

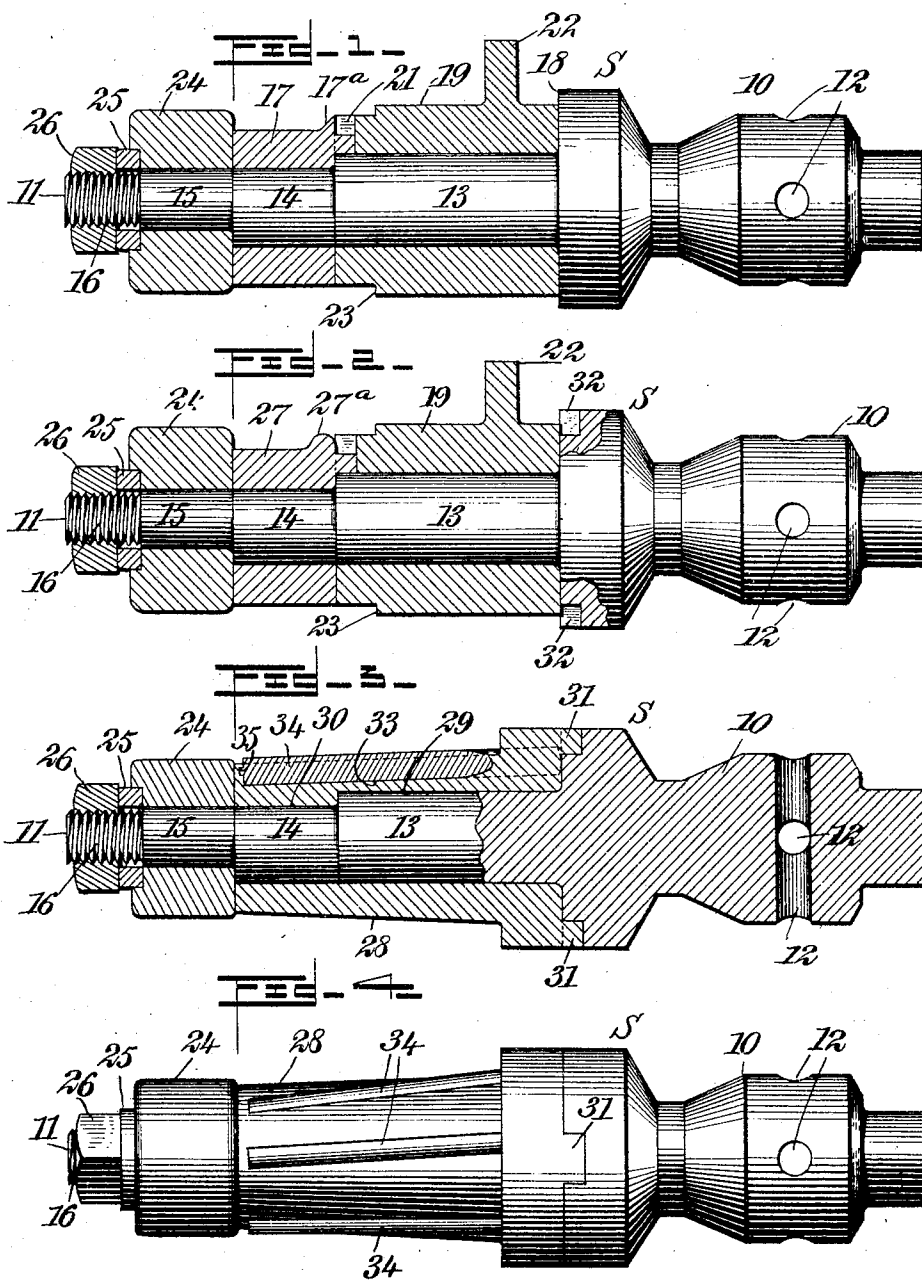
No. 786,064.

PATENTED MAR. 28, 1905.

J. L. SMITH.
TOOL FOR OPERATING UPON BOILER TUBES.

APPLICATION FILED MAY 14, 1904.

2 SHEETS—SHEET 1.



WITNESSES:

R. C. Abbott
S. H. Cobb

INVENTOR

John L. Smith

BY

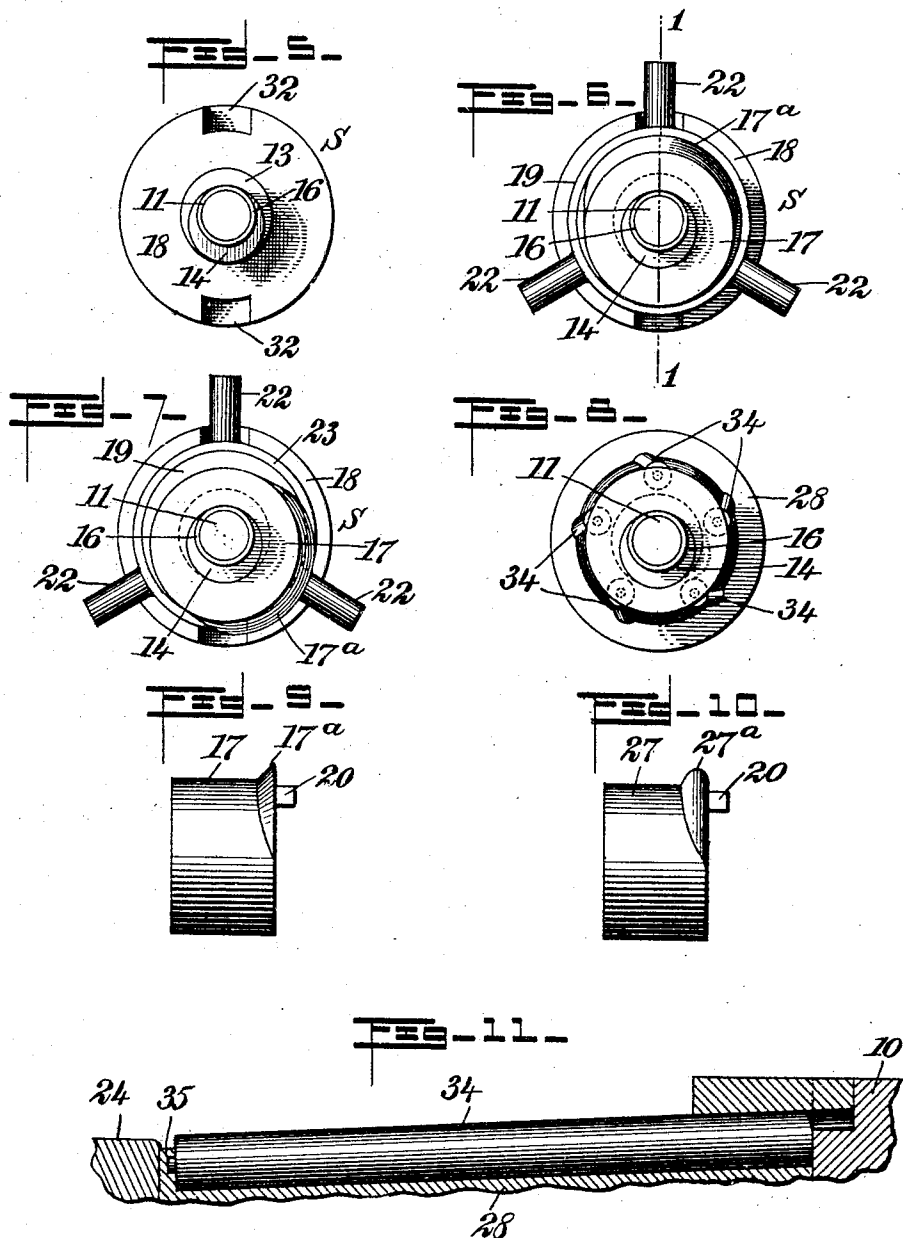
Mumuk
ATTORNEYS

No. 786,064.

PATENTED MAR. 28, 1905.

J. L. SMITH.
TOOL FOR OPERATING UPON BOILER TUBES.
APPLICATION FILED MAY 14, 1904.

2 SHEETS—SHEET 2.



WITNESSES:

R. C. Allen

S. H. Cobb

INVENTOR

John L. Smith

BY

Wm. W. Smith
ATTORNEYS

UNITED STATES PATENT OFFICE.

JOHN LEWIS SMITH, OF EUREKA SPRINGS, ARKANSAS.

TOOL FOR OPERATING UPON BOILER-TUBES.

SPECIFICATION forming part of Letters Patent No. 786,064, dated March 28, 1905.

Application filed May 14, 1904. Serial No. 207,953.

To all whom it may concern:

Be it known that I, JOHN LEWIS SMITH, a citizen of the United States, and a resident of Eureka Springs, in the county of Carroll and State of Arkansas, have invented a new and Improved Tool for Operating upon Boiler-Tubes, of which the following is a full, clear, and exact description.

My invention relates to tools for use in removing tubes from the flue-sheets of boilers and in applying new tubes, and has for its principal objects the provision of such a device which will be simple in construction and effective in operation.

It consists in the various features and combinations hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a longitudinal section through one embodiment of my invention, taken on the line 1 1 of Fig. 6 and showing the cutting member in place upon the stock. Fig. 2 is a similar view with the expanding member substituted for the cutting member and portions of the stock broken away. Fig. 3 is a full longitudinal section, but with the rolling member mounted upon the stock. Fig. 4 is a side elevation thereof. Fig. 5 is an end elevation of the stock and its spindle with the elements carried thereby removed. Fig. 6 is a similar view with the sleeves in place upon the spindle, these including the cutting member, the blade of which is shown at its position of least projection. Fig. 7 is an end elevation with the cutting member projected to its maximum extent. Fig. 8 is an end elevation of the rolling member in place upon the stock. Figs. 9 and 10 are details in side elevation of the cutting and expanding members, and Fig. 11 is an enlarged broken sectional detail showing one of the rolls mounted in its support.

S designates a stock, which is here shown as consisting of a head 10, from which projects a spindle 11. The head may be adapted for insertion in the chuck of a pneumatic or other motor and is preferably provided with

transverse openings 12 for the reception of a bar by which it may be operated by hand. As illustrated, the spindle has four portions 13, 14, 15, and 16. Of these, those indicated as 13, 15, and 16 are of different diameters, but concentric, the first mentioned being the largest and the last being provided with a thread. The intermediate portion 14 is eccentric, the extent of its eccentricity being at least equal to the thickness of the tubes which are to be operated upon, and about this portion 14 is situated the operating member. This preferably consists of a sleeve 17, which is shown in Figs. 1, 6, 7, and 9 of the drawings and is provided with a contact member or blade 17^a, the reduced edge of which extends through but a portion of the circumference, it being eccentric to the surface of the sleeve.

Between the operating member and a shoulder 18 upon the stock surrounding the portion 13 of the spindle is an adjusting member for the operating member, this consisting of a sleeve 19. The two sleeves are provided with connecting means, which may consist of a projection 20 from the operating-sleeve extending into a recess 21 in the adjusting-sleeve. The latter has radiating from it arms 22, furnishing handholds, by means of which the operator may maintain it against rotation or rotate it to secure the desired projection of the operating member. At a suitable distance from the outer end of the sleeve is a stop-shoulder 23, which in use will contact with the outer extremity of the tube and serve as a gage to determine the depth of insertion.

Outside the sleeve 17 is a guide-sleeve 24, freely rotatable about the portion 15 of the spindle. This sleeve may have at its outer end a recess in which is seated a washer 25, and operating upon the threaded end 16 is a nut 26, which retains all the elements in place upon the spindle.

The cutting member 17 is particularly useful in removing old tubes from boilers. In use the stock will be provided with a set of sleeves of a suitable diameter for the particular size of tube which is to be cut. The tool

is then inserted in the tube until the stop-shoulder 23 contacts with the end. This brings the edge of the blade just inside the sheet, the operating portion being so held by its eccentric that the blade is in its position of minimum projection. The operator now grasps the adjusting-sleeve by its arms, and the stock is rotated in any desired manner, the tool being supported in place by the guide-sleeve and the reduced portion of the adjusting-sleeve inside the shoulder 23. The rotation of the eccentric portion of the spindle while the adjusting member is being held against rotation will result in the blade being forced out almost directly into the wall of the tube, but with a slight circumferential or shearing movement, and thus cuts a limited section. This having been effected by a few turns of the stock, which produces a like number of reciprocations of the blade, the operator shifts the adjusting member circumferentially to a sufficient extent to subject a fresh portion of the tube to the action of the blade. This is continued until the wall is severed throughout its circumference. This enables the tubes to be cut flush with the inside of the sheet and pushed out without cutting the enlarged end, and the operation is such as to prevent the expansion of the tube-walls, which makes them difficult to draw through the holes in the tube-sheets.

The old tubes having been removed and it being desired to put new ones in place, the sleeve 17 is taken from the stock and a sleeve 27 (see Figs. 2 and 10 of the drawings) substituted, upon which is a contact member or expanding projection 27^a, situated similarly to the blade previously described, but having instead a rounded edge. The tube is then placed in the holes in the sheets in the proper position and the tool inserted within it until the expanding projection is just inside the sheet, this being determined, as before, by the contact of the shoulder 23. The operation proceeds in precisely the same manner as has been just described, the adjusting member being gradually turned to permit the rotating spindle to force the expanding projection against the interior of the tube at a series of successive points. This forms a perfect shoulder, strengthening the tube in the boiler and preventing end friction and leakage.

The peculiar movement imparted to the cutting and expanding projections by their being forced outward into the metal operated upon with but slight circumferential play enables them to work effectually upon thick material—for example, upon tubes one-quarter of an inch in thickness, which would be impossible with the ordinary rotary cutter and expander, unless excessive power were applied. This allows thick end pieces to be welded upon thinner tubes, making a heavy surface for rolling in the sheet and leaving a thin

tube within the boiler, which increase the steaming properties without sacrifice of the integrity of the joint.

The tube having been expanded, it remains to even the interior where they have been operated upon and force them into firm contact with the edges of the holes. For this purpose the sleeves 27 and 19 are removed from the stock and a sleeve 28 (particularly illustrated in Figs. 3, 4, 8, and 11 of the drawings) substituted. This latter sleeve has within it a bore having two portions 29 and 30 so related to one another that they fit the portions 13 and 14, respectively, of the spindle and maintain the outer periphery of the sleeve symmetrically about the axis. The eccentricity of the two spindle portions would alone prevent the sleeve from rotation thereon; but a further means is preferably provided in projections 31, which may extend from the end of the sleeve into recesses 32, formed in the shoulder 18 of the stock. The sleeve 28 has a conical surface, it converging outwardly, and in this surface are cylindrical recesses 33, which open through it. They reach from points adjacent to the outer extremity of the sleeve through openings in the opposite end. These recesses are here shown as five in number, separated from one another by equal spaces, and each of them not only has its ends lying at different distances from the axis of the spindle because of the conical form of the extremity of the sleeve, but they also are skewed or have their ends occupying different planes circumferentially of the spindle. In the recesses are situated rolls 34, which have at their outer ends journal projections 35, operating in corresponding depressions or bearings at the ends of the recesses. This prevents the displacement of the rolls through the recess-openings, they being held at their opposite ends by the walls of the sleeve and are maintained against longitudinal movement by contact with the adjacent face of the stock. The guide-sleeve may be placed outside the roll-sleeve upon the portion 13 of the spindle, as in the arrangement of the tool before described, and both these sleeves secured by the nut upon the threaded end of the spindle.

In the use of the roller the guide is introduced into the tube and the stock rotated, carrying the roll-sleeve with it. The diagonal or skewed position of the rolls causes the tool to feed into the tube, as would a screw, and their inclined or generally conical relation gradually exerts pressure upon the tube, smoothing its surface and forcing it outward against the walls of the sheet-opening. The use of the five rolls, these being separated by comparatively small spaces, distributes the pressure and avoids putting a strain upon thinner portions of the tubes.

It will be apparent that with this combination-tool the whole operation of cutting out

the old tube and inserting the new may be performed and that the elements which carry out the various operations may be quickly assembled and will operate under the application of comparatively low power.

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

1. A tool for operating upon boiler-tubes comprising a rotatable stock having an eccentric portion, an operating member surrounding said eccentric portion, and an adjusting member situated adjacent to the operating member and connected therewith by a cooperating projection and recess.

2. A tool for operating upon boiler-tubes comprising a rotatable stock having an eccentric portion, an operating member surrounding said eccentric portion, an adjusting member situated adjacent to the operating member and connected therewith, and handholds projecting from the adjusting member.

3. The combination with a stock, of a spindle fixed to the stock and having an eccentric portion, a sleeve provided with a contact pro-

jection carried by the eccentric, and a sleeve having handholds situated adjacent thereto.

4. The combination with a stock, of a spindle fixed to the stock and having an eccentric portion, a sleeve provided with a contact projection carried by the eccentric, and a sleeve having handholds situated adjacent thereto, said sleeves being provided with a cooperating projection and recess.

5. The combination with a stock, of a spindle fixed to the stock and having an eccentric portion and portions situated at each side of the eccentric portion which are concentric with one another, a sleeve provided with a contact projection surrounding the eccentric portion, and adjusting and guide sleeves situated upon the concentric portions.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN LEWIS SMITH.

Witnesses:

F. N. CLAFLIN,
M. F. GEAR.