

T. F. GRADY.
FLUE EXPANDER AND BEADER.
APPLICATION FILED JAN. 30, 1911.

1,006,934.

Patented Oct. 24, 1911.
2 SHEETS—SHEET 1.

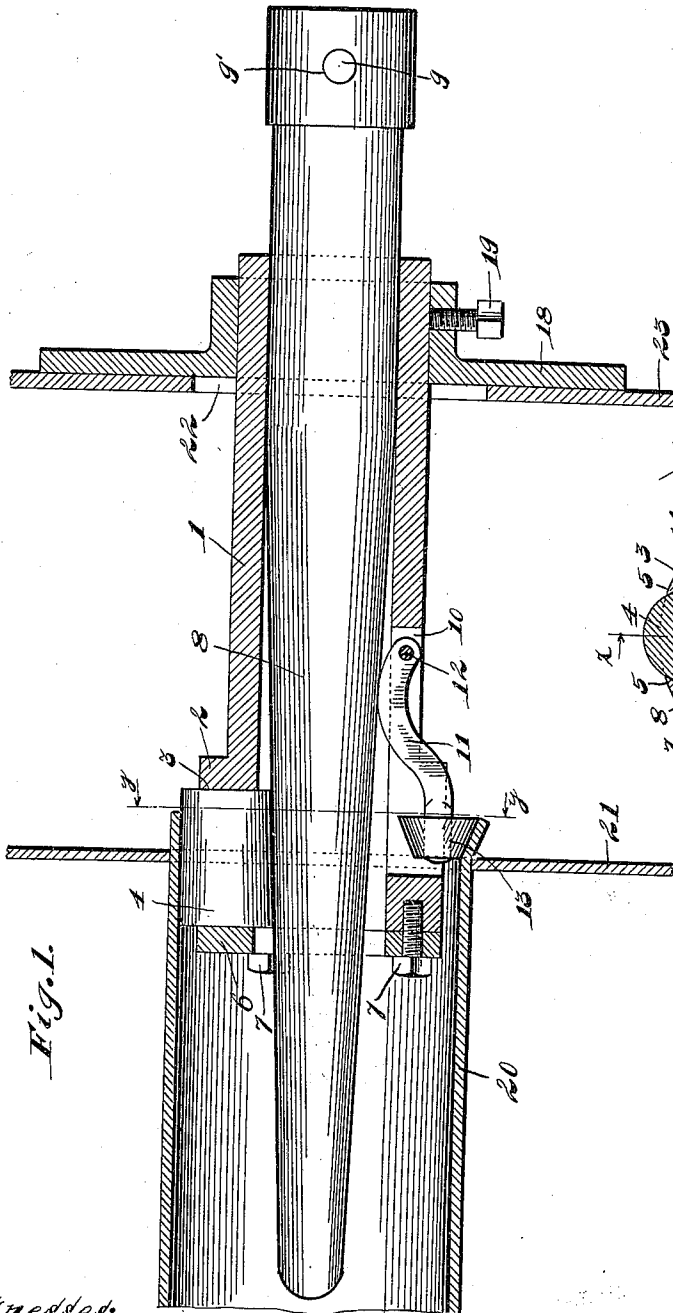


Fig. 1.

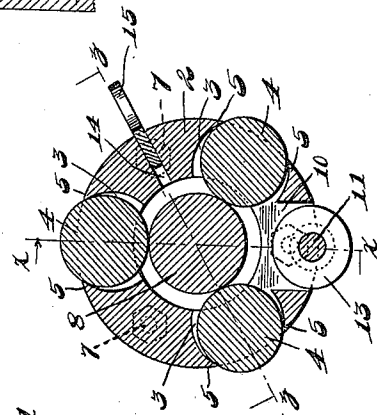


Fig. 2.

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2 SHEETS—SHEET 2.

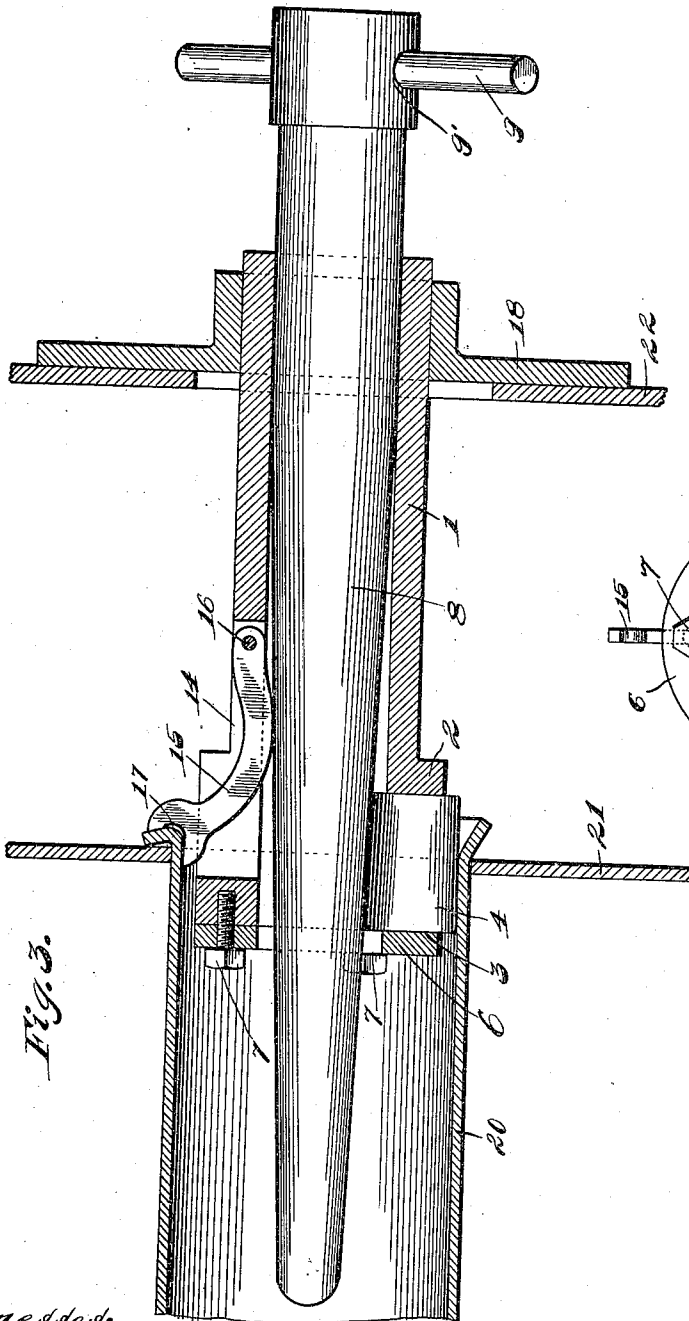


Fig. 3.

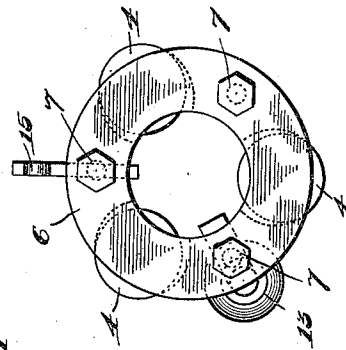


Fig. 4.

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UNITED STATES PATENT OFFICE.

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FLUE EXPANDER AND BEADER.

1,006,934.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, THOMAS F. GRADY, a citizen of the United States, and a resident of the city of Dubuque, county of Dubuque, and State of Iowa, have invented certain new and useful Improvements in Flue Expanders and Beaders, of which the following is a specification.

My invention relates to improvements in tools for expanding and beading the ends of boiler flues.

The object of my invention is the production of a tool of the character mentioned by means of which the expansion of the end of a tube or flue and the beading thereof may be effected simultaneously or in one operation resulting in economy in both time and labor.

A further object is the production of a tool as mentioned which will be of improved construction and efficient in operation.

Other objects will appear hereinafter.

With these objects in view my invention consists in a flue expanding and beading device characterized as above mentioned and in certain details of construction and arrangements of parts all as will be hereinafter more fully described and particularly pointed out in the appended claims.

My invention will be more readily understood by reference to the accompanying drawings forming a part of this specification and in which—

Figure 1 is a central longitudinal section of a tube expanding and beading tool embodying the invention, the same being shown in operative position, the section being taken on substantially line $x-x$ of Fig. 2, Fig. 2 is a transverse section taken on line $y-y$ of Fig. 1, Fig. 3 is a section similar to that shown in Fig. 1 taken on substantially line $z-z$ of Fig. 2, and Fig. 4 is an end elevation of the tool with the mandrel thereof removed.

The preferred form of my construction as illustrated in the drawings comprises a tubular body 1, the same being provided with a cylindrical opening extending the entire length thereof, one end of said body being enlarged to form a head 2. Formed in the head 2 is a plurality of radially extending slots 3, preferably three in number, the same being spaced therein at equal distances apart. Arranged in said slots 3 are loosely fitting rollers 4, the arrangement being such that radial movement of said rollers in the head 2 will be permitted, the in-

ner sides of said rollers projecting into the interior of the body 1; that is the passage extending therethrough, the outer sides of said rollers being adapted to project beyond the lateral surfaces of said head for engagement with the inner side of a tube to be expanded thereby. The outer ends of the slots 3 are contracted as will be observed so that the portions 5 serve as a means of limiting outward movement of said rollers in said slots, this provision evidently serving to prevent displacement of the rollers 4; that is falling of the same from the body 1. Longitudinal movement of said rollers 4 in one direction is prevented by the closed extremities of the slots 3, longitudinal movement in the opposite direction being prevented by an annular member 6 which is secured in position upon the forward extremity of the body 1 closing the forward or open extremities of said slots 3, by means of screws 7 which extend through said member 6, the same being threaded into the head 2 intermediate of the slots 3.

Removably arranged within the body 1 is a mandrel 8 extending longitudinally of said body, one end of said mandrel which for convenience will be designated as the rearward end thereof being cylindrical and of a diameter such as to adapt the same to be snugly received in said body. The opposite or forward end of said mandrel is tapered, this end, when said mandrel is inserted into said body being adapted to contact the inner sides of the rollers 4 in order to effect the outward forcing or radial movement thereof when said mandrel is forced into said body, such action being old and well known and therefore no further description regarding the same need here be made. Rollers 4 are slightly conical in form and in operation assume a slight angle to the axis of mandrel 8 so as to cause said rollers to contact uniformly with said mandrel and the inner sides of the tube. In order to facilitate ready insertion of said mandrel in the body 1 and in the imparting of rotary movement to said mandrel, the rearward end of the latter is provided with a transversely extending gripping bar 9, said bar being loosely mounted in a transversely extending recess 9' provided for the reception thereof in said mandrel. As will be observed the rollers 4 are frusto conical or tapering in form, the same being so formed in order that the outer sides thereof,

that is, the portions of the peripheries of said rollers which are brought in contact with the flue or tube to be expanded when the device is in operation, shall be displayed in a plane parallel with the axis of the body 1 and mandrel 8 and hence parallel with the side of the flue or tube engaged thereby when the inner sides of said rollers are resting in contact with the tapering end of the mandrel.

Arranged in one side of the body 1 is a longitudinally extending slot 10 in which is arranged a stem 11 one end of which is fulcrumed as at 12 in said slot. The opposite end of the stem 11 carries a roller 13, frusto conical or tapering in form, the lower end portion of the slot 10 being enlarged in order to snugly accommodate said roller 13 when the stem 11 is rocked inwardly. Also arranged in the body 1 intermediate the slots 3 provided therein is a slot 14 in which is arranged a swingingly mounted arm 15, one extremity of said arm being fulcrumed as at 16 in said slot. The opposite or forward end 17 of the arm 15 is bifurcated or recessed in order to adapt the same when brought into contact with the edge of a flue or tube and forced snugly into engagement therewith to effect outward flaring thereof or the formation of a bead thereon. The central portions of the arm 15 and the stem 11 are curved inwardly as will be observed so that when the mandrel 8 is arranged in the body 1 and manipulated as above described, the tapering forward end portion thereof will engage said inwardly curved portions of said stem and arm and effect the outward rocking of the forward or free ends of the latter. The arrangement is such that the end 17 of the member 15 and the roller 13 of the stem 11 are disposed in substantially the same transverse plane, this plane passing also through the rearward end of the expansion rollers. The reason for such arrangement will become apparent from the following. Arranged upon the rearward end of the body 1 is an annular flange 18, the same being longitudinally adjustable upon said body, a set screw 19 threaded into the hub portion of said flange serving as a means for securing said flange in any position of adjustment upon said body.

The operation of the tool is as follows:—
A tube 20 being in position in the inner flue sheet 21 with a sufficient length projecting through said sheet to permit of beading, the forward end of the tool is inserted through the opening 22 provided in the outer sheet 23 coaxial with the flue 20. The forward end of said tool is inserted into the end of tube 20 to such an extent that the roller 13 will contact with the projecting end of the flue. Then the mandrel

is forced outwardly into the position shown in Fig. 1. Then the body 1 is rotated through a partial rotation or until enough of the edge of the tube is flared so that tool 17 may be placed in engagement with said flared portion. Then mandrel 8 and body 1 are slightly withdrawn and tool 17 placed in engagement with the flared portion of the flue and body 1 forced inwardly until the flared portion is bent into the form indicated in Fig. 3. The flange 18 is now adjusted upon the body 1 positioning the same in engagement with the outer side of the sheet 23. When so arranged, said flange, as will be observed, will serve as a means for preventing inward movement of the body 1 thereby maintaining the relative positions of the expansion rollers 4 and the beading arm 15 and roller 13 as above described. Upon completing such adjustment the mandrel 8 through the medium of the bar 9 is forced into the body 1 and rotated. The friction between rollers 4 and mandrel 8 causes rotation of said rollers, which riding upon the inner surface of the tube cause rotation of body 1. The inward forcing of the mandrel, as will be observed, effects the outward forcing of the expansion rollers 4 into engagement with the adjacent portions of the tube 20 and said rollers in turning effect the expansion of said tube 20, forcing the same into snug engagement with the opening provided therefor in the sheet 21, the expansion rollers, upon rotation of the mandrel rolling between the mandrel and the inner face of the tube. Simultaneous with such actuation of the expansion rollers, the arm 15 and the stem 11 will be rocked outwardly forcing the roller 13 and the end 17 into engagement with the projecting end portion of the tube. The roller 13 is of such a form as to be adapted when forced into engagement with the end of the tube to effect the flaring thereof as clearly shown in Fig. 1, the end 17 of the beading arm 15 being adapted to go a step farther and effect the bending of said top end outwardly and downwardly against the adjacent side of the sheet 21. Thus the beading of the end of the tube is effected simultaneously with the expansion thereof. The stem 11 and the arm 15 are so arranged that when the mandrel 8 is removed the same will be formed to swing inwardly so as to permit of ready removal of the tool through the opening 22 when the beading and expanding operation has been completed.

A tool of a construction as set forth is of simple construction and efficient in use.

While I have illustrated and described the preferred form for carrying my invention into effect, this is capable of variations or modifications without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of

construction as set forth but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

5 Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a tube expanding and beading tool, the combination of a tapering mandrel; a tubular body loosely mounted upon said mandrel; a plurality of spaced expansion rollers mounted in said body and adapted to be radially moved therein, the inner sides of said rollers contacting the lateral surface of said mandrel, the outer sides of said rollers being adapted to project beyond the lateral surface of said body; a flaring roller; a stem carrying said flaring roller, one end of said stem being fulcrumed in said bead; a beading arm having one end fulcrumed in said body and having its opposite end formed for the engagement of the extremity of a tube for forming a bead thereon, the intermediate portions of said stem and beading arm projecting into the passage through said body for engagement with said mandrel when the latter is moved longitudinally in said body, substantially as described.

2. In a tube expanding and beading tool, the combination of a tapering mandrel; a tubular body loosely mounted upon said mandrel; a plurality of spaced expansion rollers mounted in said body and adapted for radial movement therein, the inner sides of said rollers contacting the lateral surface of said mandrel, the outer sides of said rollers being adapted to project beyond the lateral surface of said body; a conical flaring roller; a stem carrying said roller at one end thereof, the opposite end of said stem being fulcrumed in said body; and a beading arm having one end fulcrumed in said body and having its opposite end formed for the engagement of the extremity of a tube for the formation of a bead thereon, the central portions of said stem and said arm projecting into the interior of said body for engagement with the lateral surface of said mandrel upon insertion of the latter into said body, said flaring roller and said free end of said beading arm being adapted when forced outwardly by said mandrel and rotated to effect the formation of a bead at the extremity of the tube engaged thereby, substantially as described.

3. In a tube expanding and beading tool, the combination of a tapering mandrel; a tubular body loosely mounted on said mandrel; a plurality of spaced expansion rollers mounted in said body and adapted for radial movement therein, the inner sides of said rollers contacting the lateral surface of said mandrel, the outer sides of said rollers being adapted to project beyond the lateral surface of said body, means adjustably se-

cured to said body for limiting inward movement thereof when inserting said body into position for operation; and a flaring roller and a beading arm fulcrumed in said body and adapted to be moved radially upon longitudinal movement of said mandrel in said body, substantially as described.

4. In a tube expanding and beading tool, the combination of a tapering mandrel; a tubular body loosely mounted on said mandrel; a plurality of spaced expansion rollers mounted in said body and adapted for radial movement therein, the inner sides of said rollers contacting the lateral surface of said mandrel, the outer sides of said rollers being adapted to project beyond the lateral surface of said body; a flange adjustably secured to said body for limiting inward movement thereof when inserting said body in an opening for operation; and a flaring roller and a beading arm mounted in said body and adapted to be moved radially upon lateral movement of said mandrel in said body, substantially as described.

5. In a tube expanding and beading tool, the combination of a tapering mandrel; a tubular body loosely mounted upon said mandrel; a plurality of spaced expansion rollers mounted in said body and adapted for radial movement therein, the inner sides of said rollers contacting the lateral surface of said mandrel, the outer sides of said rollers being adapted to project beyond the lateral surface of said body; a conical flaring roller; a stem carrying said roller at one end thereof, the opposite end of said stem being fulcrumed in said body; a beading arm having one end fulcrumed in said body and having its opposite end formed for the engagement of the extremity of a tube for the formation of a bead thereon, the central portion of said stem and said arm projecting into the interior of said body for engagement with the lateral surface of said mandrel upon insertion of the latter into said body, said flaring roller and said free end of said beading arm being adapted when forced outwardly by said mandrel and rotated to effect the formation of a bead at the extremity of the tube engaged thereby; and a flange adjustably secured to said body for limiting inward movement thereof when inserting said body into an opening for operation, substantially as described.

6. In a tube expanding and beading tool, the combination of a tapering mandrel; a tubular body loosely mounted upon said mandrel; a plurality of spaced expansion rollers mounted in said body and adapted for radial movement therein, the inner sides of said rollers contacting the lateral surface of said mandrel, the outer sides of said rollers being adapted to project beyond the lateral surface of said body; a conical flaring roller mounted in a longitudinally extend-

ing slot provided in said body; a stem arranged in said slot and carrying said roller at one end thereof, the opposite end of said stem being fulcrumed in said body; and a
5 beading arm arranged in a longitudinally extending slot provided in said body, the same having one end fulcrumed in said body and having its opposite end formed for the engagement of the extremity of a tube for
10 the formation of a bead thereon, the central portions of said stem and said arm projecting into the interior of said body for engagement with the lateral surface of said mandrel upon insertion of the latter into

said body, said flaring roller and said other
15 end of said beading arm being adapted when forced outwardly by said mandrel and rotated to effect the formation of a bead at the extremity of the tube engaged thereby, substantially as described. 20

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

THOMAS F. GRADY.

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."