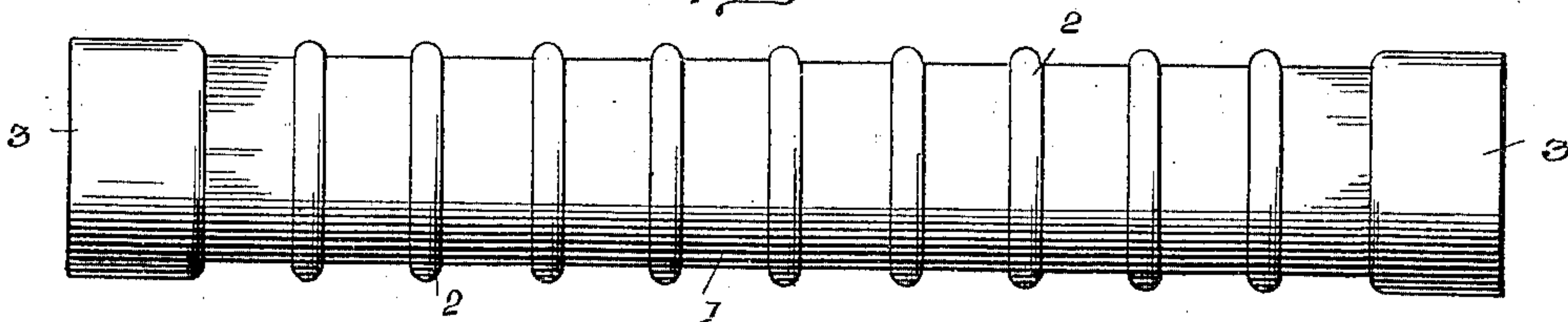


Fig. 2.

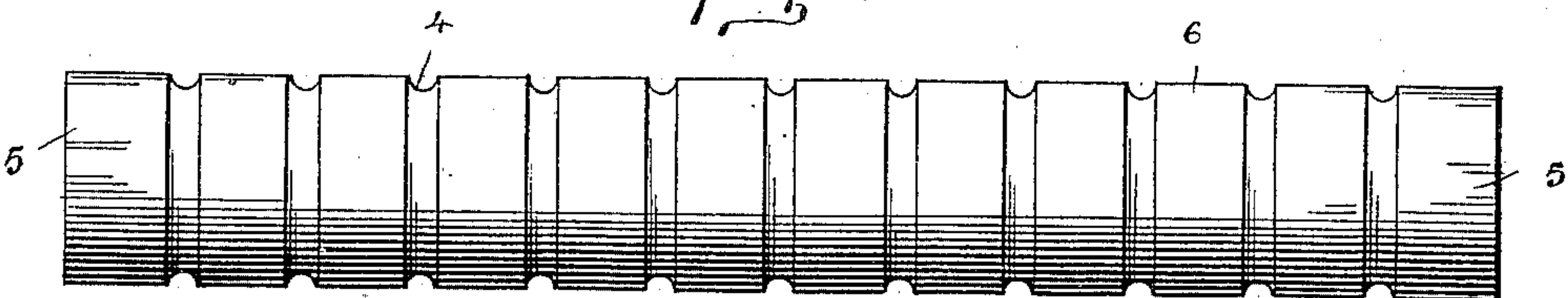


Fig. 3.

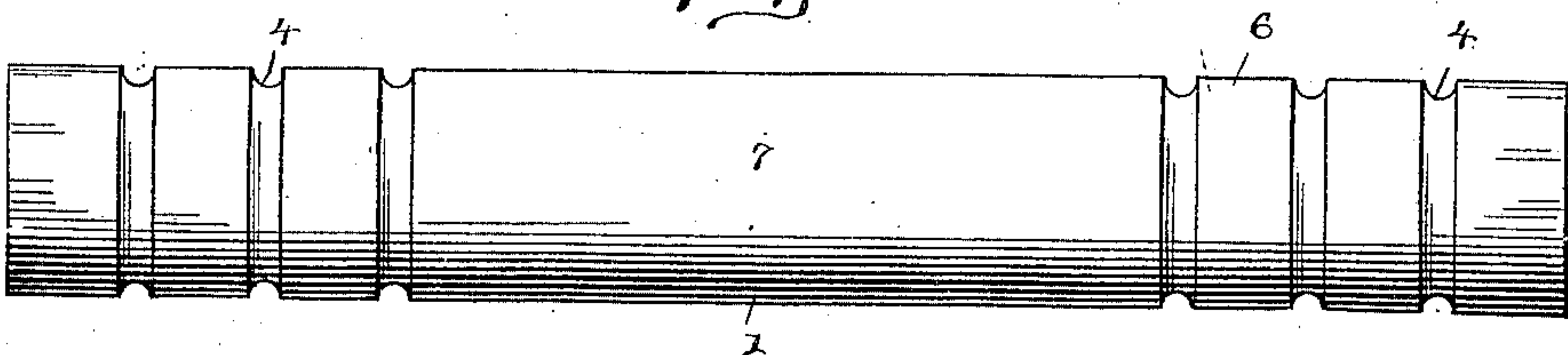
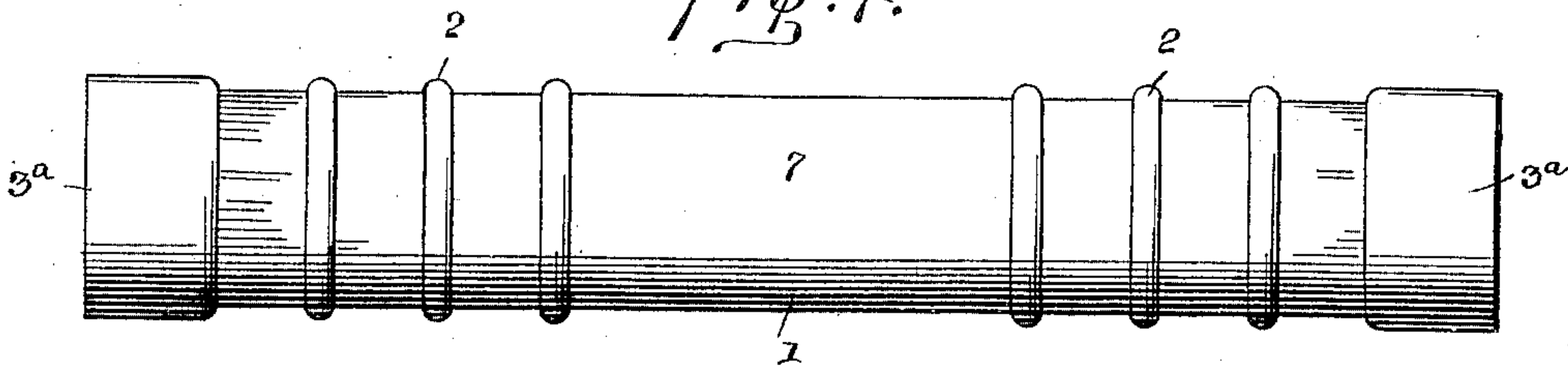


Fig. 4.



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2 Sheets—Sheet 2.

Fig. 5.

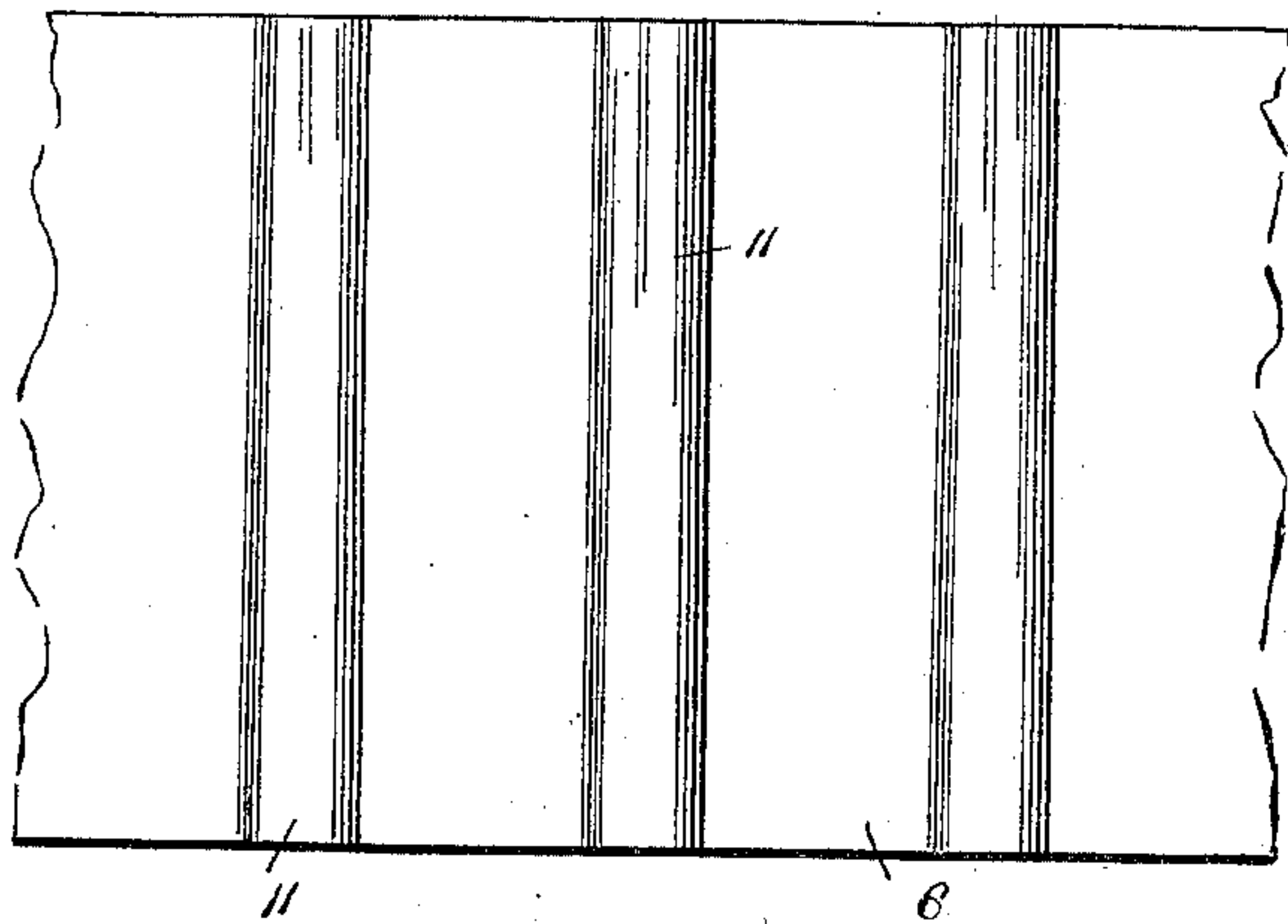


Fig. 6.

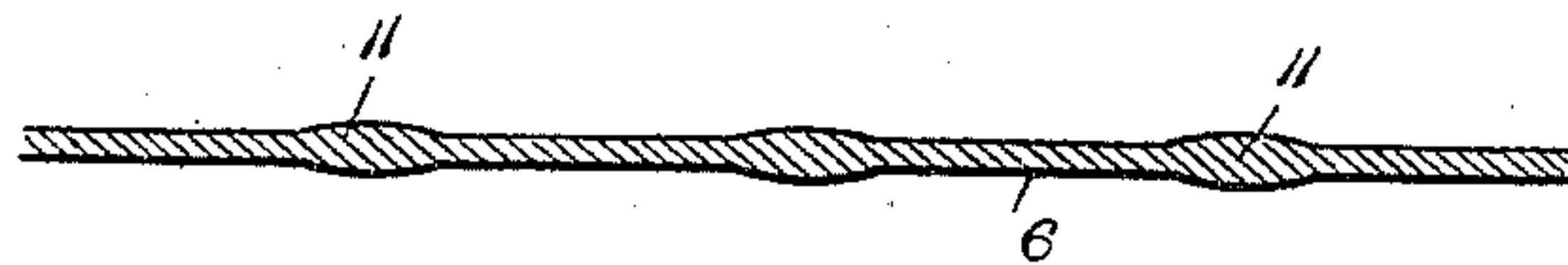


Fig. 7.

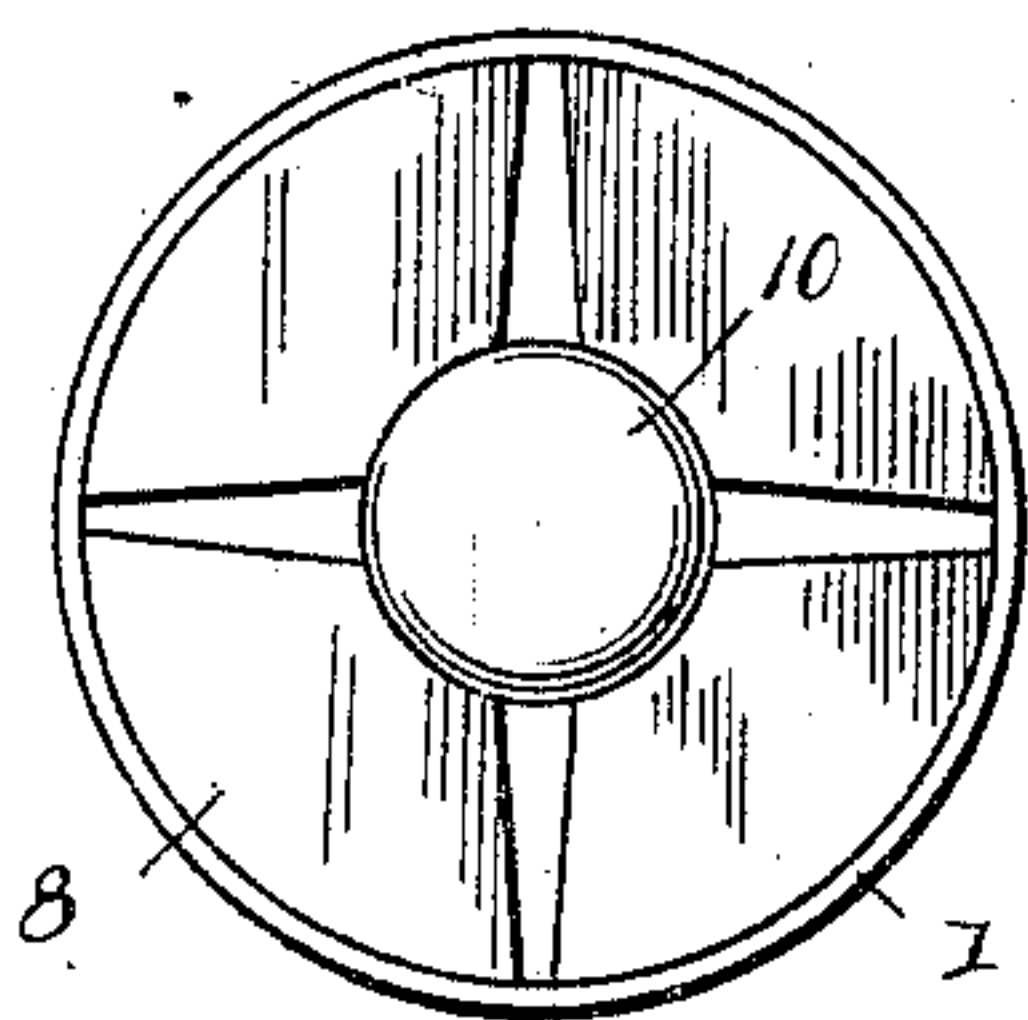


Fig. 8.

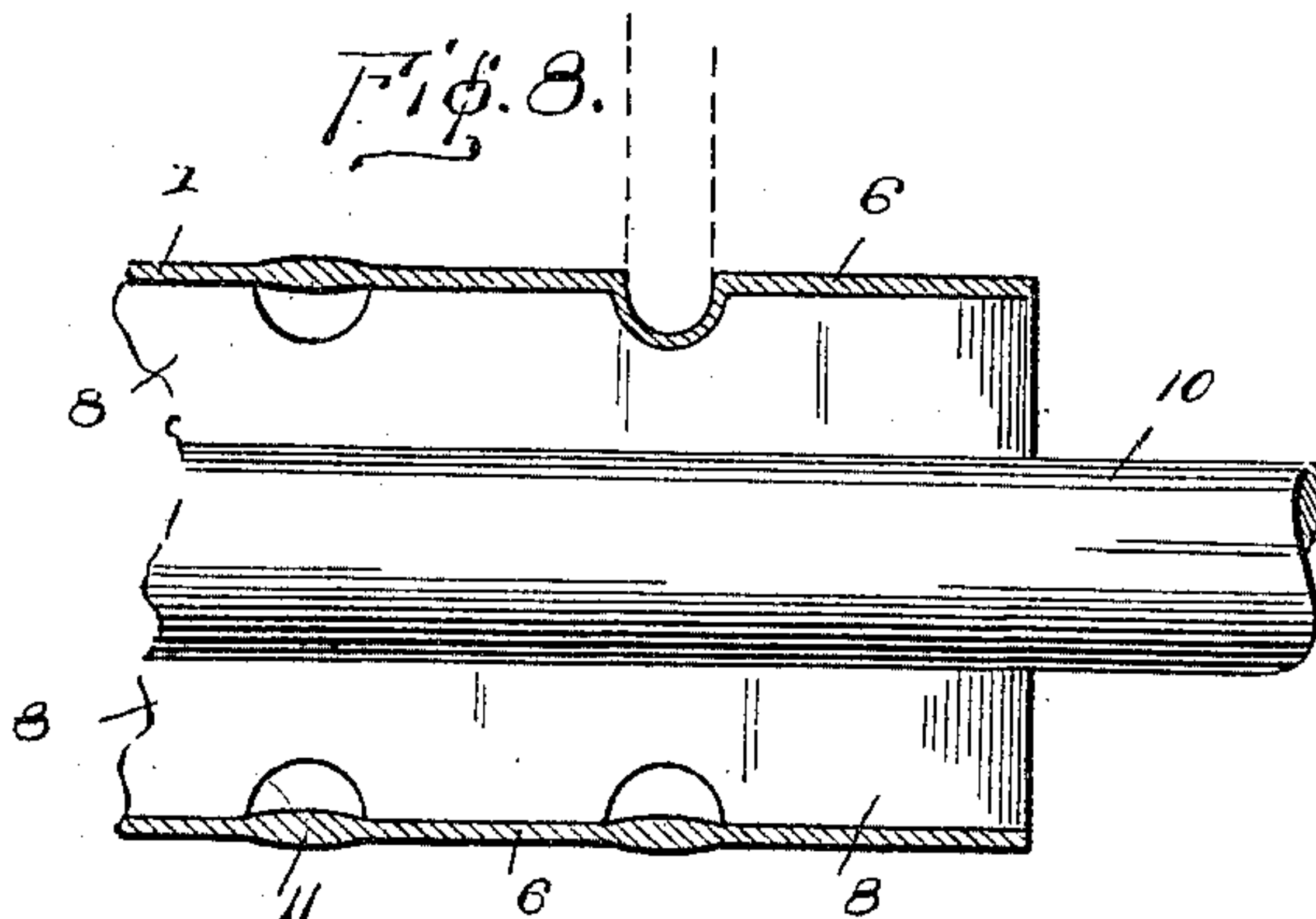
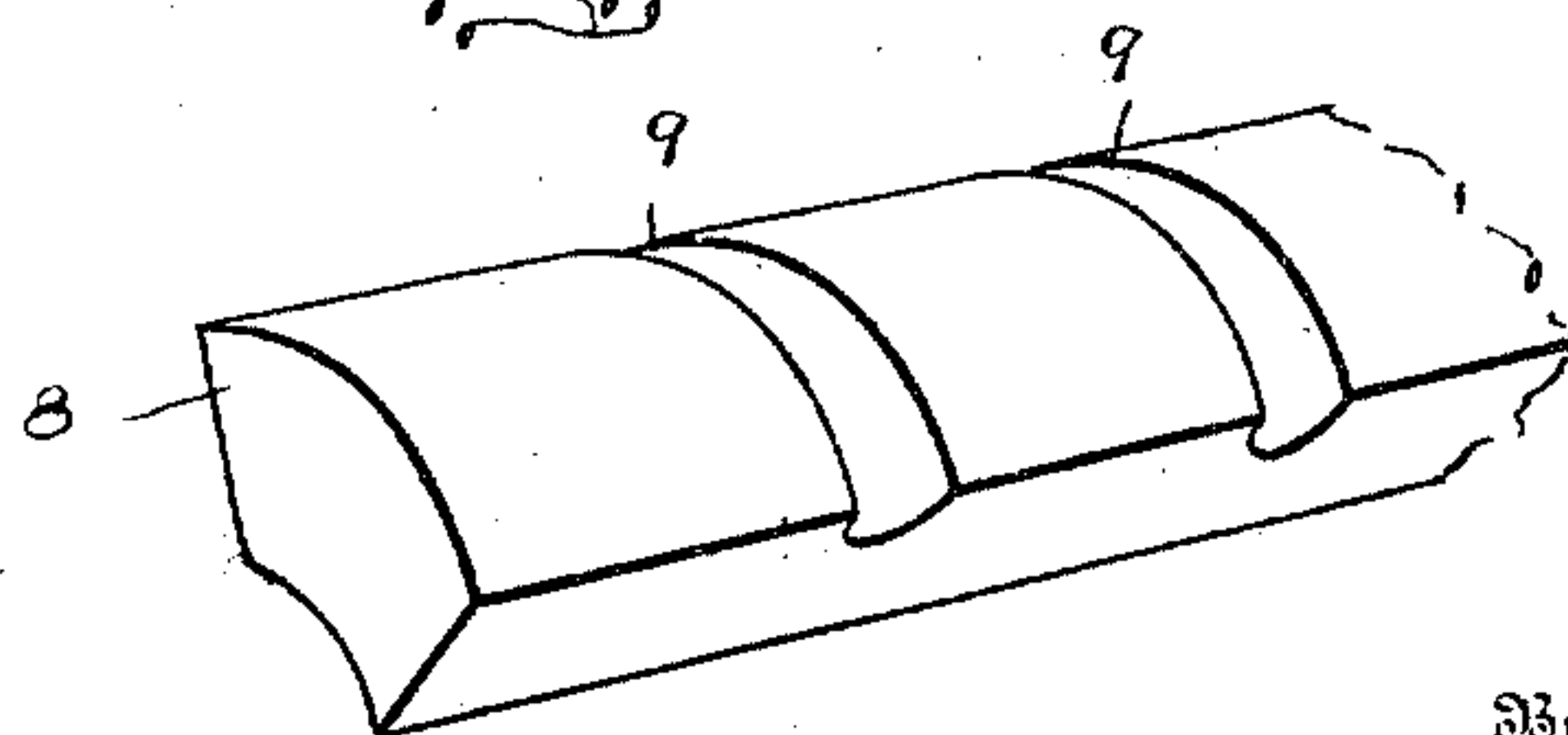


Fig. 9.



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# UNITED STATES PATENT OFFICE.

JOHN W. WALSH, OF BURLINGTON, IOWA.

## BOILER-TUBE.

SPECIFICATION forming part of Letters Patent No. 682,299, dated September 10, 1901.

Application filed January 28, 1901. Serial No. 45,078. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN W. WALSH, a citizen of the United States, residing at Burlington, in the county of Des Moines and State of Iowa, have invented new and useful Improvements in Boiler-Tubes, of which the following is a specification.

My invention relates to tubes designed for use as boiler-tubes; and its primary object is to provide a boiler-tube so constructed as to allow for expansion and contraction due to sudden changes in temperature.

A further object of the invention is to provide a corrugated tube which may be readily cleaned and in which the corrugations are so relatively arranged as to avoid the accumulation of scale between the corrugations.

It is designed to form the corrugated tubes from sheets of metal of the proper size and thickness, and an important characteristic of the improvement is that the parts of the metal plate to be corrugated are thickened or reinforced, so that the corrugated portion of the tube when the latter is completed will be of the same strength and thickness of metal as the uncorrugated portion of the tube.

The construction of the improvement will be fully described hereinafter in connection with the accompanying drawings, which form part of this specification, and its novel features will be defined in the appended claims.

In the drawings, Figure 1 is a side elevation of a tube embodying the invention provided with external corrugations. Fig. 2 is a side elevation of a tube embodying the invention having its corrugations formed on the inner surface of the tube. Figs. 3 and 4 are side elevations of modified forms of the tube. Fig. 5 is a plan view of a portion of a metal plate from which the improved tubes are to be formed. Fig. 6 is a longitudinal section of the plate shown in Fig. 5. Fig. 7 is an end view of a device for forming the corrugations in the tube. Fig. 8 is a longitudinal section of Fig. 7, and Fig. 9 is a perspective view of one of the segments shown in Figs. 7 and 8.

Referring to Fig. 1, the reference-numeral 1 designates a tube formed with a plurality of concentric external corrugations 2, which are located a sufficient distance apart to prevent the accumulation of the products of com-

bustion—scale or dirt—between the corrugations. I preferably form the corrugations from six to twelve inches apart, which effectually prevents the filling up of the spaces between the corrugations and at the same time permits of the required expansion and contraction. The ends 3 of the tubes are circumferentially enlarged, so that they are equal in diameter to the corrugations. By this construction the tubes when assembled within a boiler are the same distance apart as if they were uncorrugated.

In Fig. 2 the corrugations 4 are formed in the interior of the tube, and inasmuch as the ends 5 of the tubes are of the same diameter as the space 6 between the corrugations no enlargement of the ends is necessary.

In Fig. 3 the tube 1 is formed with interior corrugations 4, arranged adjacent to the ends of the tube, the central portion 7 being left uncorrugated. This greatly facilitates the cleaning of the tube and also permits of the expansion and contraction to the required extent.

In Fig. 4 the corrugations 2 are formed only adjacent to the ends of the exterior of the tube, the ends 3<sup>a</sup> of this form of invention being also enlarged circumferentially.

In the manufacture of my improved tubes properly-heated sheets of metal may be passed between corrugated rollers, which will impart the corrugations to the sheet and at the same time bend them to the required tubular shape, after which their meeting edges are riveted, or the corrugations may be made in the tubes after the latter are formed by employing a corrugator of suitable construction.

I have shown in the drawings, Figs. 7, 8, and 9, a form of corrugator adapted for this purpose and comprising a cylinder composed of a plurality of segments 8, said segments being formed with transverse grooves 9, as shown in Fig. 9, and an expanding-rod 10. To corrugate the tube with this apparatus, the cylinder, made up of segmental sections, is inserted into the tube in such a manner that the grooves 9 in the several segments are alined to form continuous grooves, after which the expanding-rod 10 is inserted for the purpose of forcing the segments against the inner surface of the tube, as illustrated in Fig. 7. A corrugated roller is then em-



ployed to depress the metal into the annular grooves, as shown in Fig. 8.

It will be obvious that after the corrugations have been formed upon the tube the  
5 expanding-rod 10 may be withdrawn, which will permit the removal of the grooved segments from the interior of the tube.

As illustrated in Figs. 5 and 6, the metal sheet or blank from which the tube is formed  
10 is made thicker at the points 11 where the blank is to be corrugated to prevent the rollers which form the corrugations from reducing the thickness of the metal in the corrugations, which would result in making the  
15 corrugations weaker and thinner than the other portions of the tube, as would be the case if sheets of metal of uniform thickness were used.

When sheets of metal of uniform thickness  
20 are used in the manufacture of corrugated tubes, the weight and pressure necessary to form the corrugations are so great that it reduces the thickness of the metal in the corrugations and the wear is not equally distributed.  
25

By employing my improved metal sheets, which are thickened or reinforced at the points where the corrugations are to be formed, I entirely avoid the objection to the  
30 employment of sheets of uniform thickness.

The invention is especially adapted for boiler-tubing; but it may be applicable to internal furnaces and other tubular structures where corrugations are desirable for the purpose of compensating for the contraction and  
35 expansion.

I claim—

1. A sheet-metal tube having a plurality of concentric corrugations which are of substantially the same thickness as the uncorrugated spaces between the corrugations.  
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2. A metal tube formed of a plurality of concentric corrugations which are separated by continuous annular plain spaces and having its ends circumferentially enlarged, said  
45 corrugations and plain spaces being of uniform thickness.

3. A sheet-metal tube having its ends enlarged circumferentially and formed adjacent to said ends with concentric corrugations of substantially the same thickness as the metal forming the uncorrugated portion  
50 of the tube.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN W. WALSH.

Witnesses:

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