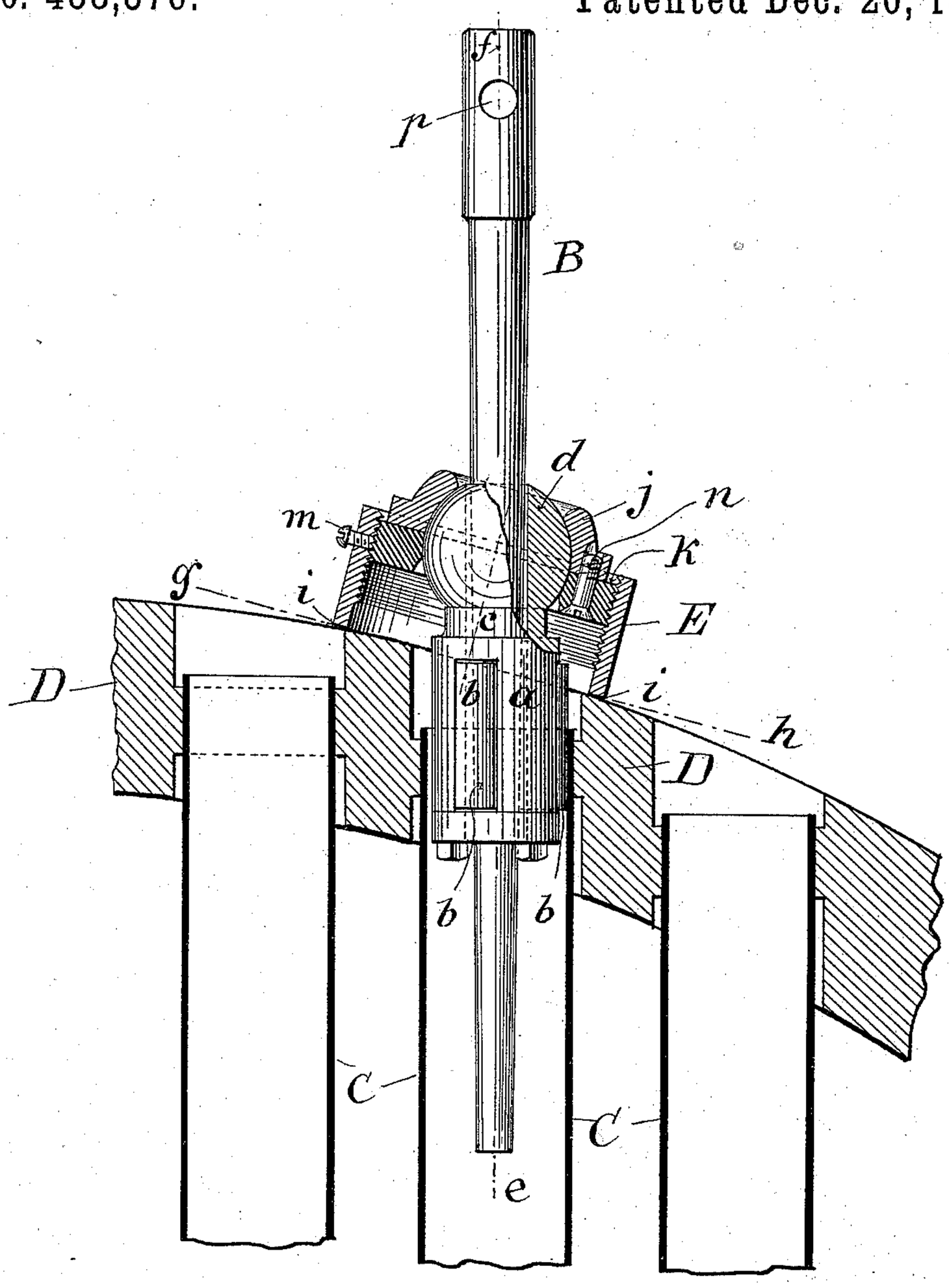
(No Model.)

O. A. WHITE.

TUBE EXPANDER.

No. 488,376. Patented Dec. 20, 1892.



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TUBE-EXPANDER.

SPECIFICATION forming part of Letters Patent No. 488,376, dated December 20, 1892.

Application filed August 19, 1892. Serial No. 443,536. (No model.)

To all whom it may concern:

Be it known that I, OTIS AUGUSTUS WHITE, a citizen of the United States, residing at Boston, county of Suffolk, and State of Massachusetts, have invented certain new and useful Improvements in Tube-Expanders, of which the following is a specification.

This invention relates to tools for expanding the ends of malleable tubes into the tube holes in steam boilers or other structures; and the object of said invention is to afford a means of limiting the entrance of the tool, irrespective of any angular inclination that may occur in the external surface of the said structure at variance from a plane perpendicular to the axis of the tube.

The said invention consists in the combination with an expanding tool of a stop shoulder universally jointed thereto so as to adapt itself to different angular positions to the axis of the tool; and also in means for the longitudinal adjustment of said shoulder; and also in means whereby the tool is permitted to revolve in the axis of such universal joint; and in order to enable others skilled in the art to which this invention appertains to understand and use the same, I will proceed to describe the details of its construction, explain its operation, and subsequently point out in the appended claims its novel characteristics.

Referring to the drawing: the figure represents a side elevation partly in section, of an expanding tool with the improvement attached applied in the operation of expanding a tube, having an angular external structure.

The expanding tool, illustrated, is composed of a radially mortised stock or body *a*, wherein are supported the expanding rollers *b*. A tapered mandrel B is inserted through the stock or body *a*, which being revolved and gradually fed forward forces the rollers *b* against the interior of the tube C, causing the same to become expanded upon the casting D, forming a tight joint.

E, is a stop shoulder universally jointed to the tool, so as to adapt itself to different angular positions to the axis *e—f* thereof, such for example, as that *g—h* indicated in the drawing. The stop shoulder E is capable of an oscillatory motion of self-adjustment whereby its abutting flange *i*, may coincide at any angle within reasonable limits, with the surface of the head D, or other external structure into which the end of the tube C is to be expanded. The stop shoulder E, is moreover revolubly jointed to the tool, so as to permit the latter's rotation on its axis *e—f*, when the mandrel B is revolved.

The construction illustrated, which may be variously departed from in matter of detail within the meaning of the invention, is as follows: The shank *c*, of the tool, terminates in a ball *d*, concentric with the axis *e—f* of the tool, about which ball is fastened the oscillating stop shoulder E, to move upon a center lying within said axis. Consequently the abutment formed by the stop shoulder E, limiting the entrance of the tool, will operate toward the center of oscillatory adjustment and the resistance become equalized around the axis of the tool, avoiding any tendency to deflect the same from its coincidence with the axis of the tube C during the operation of expanding.

The socket of the universal joint consists in two parts *j—k* fastened together by screws *n*. The part *k* is screw threaded into the flange *i*, of the stop shoulder E, and the said flange is thereby rendered longitudinally adjustable in order to gage the amount of projection of the expanding rollers into the mouth of the tube C. Said longitudinal adjustment after being determined is retained by a suitable set screw *m*.

In the operation of the device, the tool is inserted into the mouth of the tube C, and the universally jointed stop shoulder E thereupon automatically adjusts itself to the head D; whether at right angles, or otherwise disposed to the axis of the tube C. Moreover the stop shoulder E, by reason of its universal movability, is adapted to find a firm seating on any external surface which may be convex, concave, or irregularly contoured in distinction from a plane surface. A pin or other rotating device is inserted at *p*, into the mandrel B, which is thereby revolved and gradually advanced into the tube between the rollers *b*, actuating the same by impingement thereon. The rollers *b*, move in a constant plane of orbital revolution according to the position of the stop shoulder E, and the revolving plane of said expanding rollers is more particularly determined by the adjust-

ment of the flange *i*, of the said stop shoulder E, in the manner hereinbefore described.

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

1. In a tube expanding tool, a stop shoulder universally jointed thereto so as to adapt itself to different angular positions to the axis of the tool, for the purposes described.

2. In a tube expanding tool, a stop shoulder universally jointed thereto by a revoluble joint concentric with the axis of the tool, for the purposes described.

3. In a tube expanding tool, a stop shoulder universally jointed thereto so as to adapt itself to different angular positions to the axis of the tool, and means for adjusting the longitudinal position of the abutting surface of said stop shoulder, for the purposes described.

4. The combination in an expanding tool, of a stock or body, expanding rollers supported therein, a tapered mandrel inserted between the rollers, and at the extremity of the stock or body a ball concentric with the axis of rotation of the tool, and a stop shoulder provided with a socket fitting the said ball, substantially as described.

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