(No Model.) 2 Sheets—Sheet 1.

# J. WEST.

## BOILER TUBE EXPANDER.

No. 489,278. Patented Jan. 3, 1893.

Fig. 1.

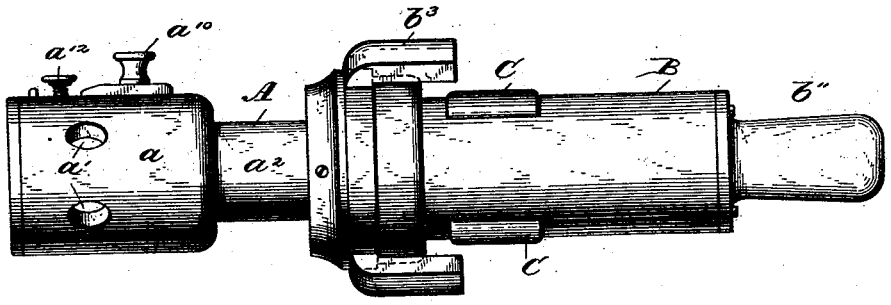



Fig. 2.

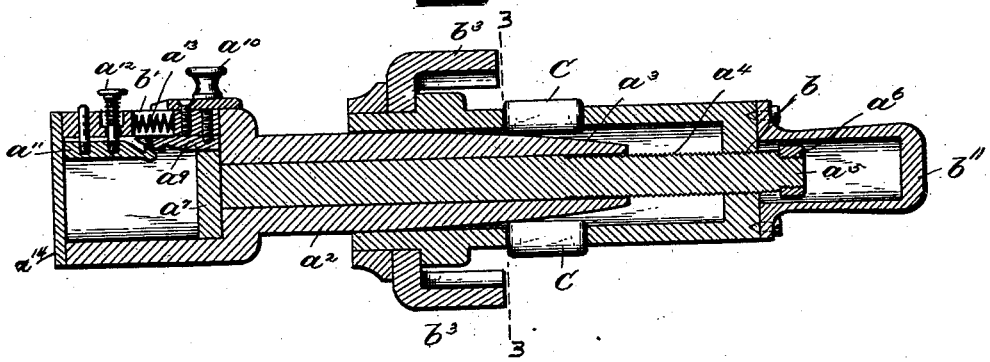



Fig. 3.

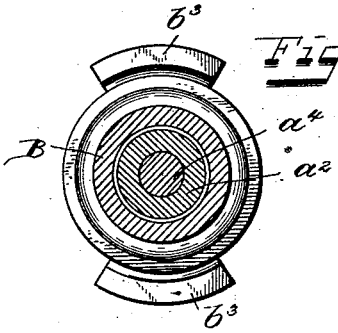
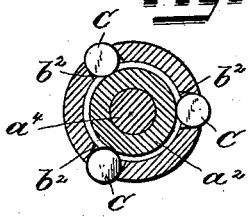



Fig. 4.




Witnesses.
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James H. Ramsey

Inventor.
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By Geo. B. Parkinson,
His Attorney.

(No Model.) 2 Sheets—Sheet 2.

# J. WEST.

## BOILER TUBE EXPANDER.

No. 489,278. Patented Jan. 3, 1893.

Fig. 5.

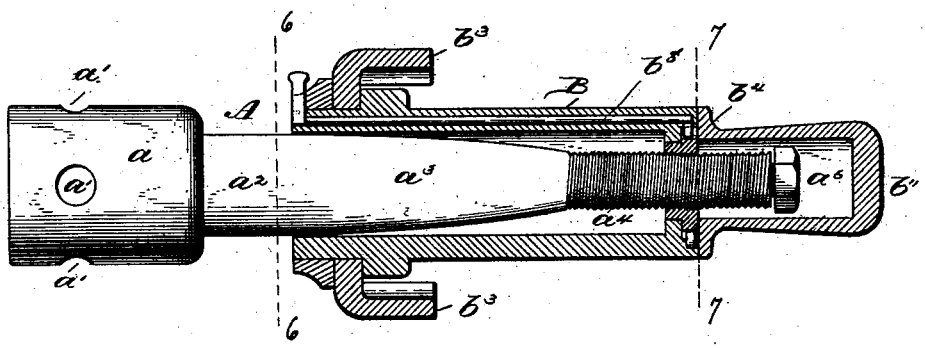



Fig. 6.

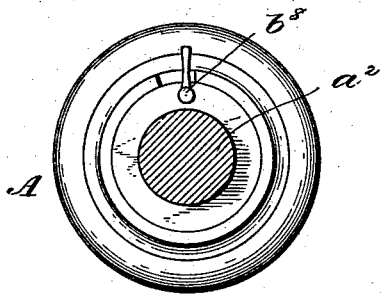



Fig. 7.

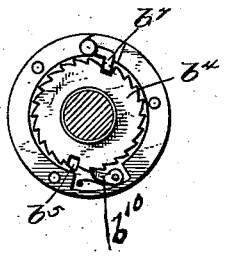
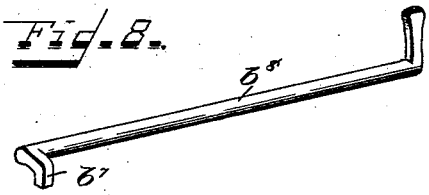



Fig. 8.



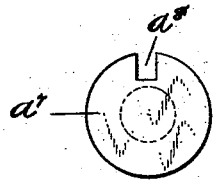




Fig. 9.

Witnesses.
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James N. Carusey

Inventor.
Joseph West.
By Geo. B. Parkinson,
His Attorney.

# UNITED STATES PATENT OFFICE.

JOSEPH WEST, OF CINCINNATI, OHIO.

## BOILER-TUBE EXPANDER.

SPECIFICATION forming part of Letters Patent No. 489,278, dated January 3, 1893.

Application filed April 4, 1892. Serial No. 427,632. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH WEST, a subject of the Queen of Great Britain, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Boiler-Tube Expanders, of which the following is a specification.

The method of expanding boiler flues now in most general use involves hammering, which is objectionable on account of the great liability of injury or destruction of the flues and the expanding tools.

Much ingenuity has been expended in attempts to provide mechanically fed expanding tools which would insure uniformity of feed and do away with the defects incident to hammer driven tools, but none of the mechanically fed tools have as yet superseded the hammer driven tools. This is due partly to the complicated nature of the devices, partly to lack of control of the feed, partly to liability of the mechanism to become clogged and injured by cinders or other extraneous substances and partly to the fact that the operator has to rely upon his judgment to determine when the work is completed and is liable to carry the expansion too far, thereby destroying the flue.

The object of my invention is to produce a simple and economical mechanically fed expander which will obviate these objections and the invention consists in the parts and combination of parts hereinafter described and claimed:

In the drawings: Figure 1 is a side view of a boiler flue expander showing one form of my invention. Fig. 2 a longitudinal section of the same. Fig. 3 a cross section on the line 3—3 of Fig. 2 looking to the left. Fig. 4 a like view on the same line looking to the right. Fig. 5 a side view, partly in section, of another form of my invention. Fig. 6 a cross section on the line 6—6 of Fig. 5. Fig. 7 a cross section on the line 7—7 of Fig. 5. Fig. 8 a detail of a rod shown in Fig. 5, and Fig. 9 an end view of a portion of the mandrel shown in Fig. 2.

A is the mandrel and B the feed chamber. The mandrel has a head $a$ provided with suitable apertures $a'$ adapted to receive a bar whereby the mandrel may be rotated. A portion $a^3$ of the body of the mandrel is preferably of uniform diameter, and another portion $a^3$ tapered—the taper preferably being a curve. The mandrel also has a threaded portion $a^4$ adapted to work in a correspondingly threaded portion $b$ of the feed chamber. This threaded portion may be integral with the head and body portions of the mandrel as shown in Fig. 5, or it may be separable as shown in Fig. 2. The threaded nut of the mandrel is preferably provided with a smaller threaded portion $a^5$ over which takes a nut $a^6$ adapted to lock the mandrel against complete withdrawal from the feed chamber.

As shown in Fig. 2 the body of the mandrel is hollow and adapted to receive the elongated shank of the threaded portion $a^4$. This shank is provided with a head $a^7$ adapted to rotate within the head of the mandrel. The head $a^7$ has a slot or recess $a^8$ adapted to receive a bolt or catch $a^9$ movably mounted in a longitudinal slot $b'$ in the head of the mandrel. This catch has a button or thumb piece $a^{10}$, and is adapted, when retracted, to engage with a spring catch $a^{11}$ secured to the head of the mandrel, and provided with a button or thumb piece $a^{12}$. A spring $a^{13}$ normally presses the bolt $a^9$ into engagement with the head $a^7$ of the threaded portion of the mandrel. The feed chamber is provided with longitudinal slots $b^2$ adapted to receive rolls C, and carries a guard or gage $b^3$ adapted to take over the end of the flue and limit the distance which the flue may project from the flue sheet.

The operation is as follows: The expander is thrust into the flue until the guard $b^3$ takes against the flue sheet—the threaded portion being locked into engagement with the head of the mandrel; the mandrel is then rotated and advances as it rotates. As the mandrel advances the rolls C are rotated and gradually expand the flue. The operation is continued until the flue is expanded to the required size which should coincide with the diameter of the mandrel stem, that is the straight portion of the mandrel next the head. The mandrel will then turn in the feed chamber without further expanding the tube until the shoulder $a^5$ engages with the end of the feed chamber.

If the feed is continuous, too rapid expansion may cause the flue to crack, and it is often desirable to stop the feed but continue the rolling. This can be done by withdrawing the bolt $a^9$ from engagement with the head of the feed screw. When the rolling has been carried to a sufficient extent the feed screw may again be locked into engagement with the mandrel, and the feed continued.

In the form shown in Figs. 5 to 8 the feed screw is integral with the mandrel but takes through an internally threaded disk $b^4$ adapted to rotate in the feed chamber, but normally locked against such rotation; and also held against longitudinal motion in the feed chamber. This disk is provided with peripheral slots or recesses $b^5$ adapted to receive a dog $b^7$ carried by a rod $b^8$ extending to the outer end of the feed chamber and provided with a crank or hand piece by which it may be actuated. As shown, the disk $b^4$ is provided with ratchet teeth $b^9$ and is normally held by a spring pawl $b^{10}$ against rotation while the feed screw is being withdrawn. The operation is the same as in the other construction except that the feed is stopped by withdrawing the lug $b^7$ from engagement with the threaded disk instead of by withdrawing the bolt $a^9$ from the head of the corresponding screw.

In order to guard against the admission of dust, cinders or other substances which might interfere with the proper working of the mechanism, I provide the feed chamber with an end cap $b^{11}$, and, if a two part mandrel is used, the head is closed by an end cap $a^{14}$. The expansion of the flue or tube may progress more rapidly at the beginning of the operation than during the latter part of the operation without endangering the joint. In order to secure rapid work and insure a slower rate of expansion toward the end of the operation without depending upon the discretion of the operator I make the taper more pronounced near the inner end of the mandrel and less pronounced near the outer end. This also enables me to use a much shorter mandrel thereby reducing the size and weight of the tool.

I claim:

1. The combination in a tube expander of a feed chamber having one or more slots therein, one or more rolls taking into the slots, a tapering mandrel, adapted to engage with the rolls, having a feed screw adapted to engage a correspondingly threaded portion of the feed chamber, means for rotating the mandrel, and a movable dog adapted to make or break operative connection between the rotating mechanism and the feed mechanism.

2. The combination in a tube expander of a feed chamber, having one or more slots, one or more rolls taking into the slots, a tapering mandrel adapted to engage with the rolls and having a feed screw taking through a correspondingly threaded disk rotatably mounted in the feed chamber and means for locking the disk against rotation in the feed chamber.

3. The combination in a tube expander of a feed chamber, having one or more slots, one or more rolls taking into the slots, a tapering mandrel adapted to engage with the rolls and having a feed screw, a disk in the feed chamber threaded to receive the feed screw, recesses in the disk and a rod taking through the wall of the feed chamber having a lug adapted to take into the recesses and lock the disk against rotation in the feed chamber.

4. The combination in a tube expander of the mandrel A, the feed chamber B, the rolls C, the disk $b^4$ having recesses $b^5$ and provided with ratchet teeth $b^9$, the rod $b^8$ carrying dog $b^7$ and the spring pawl $b^{10}$.

5. The combination in a tube expander of a feed chamber B, a mandrel A taking into the feed chamber, rolls C taking through slots in the feed chamber and against the mandrel and a cap $b^{11}$ attached to the inner end of the feed chamber, substantially as and for the purpose specified.

JOSEPH WEST.

Witnesses:
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JAMES N. RAMSEY.