

No. 751,731.

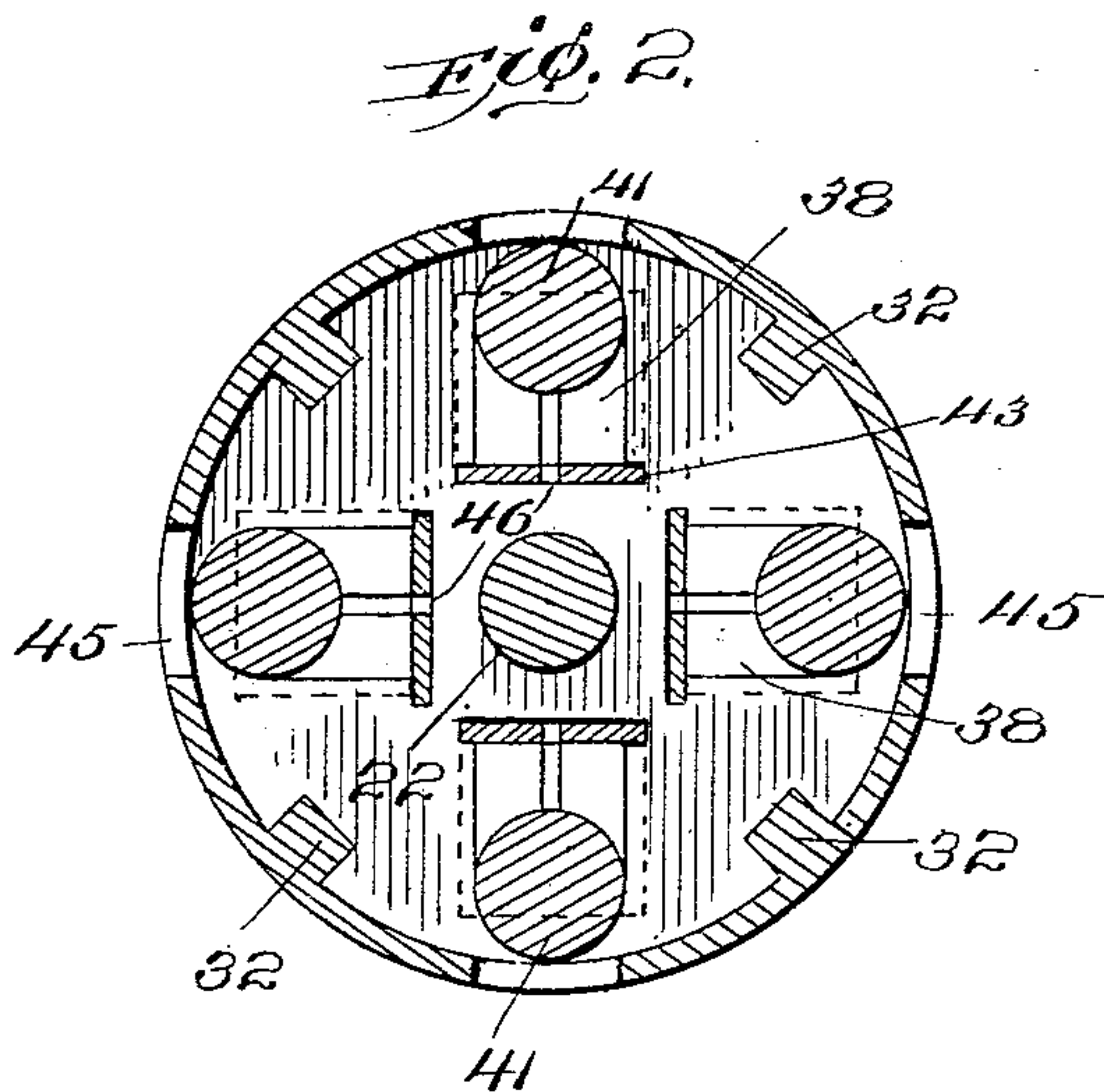
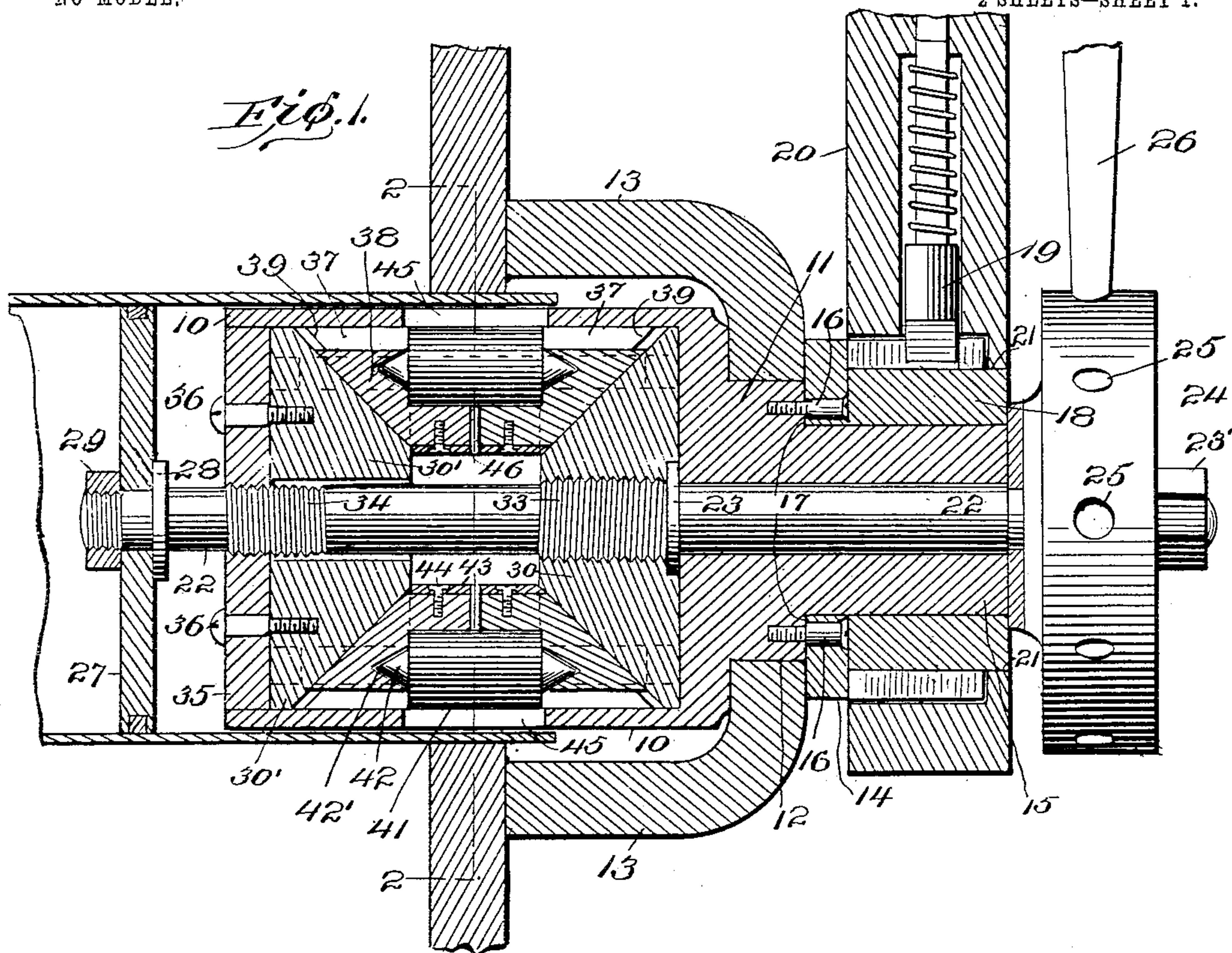
PATENTED FEB. 9, 1904.

J. S. HILL.
TUBE EXPANDER.

APPLICATION FILED JULY 10, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 3.

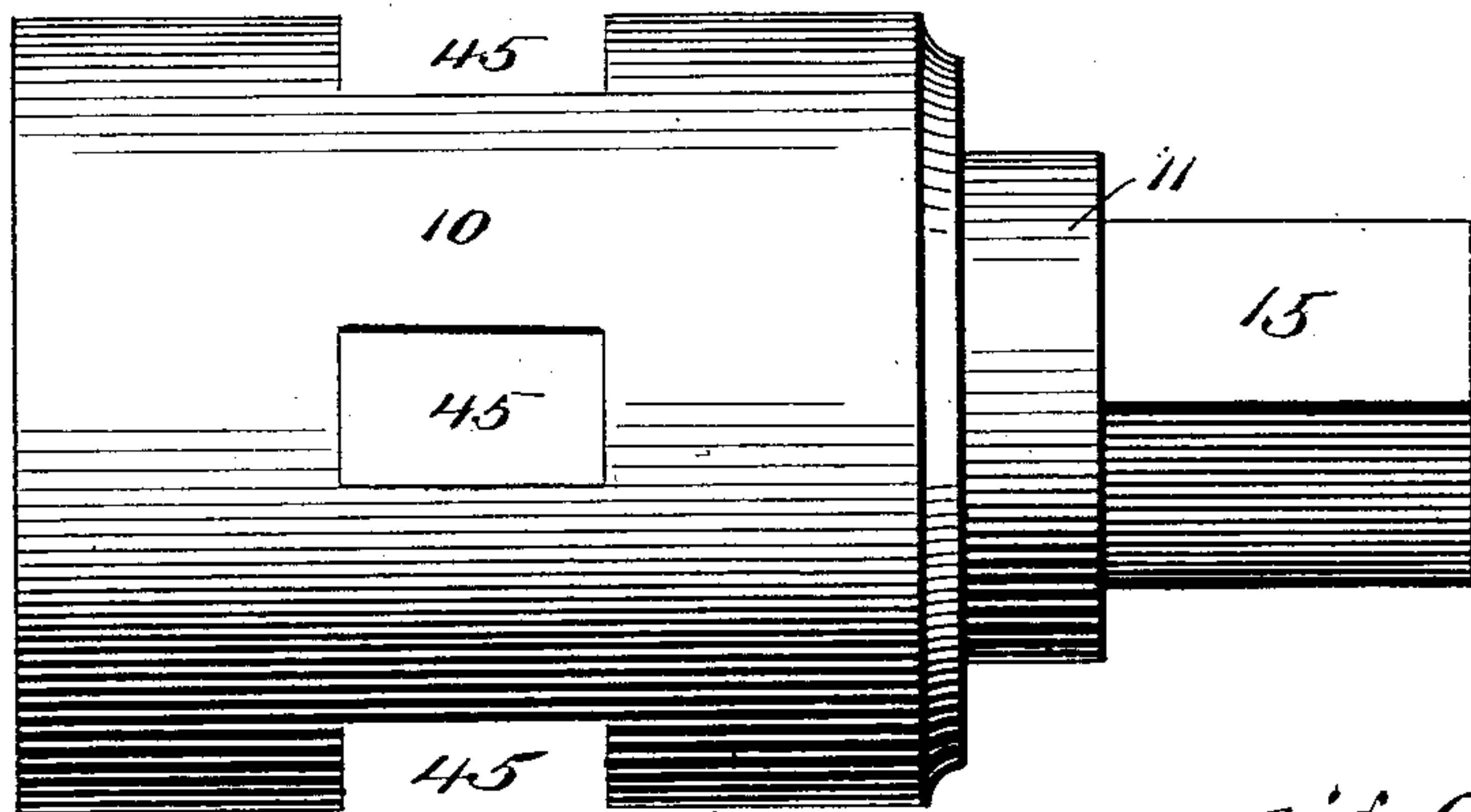


Fig. 6.

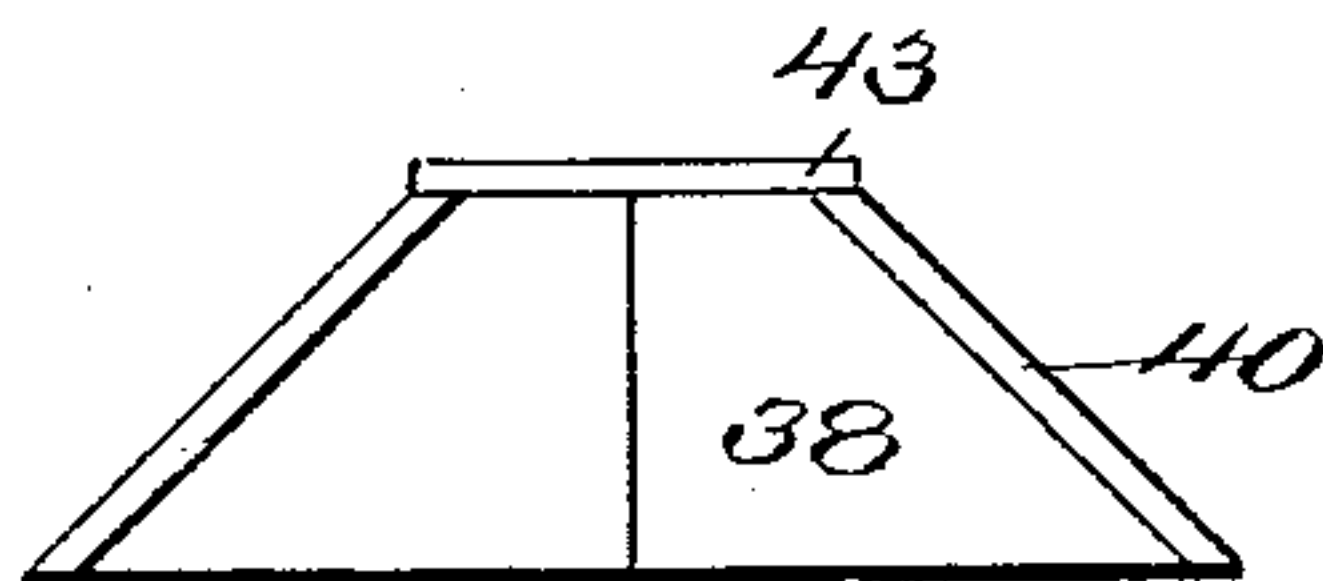


Fig. 5.

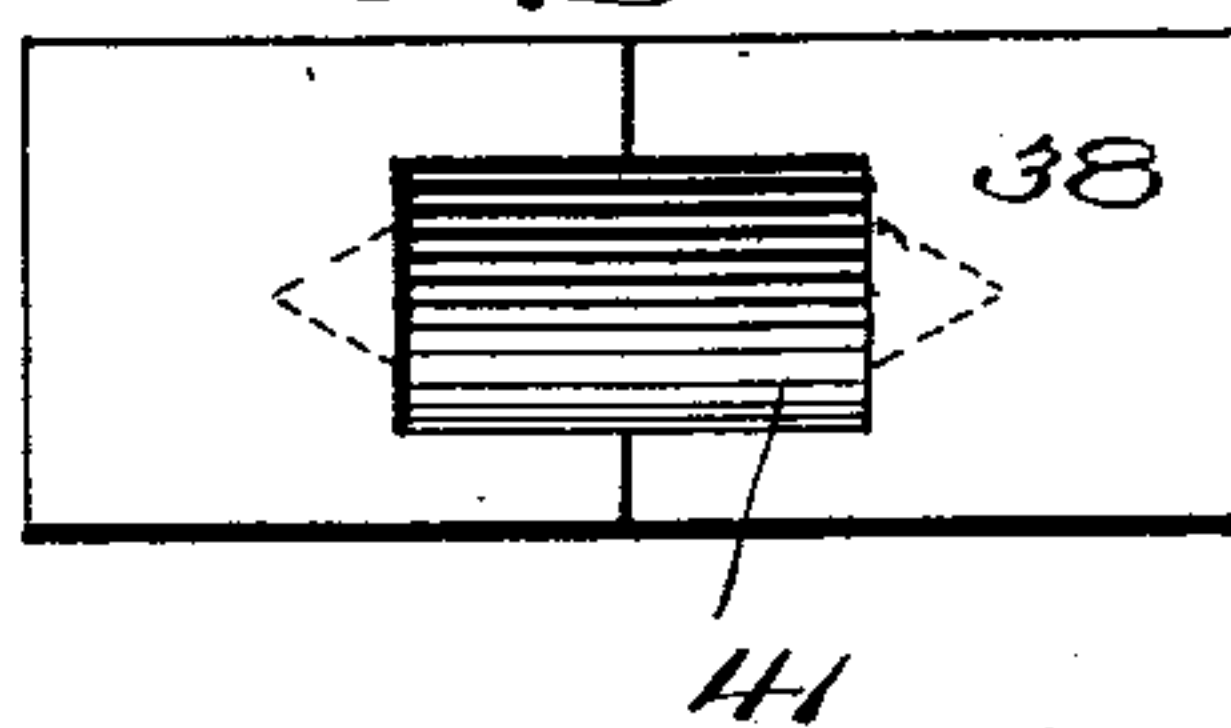


Fig. 4.

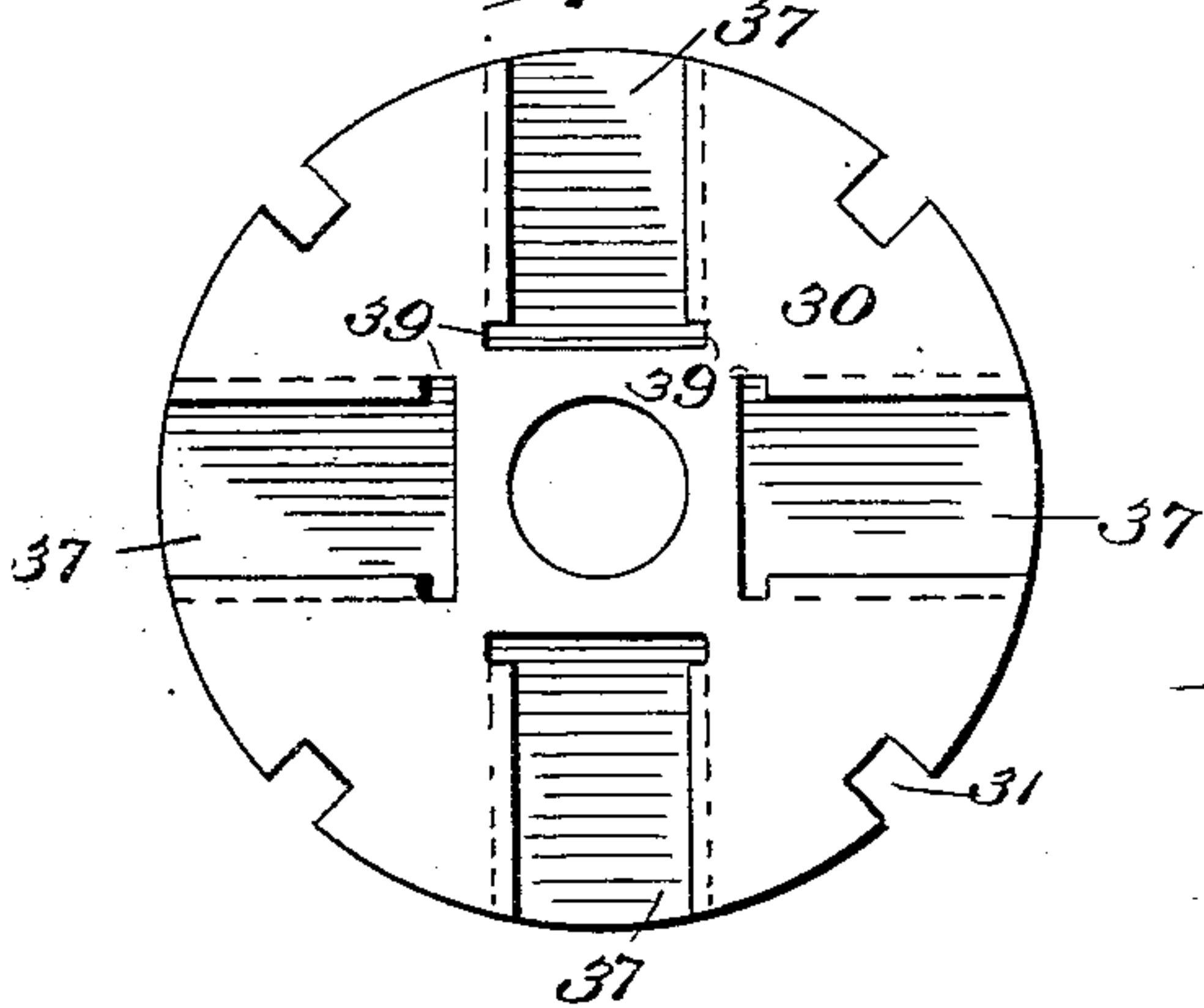
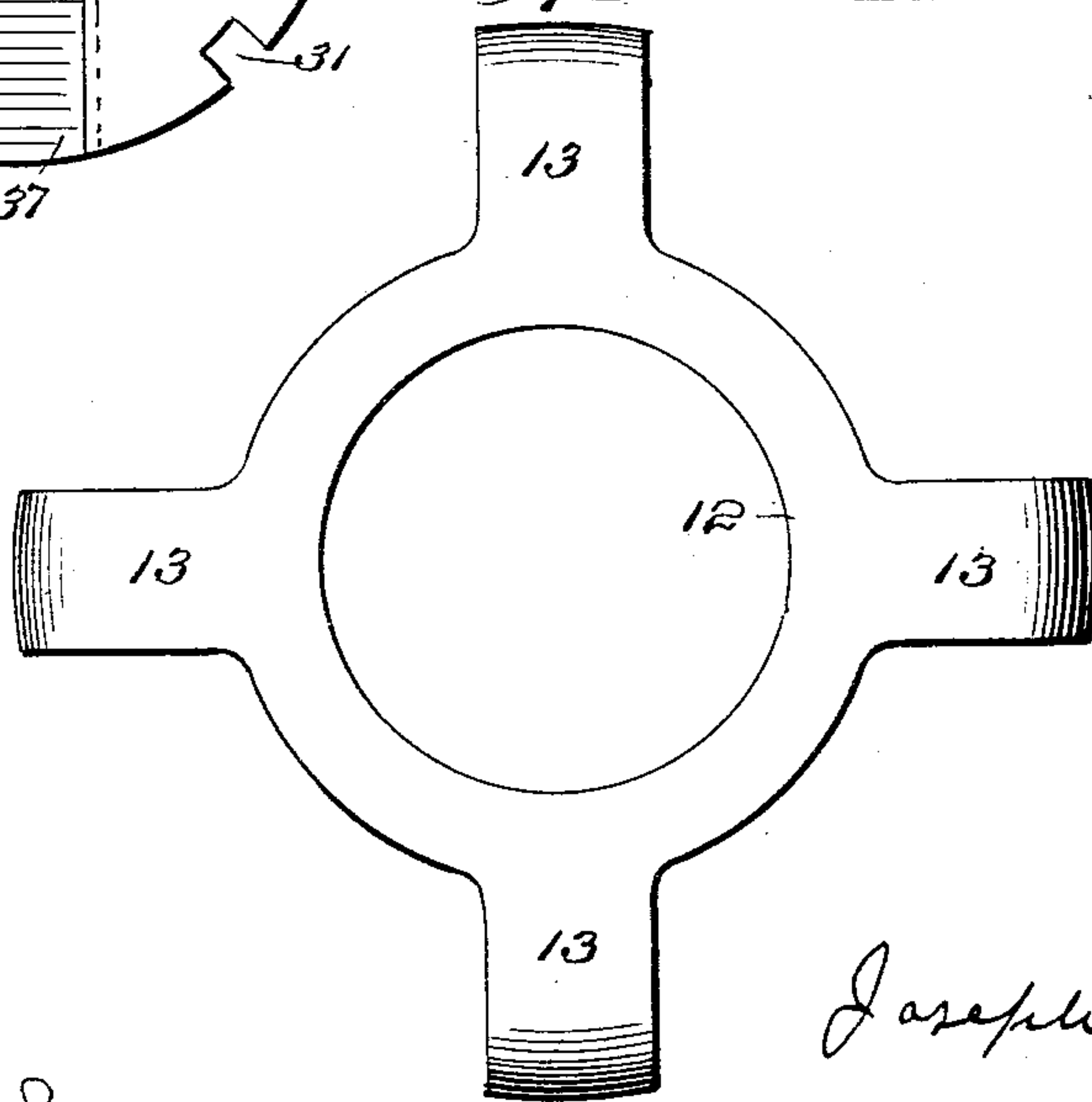


Fig. 7.



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UNITED STATES PATENT OFFICE.

JOSEPH S. HILL, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR
TO LEONORE C. HILL.

TUBE-EXPANDER.

SPECIFICATION forming part of Letters Patent No. 751,731, dated February 9, 1904.

Application filed July 10, 1903. Serial No. 165,003. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH S. HILL, a citizen of the United States, and a resident of Washington, in the District of Columbia, have
5 invented certain new and useful Improvements in Tube-Expanders, of which the following is a full, clear, and exact description, such as will enable those skilled in the art to which it appertains to make and use the invention, reference being had to the accompanying drawings, forming a part of this specification.

The invention relates to improvements in that class of tube-expanders in which rolls are forced gradually against the inner face of the
15 tube and at the same time are caused to travel around the tube to press the latter outwardly.

It consists in the novel construction, combination, and arrangement of parts, such as will be hereinafter fully described, pointed
20 out in the appended claims, and illustrated in the accompanying drawings.

In the drawings, in which similar reference characters designate corresponding parts, Figure 1 is a longitudinal sectional view of a
25 tube-expander embodying the invention. Fig. 2 is a cross-sectional view on the line 2 2 of Fig. 1. Fig. 3 is a plan view of the casing. Fig. 4 is an end view of one of the movable blocks. Fig. 5 is a plan view of the roll-carrier and roll mounted therein. Fig. 6 is a
30 side elevation of the roll-carrier. Fig. 7 is a plan view of the yoke.

The cylindrical casing 10, which carries several of the operative parts, has at one end the
35 journal 11, rotatable in the bearing 12 of the yoke 13. The casing is held in the yoke by the shoulder of the casing on one side of the yoke and the collar 14 on the other side placed on the inner end of the squared stem 15 and
40 secured by the screws 16 to the shoulder 17 of the journal 11. The casing is rotated in the yoke by a pawl-and-ratchet mechanism. On the squared stem 15 outside of the collar 14 is the ratchet-wheel 18. With the teeth
45 of this ratchet-wheel engages the pawl 19, carried by the lever 20, having a bearing 21 on the ratchet-wheel. By moving the lever back and forth through the pawl-and-ratchet mechanism the casing can be rotated in the yoke.

A shaft 22 is journaled concentrically in the
50 stem of the casing and is held therein against displacement by the washer 23 inside of the casing and the nut 23' on the outer end of the shaft. The shaft is rotated independently of the casing by the wheel 24 on its outer end,
55 provided with openings 25 in its periphery to receive the end of the lever 26. The shaft passes through the casing, and its inner end is journaled in the bearing-plate 27. The latter is held in place on the shaft by the collar
60 28 on one side and the nut 29 on the other. In the periphery of the bearing-plate is an annular groove, in which is placed a split-ring spring which bears against the inner face of the tube being expanded and holds the bear-
65 ing-plate in place.

In the casing 10, at opposite ends of the same, are the cylindrical blocks 30 and 30', movable longitudinally therein. The blocks are provided with grooves 31, registering
70 with ribs 32, projecting from the inner face of the casing. These ribs guide the blocks in their longitudinal movement and prevent them from rotating relatively to the casing. Through the blocks passes the shaft 22, which
75 is screw-threaded at 33 and engages with the inner block 30, screw-threaded to receive it. The shaft passes clear through the outer block 30' without engaging directly with the same and is screw-threaded at 34 oppositely to the
80 screw-threaded part 33. The screw-threaded part 34 engages with the plate 35, screw-threaded to receive it, which is secured to the outer face of the block 30' by the screws 36. When the shaft 22 is rotated, the blocks 30
85 and 30', owing to the opposite screw-threads, are moved in opposite directions. The object in having the shaft passing clear through the block 30' and engaging with the plate 35, secured to the block, is to facilitate the as-
90 sembling of the several parts of the device. In the inner face of each block are the four guideways 37, with inclined bottoms. The guideways of one block are directly opposite the guideways in the other block. In each
95 pair of opposite guideways is the carrier 38, having inclined ends bearing against the inclined bottoms of the guideways. In the sides

of each guideway adjacent to its bottom are the grooves 39, running parallel with the inclined bottom. With these grooves engage the ribs 40, projecting from the inclined edges of the end of the carrier, registering with the guideway. The grooves and ribs form a rabbit connection between the carrier and the blocks, so that the carrier will always be held with its inclined ends bearing against the inclined bottoms of the guideways, so that when the blocks are moved apart the carrier will be retracted.

A roll 41 is placed in each carrier 38. The latter is provided with a recess to receive the roll, and the bottom of the recess is curved to form a bearing for the roll, which projects above the face of the carrier. The roll is held in place in the carrier by the conical journals 42, registering with the conical bearings 42' in the carrier. To permit the placing of the roll in the carrier, the latter is made in two sections secured together after the roll is in place by the plate 43, attached to the bottoms of the sections by the screws 44. In the casing 10 opposite to each roll is an opening 45, through which the roll is projected when its carrier is moved outwardly by the blocks 30 and 30' being moved together. The space between the inner ends of the blocks 30 and 30' and the bottoms of the carriers forms an oil-reservoir, from which oil can flow through the passages 46 to lubricate the rolls and the inner face of the tube being treated.

The operation of the device is as follows: The rolls being in a retracted position, as shown in Fig. 1, the casing is inserted in the end of the tube to be expanded with the bearing-plate 27 in advance of it. The split-ring spring in the periphery of the bearing-plate causes the plate to fit closely in the tube. The introduction of the casing into the tube is limited by the yoke 13 contacting with the tube-sheet of the boiler. By means of the wheel 24 and the hand-lever 26 the shaft 22 is rotated to cause the blocks 30 and 30' to approach each other by reason of the opposite screw-threads on the shaft and in the blocks. As the blocks move together the carriers are forced outwardly by the inclined ways of the blocks bearing on the inclined ends of the carrier. This movement of the carriers projects the rolls outwardly through the openings 45 in the casing against the inner surface of the tube. The casing is then rotated by the lever 20 and the pawl-and-ratchet mechanism to cause the rolls to travel around the inner face of the tube. By alternately forcing the rolls outwardly and rotating the casing the tube is gradually expanded against the edge of the tube-sheet. When the tube has been sufficiently expanded, the shaft 22 is turned in the opposite direction to separate the blocks 30 and 30'. As the latter move apart the rolls are retracted by reason of the rabbit connection between the carriers and the blocks.

When the rolls have been sufficiently retracted to clear the tube, the casing is withdrawn. The bearing-plate 27 serves to take up the transverse end thrust of the shaft 22 and prevents the casing from binding in the tube, owing to the movement of the operating-lever 20 on the outer end of the casing.

While the herein-described embodiment of the invention is the preferred one, yet it can be departed from to a considerable extent without departing from the spirit of the invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a tube-expander, a rotatable casing having openings in its wall, blocks in said casing movable relatively to each other and having opposite inclined guideways, carriers registering with said guideways, rolls journaled in said carriers, and means for moving said blocks together to force outwardly said carriers to project said rolls through the openings in the casing.

2. In a tube-expander, a rotatable casing having openings in its wall, blocks in said casing movable relatively to each other and having opposite inclined guideways, carriers registering with said guideways, rolls journaled in said carriers, a shaft having opposite screw-threads respectively engaging with opposite screw-threads in said blocks, and means for rotating said shaft in said casing to move said blocks in opposite directions.

3. In a tube-expander, a rotatable casing having openings in its wall, blocks in said casing and rotatable with the same, movable relatively to each other and having opposite inclined guideways, carriers registering with said guideways and having sliding connections with said blocks, rolls journaled in said carriers, and means for moving said blocks relatively to each other to move said carriers and said rolls relatively to the openings in said casing.

4. In a tube-expander, a rotatable casing having openings in its wall, blocks in said casing rotatable with the same and movable relatively to each other and having opposite inclined guideways, carriers registering with said guideways and consisting of two sections joined together, a roll with an end journaled in each section of a carrier, and means for moving said blocks relatively to each other to move the carriers and their rolls relatively to the openings in the casing.

5. In a tube-expander, blocks movable relatively to each other and having opposite inclined guideways, a carrier registering with each pair of opposite guideways, and a roll journaled in each carrier.

6. In a tube-expander, blocks movable relatively to each other and having opposite inclined guideways, a carrier registering with each pair of opposite guideways, a roll jour-

naled in each carrier, and a rotatable shaft having opposite screw-threads respectively engaging with said blocks.

5 7. In a tube-expander, blocks movable relatively to each other and having opposite inclined guideways, a carrier registering with each pair of opposite guideways and having a sliding connection with said blocks, and a roll journaled in each carrier.

10 8. In a tube-expander, blocks movable relatively to each other and having opposite inclined guideways, a carrier registering with each pair of opposite guideways and having a rabbet connection with said blocks, and a
15 roll journaled in each carrier.

9. In a tube-expander, a casing having openings in its wall, mechanism for rotating

said casing, blocks relatively movable in said casing and rotatable with the same and provided with opposite inclined guideways, carriers registering with the opposite guideways, rolls journaled in the carriers, a shaft journaled at one end in said casing and having opposite screw-threads respectively engaging with said blocks, and a bearing-plate having
20 the other end of said shaft journaled in the same. 25

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

JOSEPH S. HILL.

Witnesses:

GRANT BURROUGHS,
EDWIN S. CLARKSON.