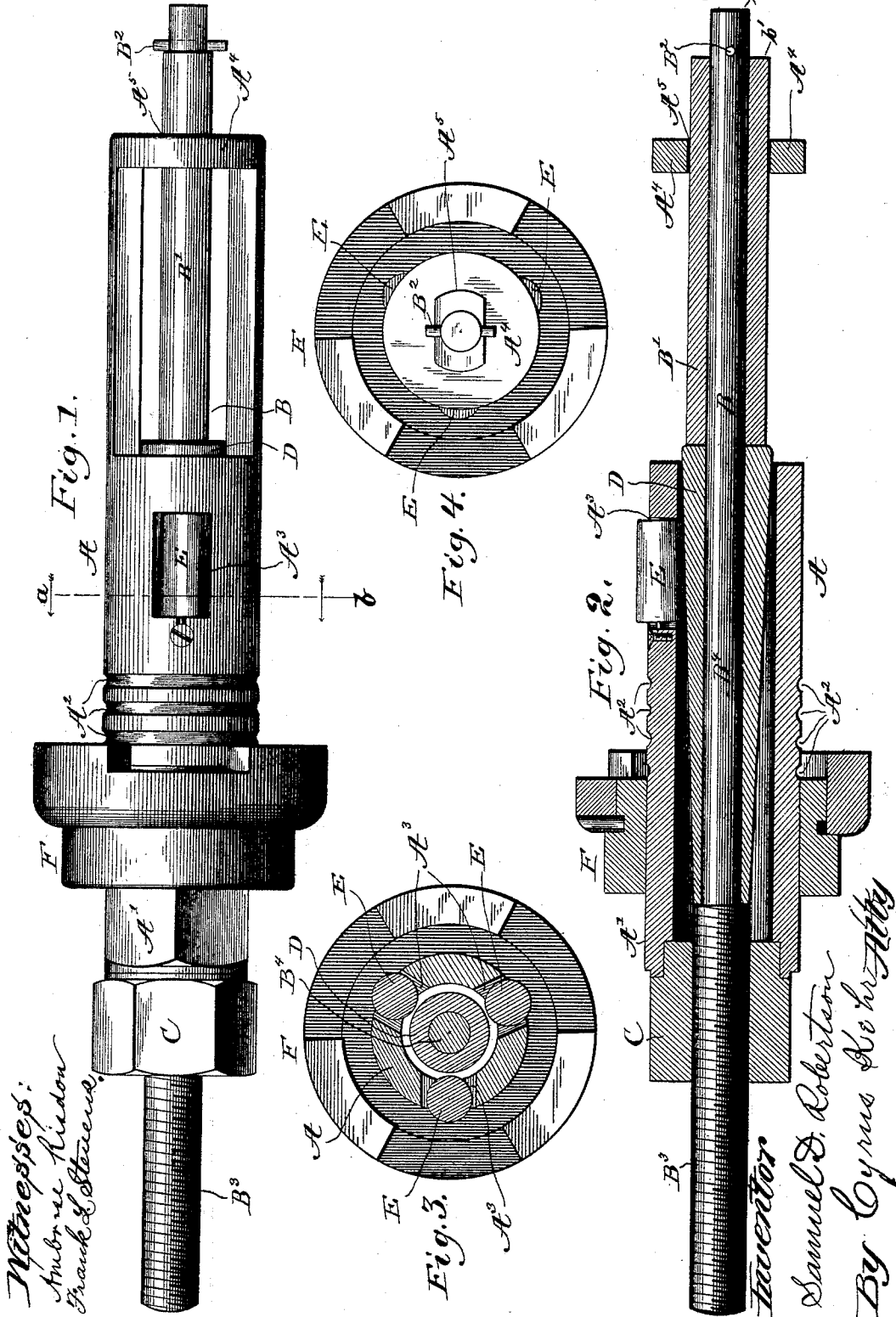


(No Model.)

S. D. ROBERTSON.
PIPE EXPANDER.

No. 497,820.

Patented May 23, 1893.



UNITED STATES PATENT OFFICE.

SAMUEL D. ROBERTSON, OF UNDINE, CALIFORNIA.

PIPE-EXPANDER.

SPECIFICATION forming part of Letters Patent No. 497,820, dated May 23, 1893.

Application filed December 7, 1891. Renewed March 31, 1893. Serial No. 468,606. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL D. ROBERTSON, a subject of the Queen of England, residing at Undine, in the county of San Joaquin and State of California, have invented certain new and useful Improvements in Pipe-Expanders; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

My improvement is designed particularly for use in expanding the flues of steam boilers.

In the accompanying drawings—Figure 1 is a side elevation of a pipe expander embodying my improvement. Fig. 2 is a longitudinal section of the same. Fig. 3 is a transverse section in line *a—b* of Fig. 1. Fig. 4 is an elevation of the end of the device which is to enter the tube.

For the sake of convenience in description, the end of the apparatus which in use enters the tube is termed the inner end while the opposite end is termed the outer end.

A is a cylindric shell having the polygonal portion A' at the outer end. Next to this polygonal portion is a series of circumferential grooves A². Next to said grooves are three radial, longitudinal slots A³ extending through the shell and each being, preferably, narrower at the surface of the shell than at the interior. The inner end of the shell has a wall A⁴ through which there is a non-circular opening A⁵, preferably having two straight sides.

B is an arbor extending lengthwise through the shell A, axially in line with the latter. The inner portion, B', of the arbor, which portion is composed of the core, *b*, and sleeve, *b'*, shrunk or keyed upon said core, extends through the opening A⁵ and is of proper cross-section to fill said opening. A pin B² or other head may be applied to the extreme inner end of the arbor to prevent the latter from moving quite out of the opening A⁵. The outer portion B³ of the arbor B is screw-threaded and has upon it a nut C fitting into or against the outer end of the shell A. By turning this nut on, the arbor B may be drawn

outward in the shell A. The middle portion B⁴ of the arbor has loosely surrounding it and concentric therewith a conical sleeve D, the base or greater diameter of said sleeve being toward the inner end of the apparatus.

A roller E lies in each slot A³ and rests upon surface of the sleeve D. Such roller is of proper diameter to allow it to extend a little beyond the surface of the shell A but too large to allow the roller to pass radially outward through said slot.

F is the ordinary annular guard surrounding the shell A between the rollers E and the polygonal portion A' of the shell A. This serves to determine the distance to which the apparatus may enter the flue.

In operation, the inner end of the apparatus is inserted into the flue until the rollers E are in the portion of the flue to be expanded, the arbor B being at its inner limit in the shell A. The nut C is then turned so as to draw the arbor B and sleeve D outward and force the rollers E radially against the wall of the flue. The entire expander is then turned by applying a wrench to the polygonal portion A' of the shell A. By this means the rollers E are forced to travel around the inner surface of the flue and press the latter outward. The nut C is then turned again so as to draw the arbor B and sleeve D still farther outward, and the entire expander is again rotated by means of a wrench applied to the polygonal portion A' of the shell A. These steps are repeated until the work is completed. The sleeve D turns readily upon the arbor B and prevents the rollers E from binding when the expander is rotated. In forms of pipe expanders not having said sleeve, the rollers frequently bind against the arbor to such an extent as to slide or drag upon the inner face of the boiler tube instead of turning upon the latter. This, besides making the operation excessively laborious, results in defective work. In my improved apparatus, the rollers never bind and the action of the apparatus is easy and uniform.

By prolonging the arbor and extending it through the opening A⁵ in the wall A⁴ at the extreme inner end of the apparatus, I support said arbor so that its axis is given a permanent position. Thus the arbor is always kept at the center of the tube, and the rollers

E are pressed outward to equal distances. Without this support of the inner end of the arbor, said end may yield in consequence of unequal resistance offered by the wall of the boiler tube to the rollers E, so that the flue is unequally expanded.

I claim as my invention—

1. In a pipe expander, the combination of the shell A having the longitudinal, radial slots A³, an arbor B extending through said shell, a nut C applied to the outer end of said arbor and arranged to bear against the shell A, a conical sleeve D surrounding said arbor opposite the openings A³ and having its thicker end directed inward, and rollers E located in said slots A³ and resting upon said sleeve, substantially as shown and described.

2. In a pipe expander, the combination of the shell A having the longitudinal, radial slots A³ and an opening A⁵ at its inner end, an arbor B extending through said shell and opening and threaded at its outer end, a conical sleeve, D, surrounding said arbor opposite said openings A³, a nut C applied around said threaded end and arranged to bear against the outer end of the shell A, and rollers E located in said slots A³, substantially as shown and described.

3. In a pipe expander, the combination of the shell A having the longitudinal radial slots A³ and a non-circular opening A⁵ at its inner end, an arbor B extending through said shell and opening and fitting the latter and threaded at its outer end, a conical sleeve, D, surrounding said arbor opposite said openings A³, a nut C applied around said threaded

end and arranged to bear against the outer end of the shell A, and rollers E located in said slots A³, substantially as shown and described.

4. In a pipe expander, the combination of the shell A having the longitudinal, radial slots A³, and an opening A⁵ at its inner end, an arbor B extending through said shell and opening and threaded at its outer end, a nut C applied around said threaded end and arranged to bear against the outer end of the shell, a conical sleeve D surrounding said arbor opposite the openings A³ and having its thicker end directed inward, and rollers E in said slots A³ and resting upon said sleeve, substantially as shown and described.

5. In a pipe expander, the combination of the shell A having the longitudinal, radial slots A³ and a non-circular opening A⁵ at its inner end, an arbor B extending through said shell and opening and fitting the latter and threaded at its outer end, a nut C applied to the outer end of said arbor and arranged to bear against the outer end of the shell A, a conical sleeve D surrounding said arbor opposite the openings A³ and having its thicker end directed inward, and rollers E located in said slots A³ and resting upon said sleeve, substantially as shown and described.

In testimony whereof I affix my signature, in presence of two witnesses, this 14th day of November, 1891.

SAMUEL D. ROBERTSON.

Witnesses:

H. R. STARKHOUSE,
WM. H. ROBINSON.