

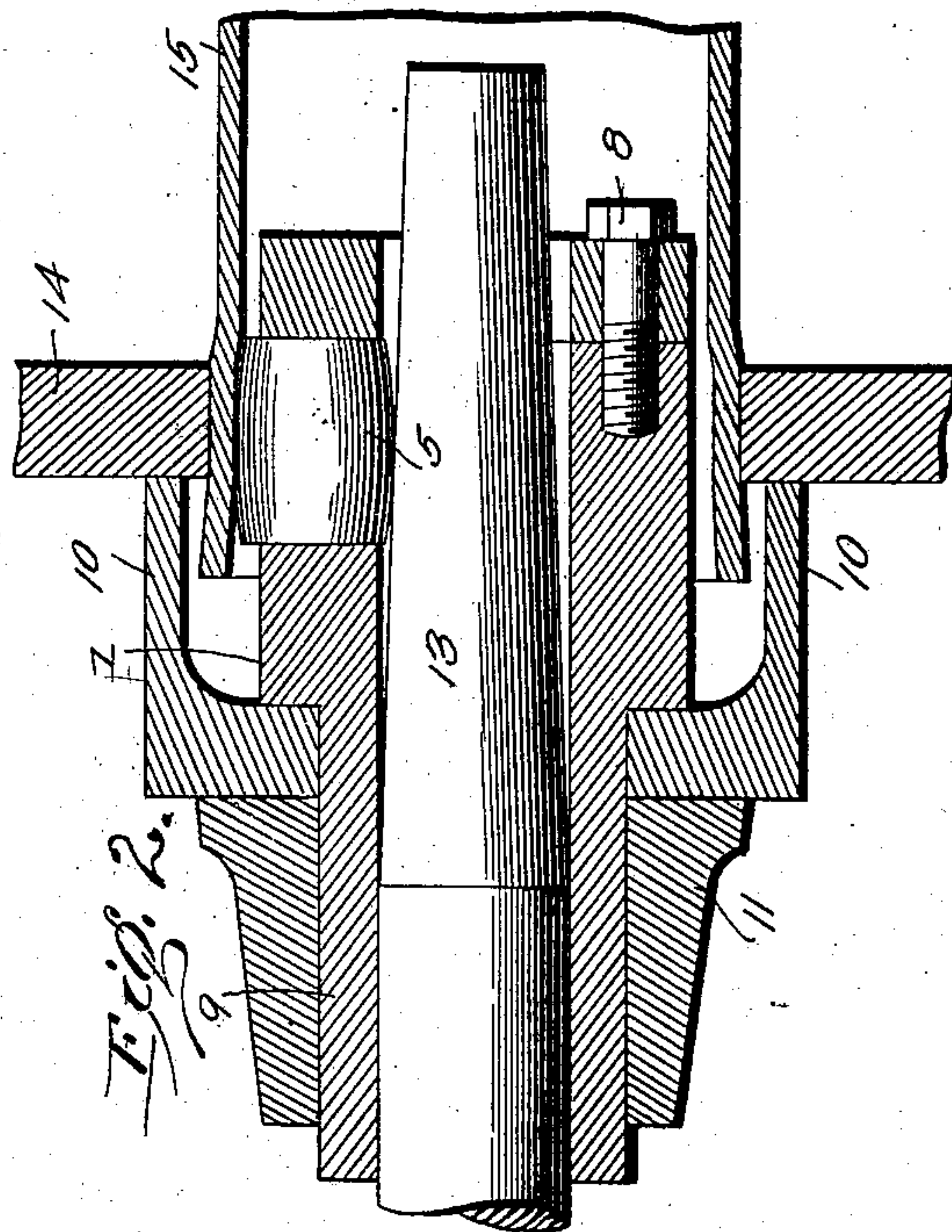
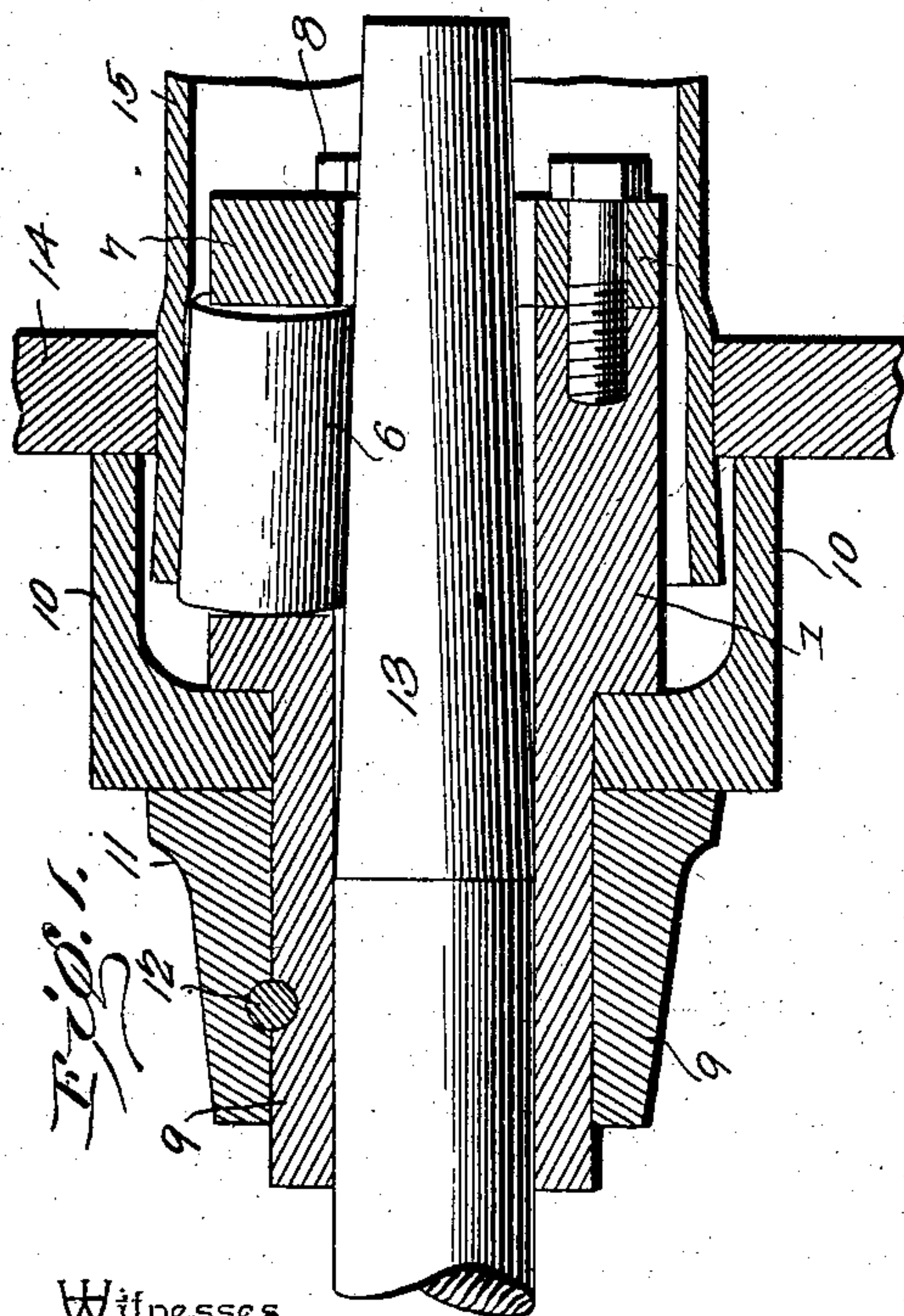
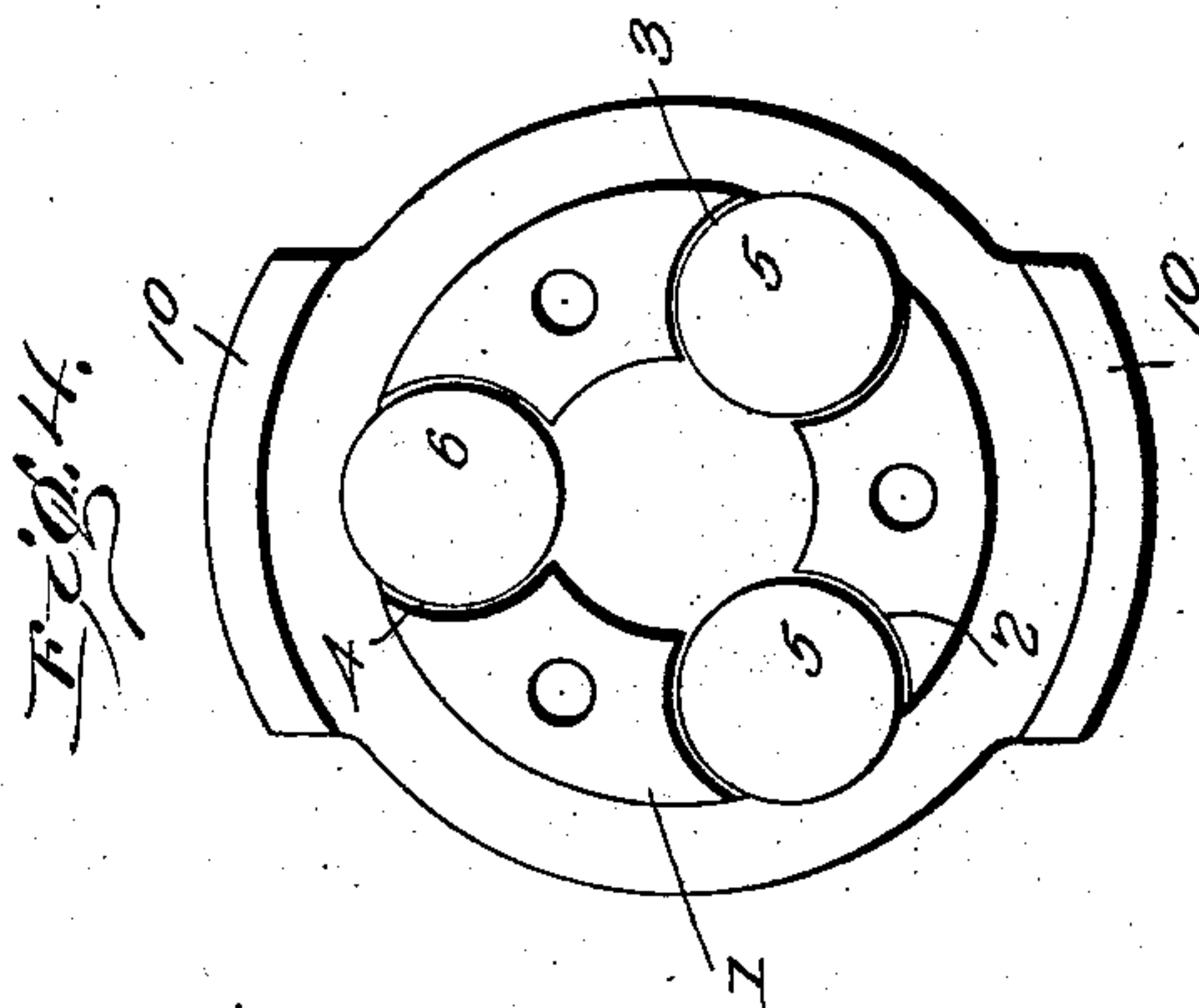
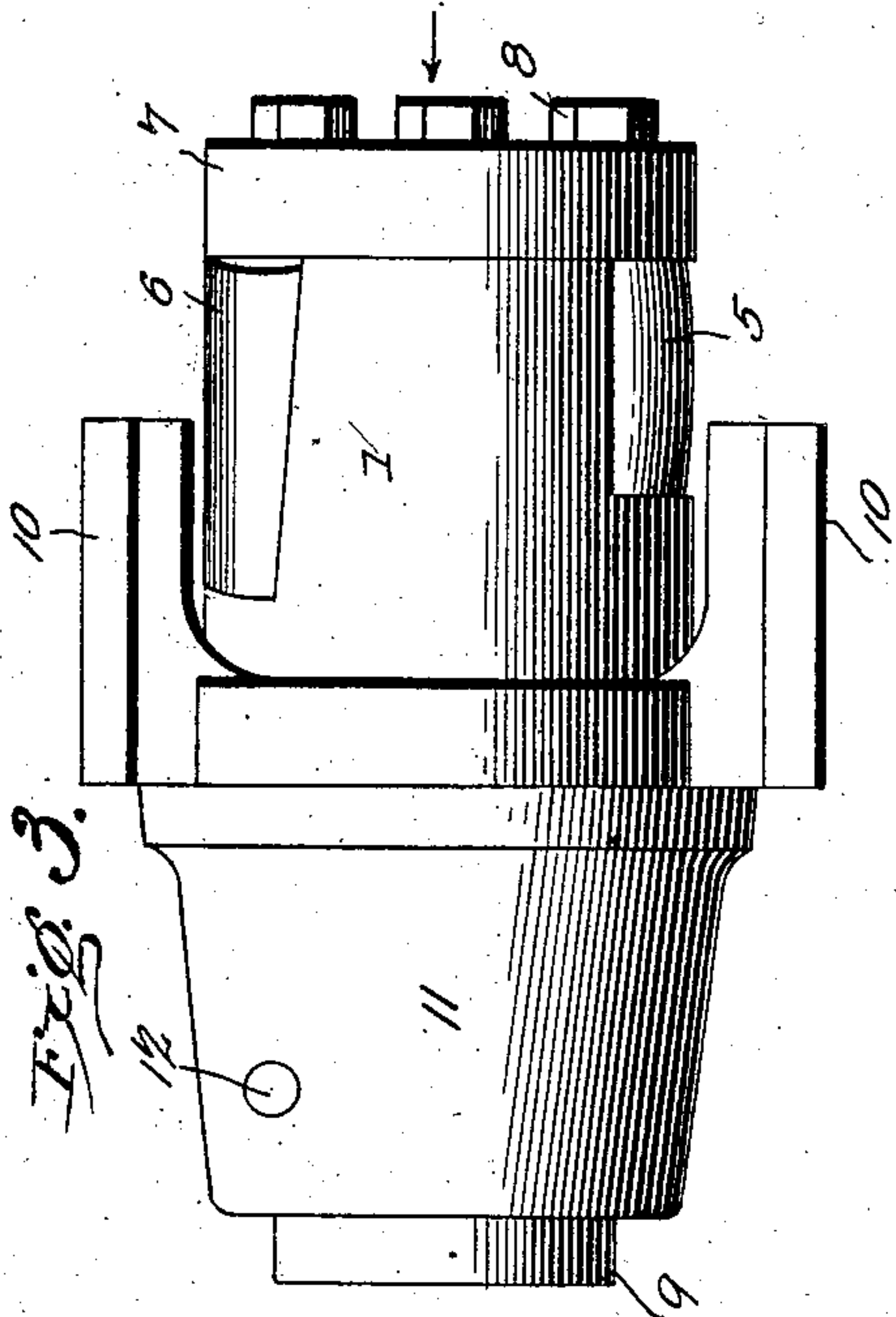
No. 721,340.

PATENTED FEB. 24, 1903.

J. S. STEVENS.
TUBE EXPANDER.

APPLICATION FILED OCT. 8, 1901.

NO MODEL.



Witnesses
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UNITED STATES PATENT OFFICE.

JAMES S. STEVENS, OF BARBERTON, OHIO.

TUBE-EXPANDER.

SPECIFICATION forming part of Letters Patent No. 721,340, dated February 24, 1903.

Application filed October 8, 1901. Serial No. 78,003. (No model.)

To all whom it may concern:

Be it known that I, JAMES S. STEVENS, a citizen of the United States, residing at Barberton, in the county of Summit and State of Ohio, have invented a new and useful Tube-Expander, of which the following is a specification.

This invention relates to boiler-tube expanders.

The object is to provide an expander which will in a ready, thoroughly-efficient, rapid, and practical manner effect spreading of a tube within the tube-sheet opening and flaring, bulging, or swaging of the tube on each side of the sheet, whereby the tube will be rigidly and positively secured in place against possibility of separation in use.

With these and other objects in view the invention consists in the novel construction and combination of parts of a boiler-tube expander, as will be hereinafter fully described and claimed.

It has been common in boiler-tube expanders as heretofore constructed to employ a plurality of swaging-rollers of the same length and disposed parallel with the longitudinal axis of the expander. It has also been common to employ a plurality of swaging-rollers disposed at an angle to the longitudinal axis of the expander, all of the rollers being of the same length. In each of these constructions the peripheries or contact-faces of the swaging-rollers are straight—that is to say, parallel with the long diameter of the rollers. Each of these constructions has inherent objections, the first on account of the tendency of the swaging-rollers to work out of the boiler-tube under rotation and the further objection that while fairly effective flaring of the outer end of the tube results from the use of the tool that portion of the tube contiguous to the inner side of the tube-sheet is not effected to cause the entire surface of the tube within the opening to bear positively and evenly against the walls thereof throughout the entire diameter of the tube. The second construction noted is open to the same objection as to failure in operating on the tube on both sides of the sheet and the further objection that by reason of all of the swaging-rollers being disposed at an angle to the longitudinal axis of its diameter the

tendency of the expander to be drawn into the tube under rotation is accentuated to an objectionable degree, rendering the manual operation of the expander extremely laborious. In the present invention both of the objections noted are overcome in a thoroughly practical and feasible manner, the first by employing comparatively short swaging-rollers having bulged or rounded contact-faces which operate both to spread the tube within the tube-opening and to bulge or swage it contiguous to the inner side of the tube-sheet and the second by the employment of a single flaring-roller of greater length than the swaging-rollers and having its axis of rotation disposed at an angle to the longitudinal axis of the expander, thereby operating both to flare the outer end of the tube against the tube-sheet and also to draw the expander into the flue, thereby obviating the necessity of constantly applying force to hold the expander in operative position.

In the accompanying drawings, forming a part of this specification, and in which like numerals of reference indicate corresponding parts, there is illustrated one form of embodiment of the invention capable of carrying the same into practical operation, it being understood that the elements therein exhibited may be varied or changed as to shape, proportion, and exact manner of assemblage without departing from the scope of the invention.

In the drawings, Figure 1 is a view in longitudinal section, showing the position occupied by the flaring-roller when the expander is in use. Fig. 2 is a similar view showing the swaging-roller. Fig. 3 is a view in side elevation of the expander. Fig. 4 is an end view looking in the direction of the arrow on Fig. 3, showing more particularly the manner in which the rollers are housed within the body or stock.

Referring to the drawings, 1 designates the body or stock of the expander, having that end which will be the front one in use provided with three recesses 2, 3, and 4, the recesses 2 and 3 being disposed parallel with the longitudinal axis of the expander and housing the swaging-rollers 5 and the recess 4 being disposed at an angle to the longitudinal axis of the expander and housing a flaring-roller 6.

These rollers are held within the recesses against any rocking movement by an annulus 7, secured to the end of the body or stock by bolts 8. The swaging-rollers 5 are in length approximately about one-half or a little greater of the length of the body or stock, while the flaring-roller is practically double the length of the swaging-rollers, the reason for the difference in length between these two sets of rollers being hereinafter fully described. The rear portion of the head of the body or stock is reduced in diameter to produce a tubular shank 9, on which is mounted a flanged stop 10 to bear against the tube-sheet, as usual, the stop being held upon the shank by a collar 11, which is secured to the shank by a pin 12. The flaring-roller is a true cylinder that is of the same diameter throughout its entire length, while the swaging-rollers are barrel-shaped or bulged outward intermediate of their ends and are approximately truncated ellipsoids in elevation. To project the rollers outward beyond the periphery of the body or stock, a mandrel 13 is employed, as usual, the taper of which will be determined by the degree of flare or bulge that it will be desired to impart to the tube. When the body or stock is inserted within the boiler-tube, with the outturned flange of the cap bearing against the tube-sheet, the rollers will then occupy a position parallel with the longitudinal axis of the expander. Upon insertion of the mandrel the two sets of rollers are deflected from a horizontal position to one at an angle to the said axis of the expander and are thus in position to begin the flaring and bulging of the tube within and against the opening of the tube-sheet. When *in situ*, the swaging-rollers bridge the width of the tube-sheet 14 and extend a short distance beyond each side of the same, the forward end of the flaring-roller being in line with the forward ends of the swaging-rollers, but its rear end projects backward and outward beyond the end of the tube, as shown in Figs. 1 and 2. Thus upon rotary motion being imparted to the body or stock the outer end of the tube is flared by the flaring-roller, that portion of the tube bounded by the tube-sheet and lying immediately beyond the sheet on its inner side being spread and bulged by the swaging-rollers, this being accomplished in a thoroughly-efficient manner by having the contact-surfaces of the said rollers bulged, as described. In addition to bulging the tube on

the inside of the tube-sheet the swaging-rollers by reason of their shape cause the tube-opening to be impinged throughout its entire width by the tube, thereby firmly and rigidly seating the tube within the tube-sheet. In other words, the contact of the tube with the tube-opening is positive throughout the length of the tube within the opening, which could not be effected were the outer contact-faces of the swaging-rollers straight, in which case, as will be apparent, only a portion of the tube near the outer side of the tube-sheet would be in positive contact therewith.

Where the end of a boiler-tube has been subjected to the action of the expander of this invention, it will be found to be expanded in such manner as positively to preclude any possibility of disconnection from the tube-sheet.

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

1. A boiler-tube expander comprising a body or stock, the outer end of which is provided with three open-ended recesses, two of which are disposed parallel with the longitudinal axis of the expander and the other at an angle thereto, truncated ellipsoidal swaging-rollers mounted in the parallel recesses, a true cylindrical flaring-roller mounted in the remaining recess, and means coacting with the end walls of the recesses to guide all of the rollers laterally and to hold them from any rocking movement.

2. A boiler-tube expander comprising a body or stock the outer end of which is provided with three open-ended recesses, two of which are disposed parallel with the longitudinal axis of the expander and the other at an angle thereto, truncated ellipsoidal swaging-rollers mounted in the parallel recesses, a true cylindrical flaring-roller mounted in the remaining recesses and being of greater length than the swaging-roller, and an annulus secured to the body or stock and coacting with the end walls of the recesses to guide all of the rollers laterally and to hold them from any rocking movement.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JAMES S. STEVENS.

Witnesses:

C. E. DOYLE,
C. WARRENER.