March 6, 1934. F. BIGGS 1,949,598

CUTTER FOR BOILER TUBES OR FLUES

Filed Dec. 29, 1932

FIG. 1.

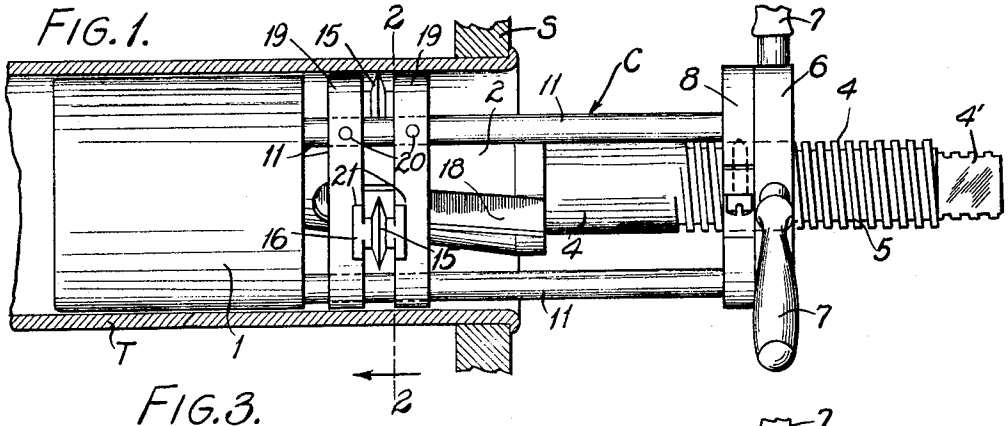


FIG. 3.

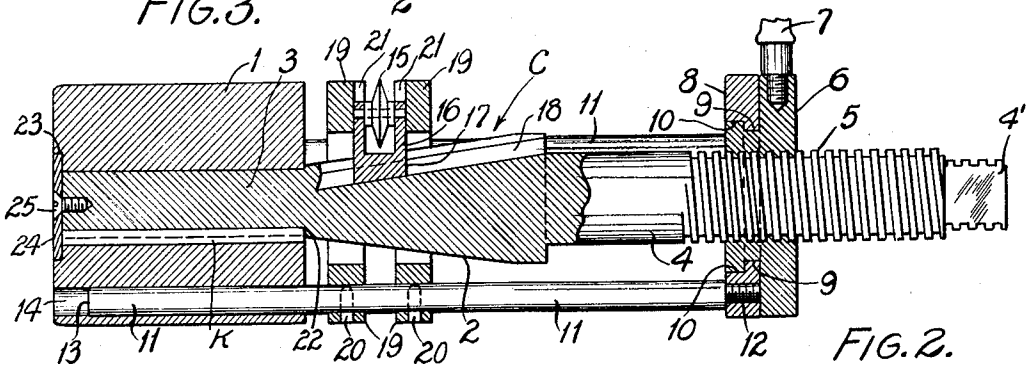


FIG. 2.

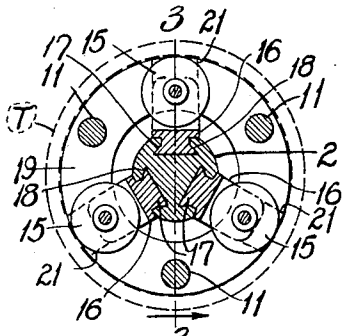


FIG. 5.

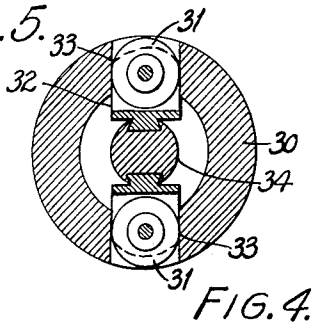


FIG. 4.

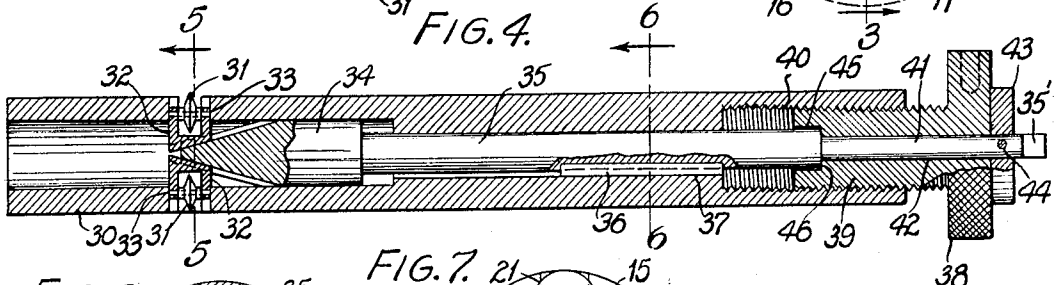


FIG. 6.

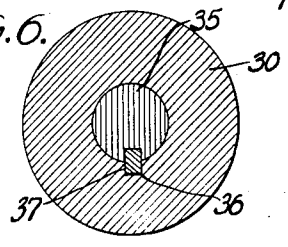
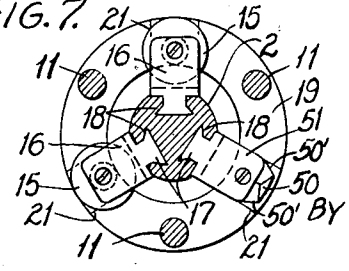


FIG. 7.



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CUTTER FOR BOILER TUBES OR FLUES

Frank Biggs, St. Louis, Mo.

Application December 29, 1932, Serial No. 649,250

1 Claim. (Cl. 81—195)

My invention has relation to improvements in cutters for boiler tubes or flues, and it consists in the novel features of construction more fully set forth in the specification and pointed out in the claim.

The object of the present invention is to provide a tube cutter that has a plurality of cutting elements and a wide bearing within the tube being cut so that the tube will not be unduly flared or bell-shaped during the cutting operation. The advantage of preventing the cut end of the tube from becoming bell-shaped is especially pronounced in removing old tubes from boilers. If the tube has been unduly spread at the cut end it cannot be removed through the flue sheet without first performing the additional operation of again contracting the flared end. I have found that if the support of the cutting tool in the tube is entirely separated from the cutters the flaring of the cut end is reduced to a minimum and the tube may be withdrawn from the boiler shell through the tub opening in the sheet without difficulty. This advantage, as well as others inherent in the invention, will be better apparent from a detailed description of the same in connection with the accompanying drawing, in which:

Figure 1 is a side elevation of my improved tube cutter applied to a boiler tube preparatory to cutting the same for subsequent removal from the boiler shell; Fig. 2 is a vertical cross-section through the cutter taken on the line 2—2 of Fig. 1, the boiler tube being shown dotted; Fig. 3 is a vertical longitudinal section through the cutter taken on the line 3—3 of Fig. 2; Fig. 4 is a longitudinal section taken on a medial plane through a modified form of tube cutter particularly adapted for cutting the smaller sizes of tubes; Fig. 5 is a cross-sectional detail taken on the line 5—5 of Fig. 4; Fig. 6 is a cross-sectional detail taken on the line 6—6 of Fig. 4; and in Fig. 7 I show a cross section similar to Fig. 2 except that one of the cutter wheels has been replaced by a burr cutter as a modified form of the invention.

Referring to the drawing, T represents a boiler tube, one end of which is secured in the flue sheet S, as well understood in the art, and C represents my improved cutter and applied to said tube for the purpose of cutting the same just inside the flue sheet S for subsequent removal from the boiler shell. The cutter comprises a bearing member 1 insertable in the tube for giving the necessary support to the cutter and a feed cone 2 having at one end a cylindrical extension 3 mounted in bearing member 1 and secured thereto by a key *k*. A spindle 4 is formed on the outer end of cone 2, said spindle 4 having feed threads 5 over which operates an adjusting nut 6 having a plurality of handles 7, 7, 7. The adjusting nut carries a split collar 8 maintained in assembled relation on the nut by means of the interlocking tongues 9 and 10, which collar is relatively rotatable with respect to the nut for the purpose presently to appear. A series of equally spaced guide rods 11 (in the present instance 3) are secured into the collar 8 by means of threaded extremities 12 and have their free ends 13 slidably mounted in bores 14 formed in the bearing members 1 and properly spaced to receive the rods 11. In the present instance the cutter C has three cutter wheels 15 arranged in equally spaced relation and mounted for rotation in cutter yokes 16. The inner ends of the cutter yokes are provided with dovetail formations 17 for sliding in corresponding dovetailed grooves 18 formed on the periphery of the feed cone 2. The cutter wheels 15 are maintained in assembled relation with respect to each other by means of spaced confining rings 19, 19 fixed to each of the rods 11 by means of pins (or set screws) 20, and the inner surfaces of the rings 19, 19 are provided with opposed grooves 21, 21 for receiving the cutter yoke 16 which slide in said grooves. It will be observed that the diameter of the cylindrical portion 3 of the feed cone 2 is slightly smaller than the smallest diameter of the cone 2 so that a shoulder 22 is formed against which the bearing member 1 abuts, and the outer end of the member 1 is countersunk at 23 to receive a disk 24 securely fixed to the member 3 by the screw 25 whereby the member 1 is confined between said disk and shoulder 22 and maintained in fixed position on the member 3. The rings 19, 19 together with collar 8 and rods 11, 11 may be termed a supporting frame for the cutter wheels 15.

The operation of my improved device should be obvious from my foregoing description but briefly may be described as follows:

The cutter C is applied to the tube that is to be cut by inserting the bearing member 1 therein so that the cutter wheels 15 will come at that point in the tube that is to be cut. The operator then rotates the nut 6 so as to drive the feed cone 2 forwardly and cause the cutter wheels 15 to be extended radially to contact with the tube. A suitable hand tool or chuck equipped with a motor is then applied to the extremity 4' of the spindle 4 and rotated. The entire cutter including the cutter wheels 15 will then be rotated and

as the wheels are riding over the inside surface of the tube the adjusting nut 6 will be turned so as to gradually extend the cutter wheels more and more until they shall have finally been extended sufficiently to have cut entirely through the flue or tube T. Owing to the long bearing of the cutter within the tube and also to the bearing obtained by the rings 19, 19 on either side of the cutter wheels and in close proximity thereto there will be very little tendency for the cutter wheels to cause the cut end of the flue to be pressed outwardly and to become bell-mouthed. Consequently, as above stated, after the tube has been cut it may be easily removed through the opening in the flue sheet S.

In the modified form of tube cutter, shown in Figs. 4, 5 and 6, a tubular housing 30 is utilized for supporting the cutter wheels 31, 31 which are mounted in yokes 32, 32 disposed in openings 33, 33 formed in the housing 30. The yokes 32, 32 cooperate with the feed cone 34 in the same manner as in the main form shown in Figs. 1 to 3 inclusive. An operating spindle 35 is formed integrally with the cone 34 and is slidably mounted in the housing 30 to which it is connected by a key 36 operable in the key-way 37 in the housing. An adjusting head 38 has a threaded portion 39 for operation within a threaded socket 40 formed in the outer end of housing 30 and the spindle 35 has a reduced extremity 41 pass through an axial bore 42 in the operating head 38. A retaining disk 43 is mounted on the spindle extremity 41 in contact with the operating head 38, said disk being secured to the spindle extremity 41 by means of a pin 44. The inner end of the threaded portion 39 of head 38 is provided with a socket 45 for receiving the shoulder 46 of the spindle 35. The spindle 35 has its outer extremity 35′ formed to receive the driving shaft of a hand drill (not shown).

In operating the modified form of cutter the housing 30 is inserted into the tube and the head 38 rotated to propel the spindle 35 and cone 34 forwardly, thus extending the cutters 31 so that they will engage the inner surface of the tube being cut. Thereafter the spindle 35 is rotated either by hand or power whereupon the entire cutter will be rotated due to the connection of the spindle with the housing 30 through the key 36. Of course, the rotation of the housing 30 will rotate the cutters 31 which are gradually extended radially by a continued adjustment of the head 38 until the tube has been entirely cut through.

In Fig. 7 I show a further modification of my improved cutter wherein a burr cutter may be substituted for one of the cutter wheels 15, said burr cutter being in the shape of a blade 50 fixed in a cutter mount 51 connected to the feed cone and operable thereby in the same manner as are the yokes 16. However, the burr cutter would not extend outwardly quite so far as the cutter wheels so that it would perform its operation of removing the burr from the cut edges of the tube T after the tube has been entirely severed. The blade 50 has lateral cutting edges 50′, 50′ which operate over the cut edges of the tube to entirely remove the burr therefrom.

Having described my invention, I claim:

A boiler tube cutter comprising a bearing member insertable in a tube, a driving spindle immovably supported at one end in the bearing member, a cutter feed cone on said spindle, said cone having a plurality of longitudinally disposed grooves on its periphery, a cutter slidingly mounted in each of said grooves, a supporting frame for the cutters, and an adjusting means comprising a nut connected with said frame for actuating the same to adjust the cutters, and driving rods supported by the nut and the bearing member.

FRANK BIGGS.