No. 773,785. PATENTED NOV. 1, 1904.

C. C. BULL.

BOILER FLUE CUTTER.

APPLICATION FILED OCT. 20, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

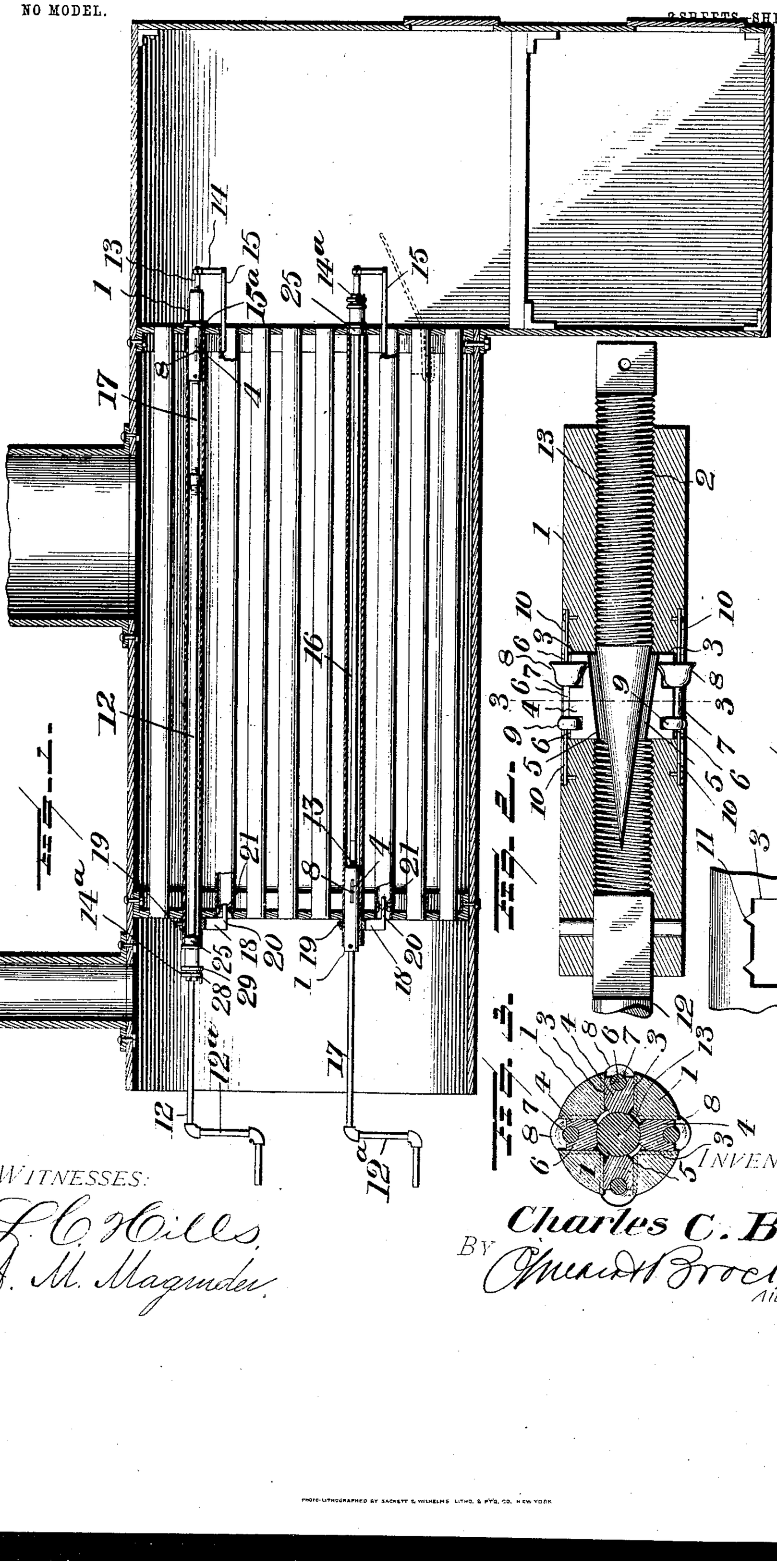

FIG. 1.

FIG. 2.

FIG. 3.

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NO MODEL. 2 SHEETS—SHEET 2.

FIG. 4.

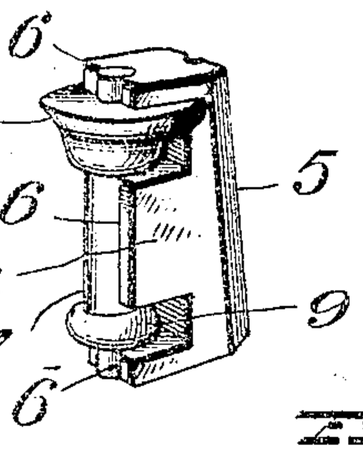


FIG. 7.

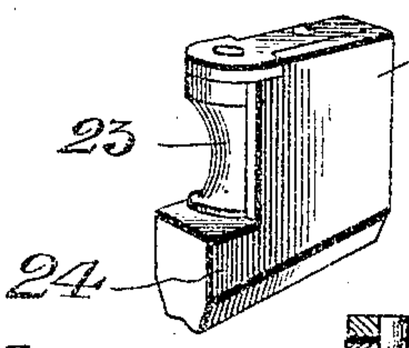


FIG. 5.

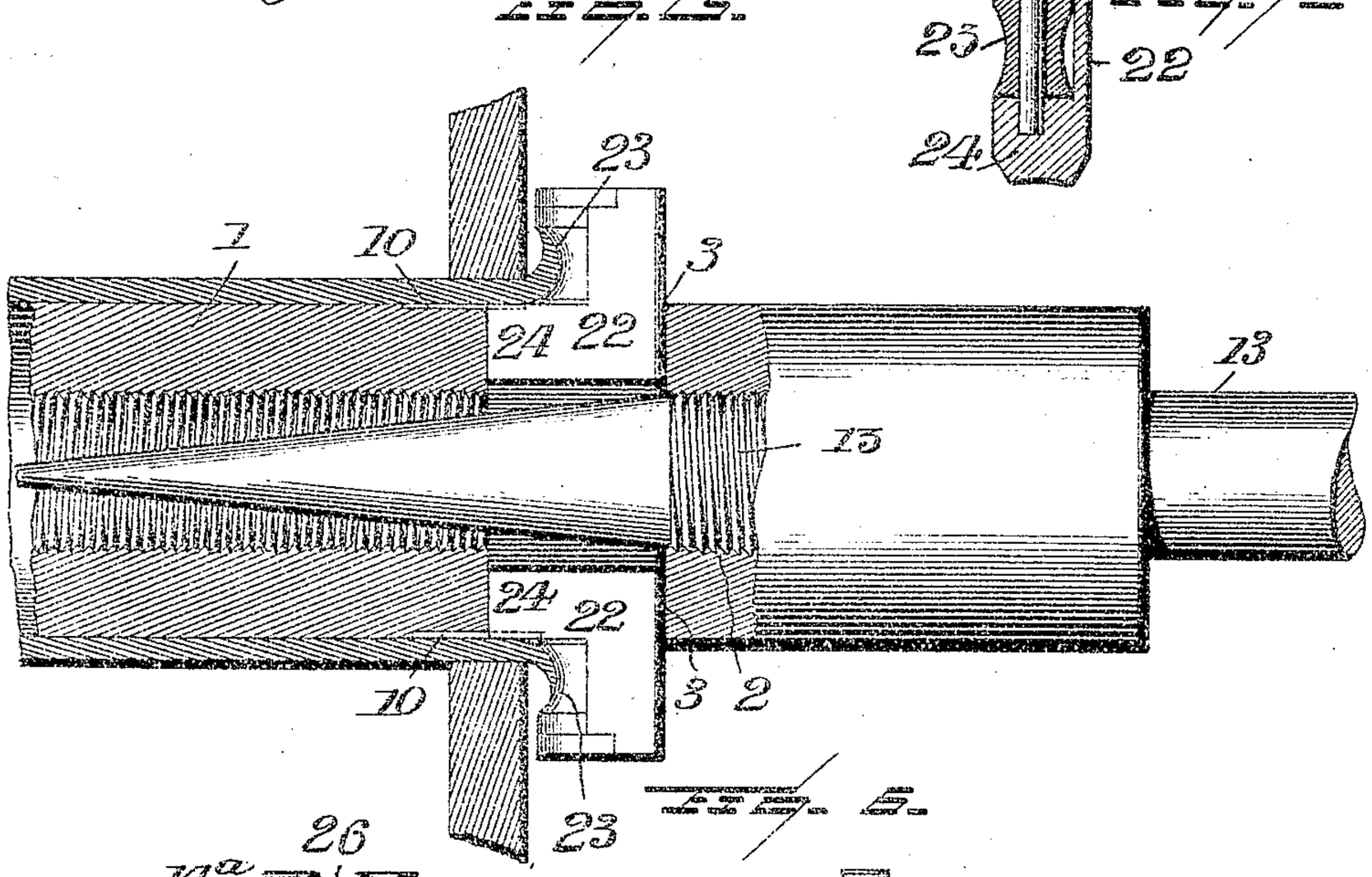


FIG. 7a.

FIG. 6.

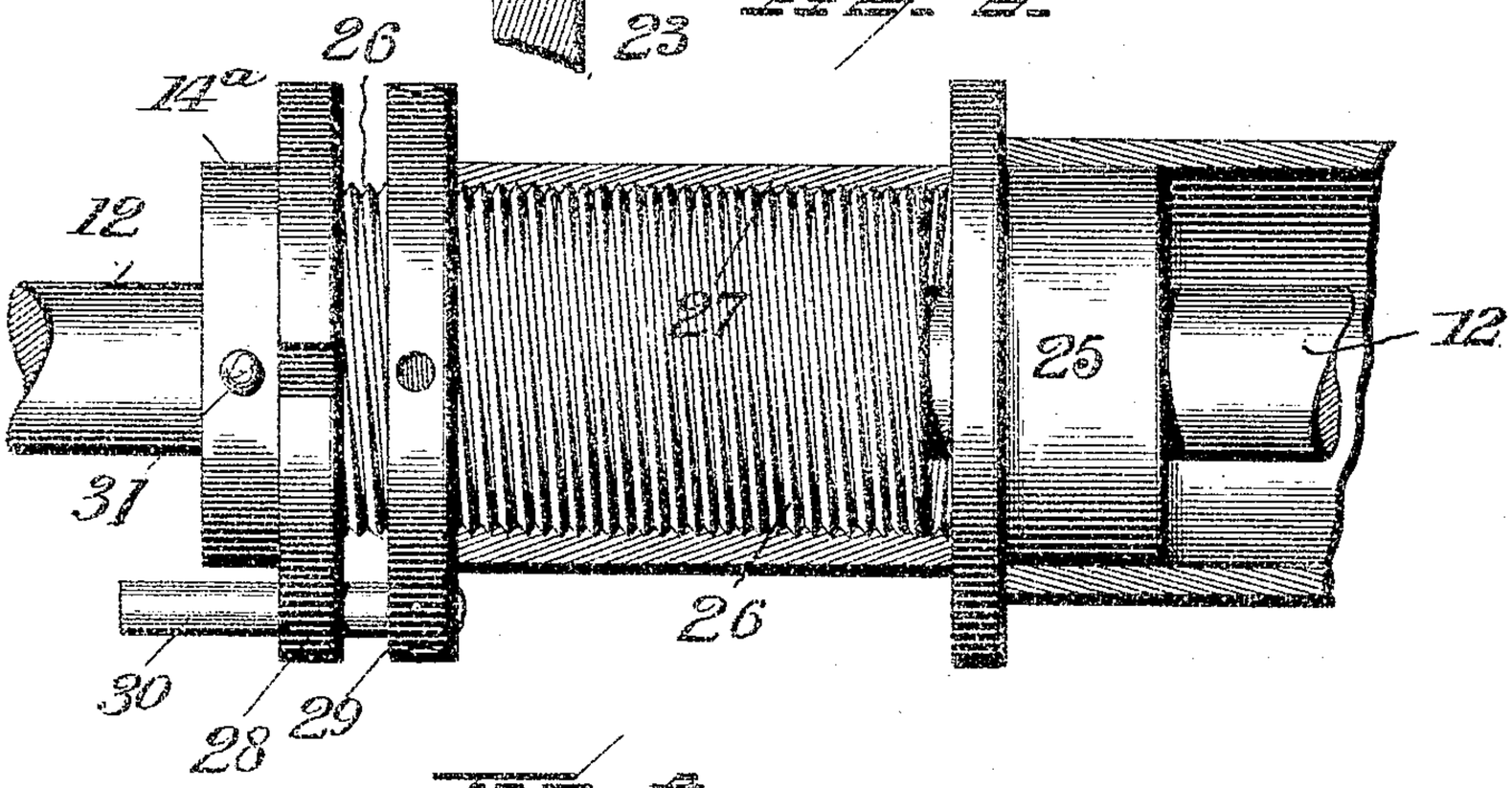
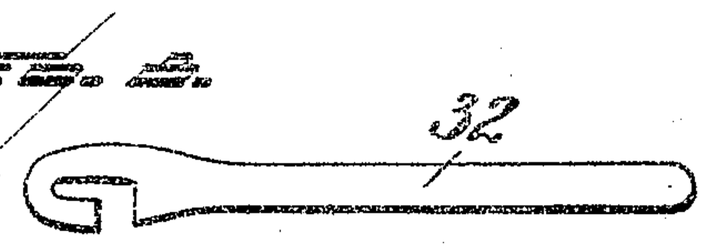


FIG. 2.



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No. 773,785. Patented November 1, 1904.

UNITED STATES PATENT OFFICE.

CHARLES C. BULL, OF LESTER, IOWA.

BOILER-FLUE CUTTER.

SPECIFICATION forming part of Letters Patent No. 773,785, dated November 1, 1904.

Application filed October 20, 1902. Serial No. 127,950. (No model.)

To all whom it may concern:

Be it known that I, CHARLES C. BULL, a citizen of the United States, residing at Lester, in the county of Lyon and State of Iowa, have invented a certain new and useful Boiler-Flue Cutter, of which the following is a specification.

My invention relates to boiler-flue cutters, expanders, and beaders; and it has for its object to produce a device of this kind which can be used for cutting off the flue at either end, bending or beading it up against the flue-sheet of the boiler and expanding it in the flue-opening.

With these objects in view the invention consists in the improved construction and novel arrangement of parts of a boiler-flue cutter, expander, and beader, as will be hereinafter more fully set forth.

In the accompanying drawings, in which the same reference-numerals indicate corresponding parts in each of the views in which they occur, Figure 1 is a longitudinal sectional view of a portion of a boiler, showing my improved flue-cutter in position for cutting off the flue both at the fire-box and smoke-box ends. Fig. 2 is an enlarged longitudinal sectional view of the head provided with cutters. Fig. 3 is a transverse sectional view of the same. Fig. 4 is a perspective detail view of one of the cutters detached. Fig. 5 is a longitudinal sectional view of a portion of a boiler, showing my improved beader in position for turning up one end of a flue. Fig. 6 is an enlarged longitudinal sectional view of the means for holding the beading-roller against the end of the flue. Fig. 7 is perspective detail view of one of the beading-jaws detached, and Fig. 7ª is a detail section of the same. Fig. 8 is a view of a lever for removing the ends of flues; and Fig. 9 is a detail view of a portion of the cutter-head, showing the recess and grooves through which the cutters protrude.

Referring more particularly to the drawings, 1 indicates the head of any improved cutter, expander, and beader, which can be made of any suitable length and dimensions, to be inserted in the flue to be operated upon. The head is preferably made cylindrical, the bore of which is angular at one end and round and interiorly screw-threaded at the other end, as shown at 2. The intermediate portion of the head is provided with a series of radially-arranged recesses 3, preferably three in number, in each of which is seated a jaw or cutter-block 4.

Each jaw has its inner edge inclined or tapered from end to end, if desired, beveled upon each side adjacent its inner edge, as shown at 5, and its outer edge is provided with end and intermediate open bearings 6. A cutter-shaft 7 is mounted in said bearings, one end of which is formed or provided with a cutter 8 and the opposite end is provided with a removable bead or ridge 9, while the central portion is smooth to fit within the bearings. The outer end face of the cutter is preferably flat or at right angles to its axis and the inner face is inclined or curved in radial cross-section, so that in cutting off a flue the end of one of the sections or portions of the flue will be cut off square to permit of its being inserted into another hole in the boiler-sheet, while the end of the other section is thinned toward its end and flared ready to be beaded or bent up against the sheet.

By providing the cutter-shaft with the bead 9 the portion of the flue just inside the flue-sheet is expanded at the same time that the cut is being made outside, or if the tool is to be used for expanding the end of a flue to prevent its leaking the bead can be located directly within the hole in the sheet or inside of it, as may desired, and rotated until the flue has been crowded outward sufficiently to stop the leak. If it is not desired to expand the tube, the bead may be removed. A retaining device, as a pair of springs 10, is secured at one end to the head and have their inner ends resting upon the journals of the cutter-shaft, holding them in their bearings.

The walls of the recesses 3 are provided with grooves 11 for the reception of the edges of the cutters. The grooves are preferably located at each end of the recesses, so that the jaw or the cutter-shafts may be reversed or turned end for end. This will permit of the head being used to operate on the flue at

either end, as the tool is generally operated from the smoke-box end of the boiler, access to that end being readily obtained through the ordinary door at that end.

The head is rotated by means of a shaft 12, which is preferably formed from ordinary gas-pipe, and an elbow and T-coupling connect a crank 12^a to it. By joining the pipe it can be made of a sufficient length to reach through the longest flues or be made short enough to be operated without entering the flue at all, as where the head is located at the smoke-box end of the boiler. The inner end of the shaft 12 is detachably connected to one end of an auxiliary shaft 17, the opposite end of the shaft 17 being formed angular to fit within the angular portion of the bore of the head and causes the head to be rotated.

A tapering spindle or feed-screw 13 is fitted in the screw-threaded end of the head and is adapted to be held against rotation by means of a hinge-wrench 14, which has one end secured thereto and the opposite end provided with an arm 15, which projects into the end of one of the flues adjacent to the flue being operated upon. The inner or tapering end of the spindle fits between the inner tapering edges of the jaws or cutter-blocks, and as the head is rotated it is gradually and automatically forced in by the screw-threads and crowds the jaws and cutters outward. The collars 14^a and 15^a are secured to the shaft 12 and head 1, respectively, to bear against the ends of the flue being operated upon to prevent the tool from moving longitudinally as it is being rotated.

When the head is being used at the smoke-box end, a supplemental rod 16 fits over and is pinned to the outer angular end of the spindle and projects through the flue, with its outer end in engagement with the wrench, and the crank is unscrewed from the longer section of pipe 12, which is detached from the shorter section 17, which is preferably permanently secured to the head, and the crank 12^a is attached direct to the section 17. A vise 18 is fastened to the projecting end of the flue being operated upon, as by means of a set-screw 19, and its bent end 20 inserted into an adjacent flue and rigidly held in position by means of a set-screw 21 for firmly holding the end of the flue while being cut.

When it is desired to use my invention for heading or bending the end of the flue against the flue-sheet, the cutter blocks or jaws are removed from the head and the header-jaws 22 inserted. Each header-jaw is provided with a beading-roller 23, which is journaled in a projection 24 of the jaw with its axis at right angles to the axis of the tube. The central portion of the beading-roller is concaved circumferentially, so that as it is drawn against the tinned and flared end of the flue, formed by cutting it off with my improved cutter, the end of the tube will be beaded or bent up closely against the sheet and a tight joint formed between the sheet and the end of the flue.

To force the beading-roller against the end of the tube, I prefer to place a washer 25 at the opposite end of the flue through which the crank-shaft 12 passes. Two screw-threaded sleeves 26 and 27 are placed on the shaft beyond the washer, one within the other. The outer end of each of them is provided with a flange, one of which, 28, is notched and the other one, 29, is provided with a lever or latch 30, by means of which the outer sleeve can be rotated independently of the inner one. The inner sleeve is rigidly secured to the crank-shaft by any suitable means—as, for instance, a pin 31—and the inner end of the outer sleeve bears against the washer, so that by rotating the outer sleeve the shaft and head can be moved longitudinally within the flue and the beader and be forced against the end of the flue with any desired degree of pressure. After the outer sleeve has been screwed up against the washer it can be locked against unscrewing by turning the lever 30 down into one of the notches in the flange on the inner sleeve.

It is evident that my improved cutter can be used for removing a flue as easily as to insert one, as it is only necessary to locate the cutter at a short distance inside of the flue-sheet, so that the flue will be cut off near the sheet. After the end of the flue has been cut off in this manner a hook 32 can be inserted through the end of the flue and slipped over the stub or short end of the flue, and by properly manipulating the lever the stub can be quickly removed from the sheet, after which a new flue can be inserted. In this manner the flue can be removed much quicker than with the ordinary means, and all danger of damaging the flue-sheet by nicking or cutting it, as is done with the ordinary chisel and hammer, is avoided.

By means of my invention flues can be removed or inserted very quickly and satisfactorily, as the danger of starting leaks by pounding is entirely avoided, and the work can be done from the outside, thereby permitting of the replacing or repair of a damaged flue by simply drawing the fire without having to wait until the boiler gets cool enough for a man to enter the boiler.

The flues do not need to be cut off the exact length before insertion, thus permitting of its being slipped farther through the sheet and cut off again in case that the end should prove to be defective and slip when being beaded or bent up against the flue-sheet. By using different-sized blocks the same head can be used for different-sized flues and the flue can be provided with a set-ring on the inside, if desired, the same as with a spring or plug tube

expander. While I have shown the cutter as being flat on the outer end face, it is obvious that both faces can be beveled, if so desired.

Although I have shown what I consider the most desirable form of manufacturing my invention, yet I reserve the right to make such changes and alterations therein as will come within the scope of my invention.

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

1. In a tool as herein described the combination with a hollow radially-recessed head, the bore of which at one end is internally screw-threaded, of a tool-holding block in each recess, a tapering screw-threaded spindle in the head, means for locking the spindle from rotation, and means for rotating the head, substantially as described.

2. In a tool as herein described, the combination, with a hollow radially-recessed head, the bore of which at one end is internally screw-threaded, of a tool-holding block in each recess, a screw-threaded tapering spindle in the bore of the head, means connected with one end of the spindle and adapted to engage a flue adjacent to the one being operated upon, and means for rotating the head, substantially as described.

3. In a tool herein described, the combination, with a head provided with a handle and with cutters, of means for automatically forcing the cutters outward, and two collars, one on the head and one on the handle in position to engage with the opposite ends of the flue being operated upon, substantially as described.

4. In a tool as herein described, the combination with a head provided with a handle and beading-rollers, of a washer, two screw-threaded sleeves one within the other, the inner end of the outer sleeve resting against the washer, means for locking the sleeves together, and means for securing the inner sleeve to the handle, substantially as described.

5. In a tool as herein described, the combination, with a head provided with a handle and with beading-rollers, of a washer, two screw-threaded sleeves, one within the other, the inner end of the outer sleeve resting against the washer and the outer end of each sleeve being flanged, the flange of the inner sleeve being notched and a lever pivotally secured to the flange of the outer sleeve, and means for securing the inner sleeve to the handle of the tool, substantially as described.

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