

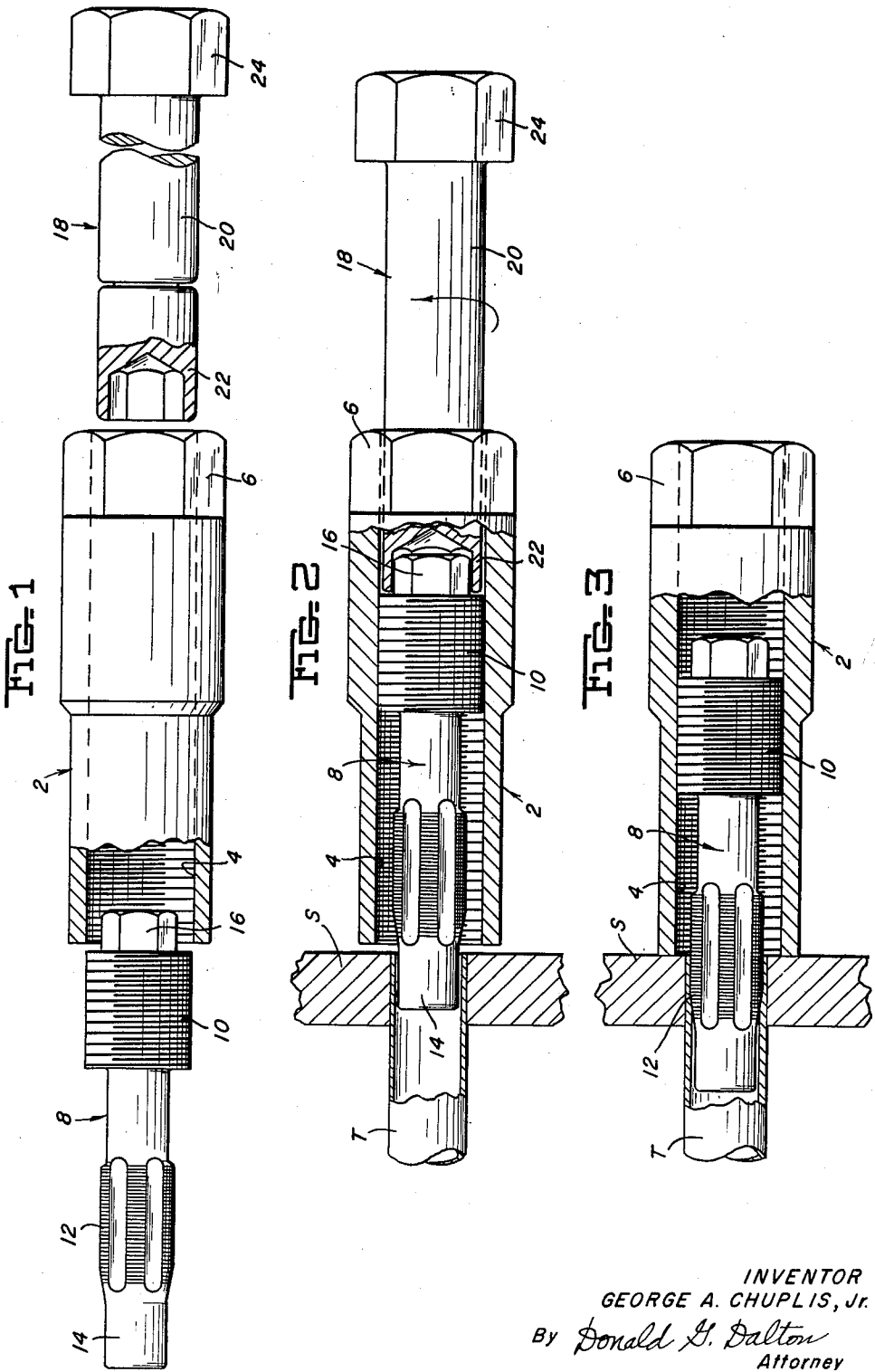
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G. A. CHUPLIS, JR
TUBE PULLER

3,120,700

Filed Jan. 24, 1961

2 Sheets-Sheet 1



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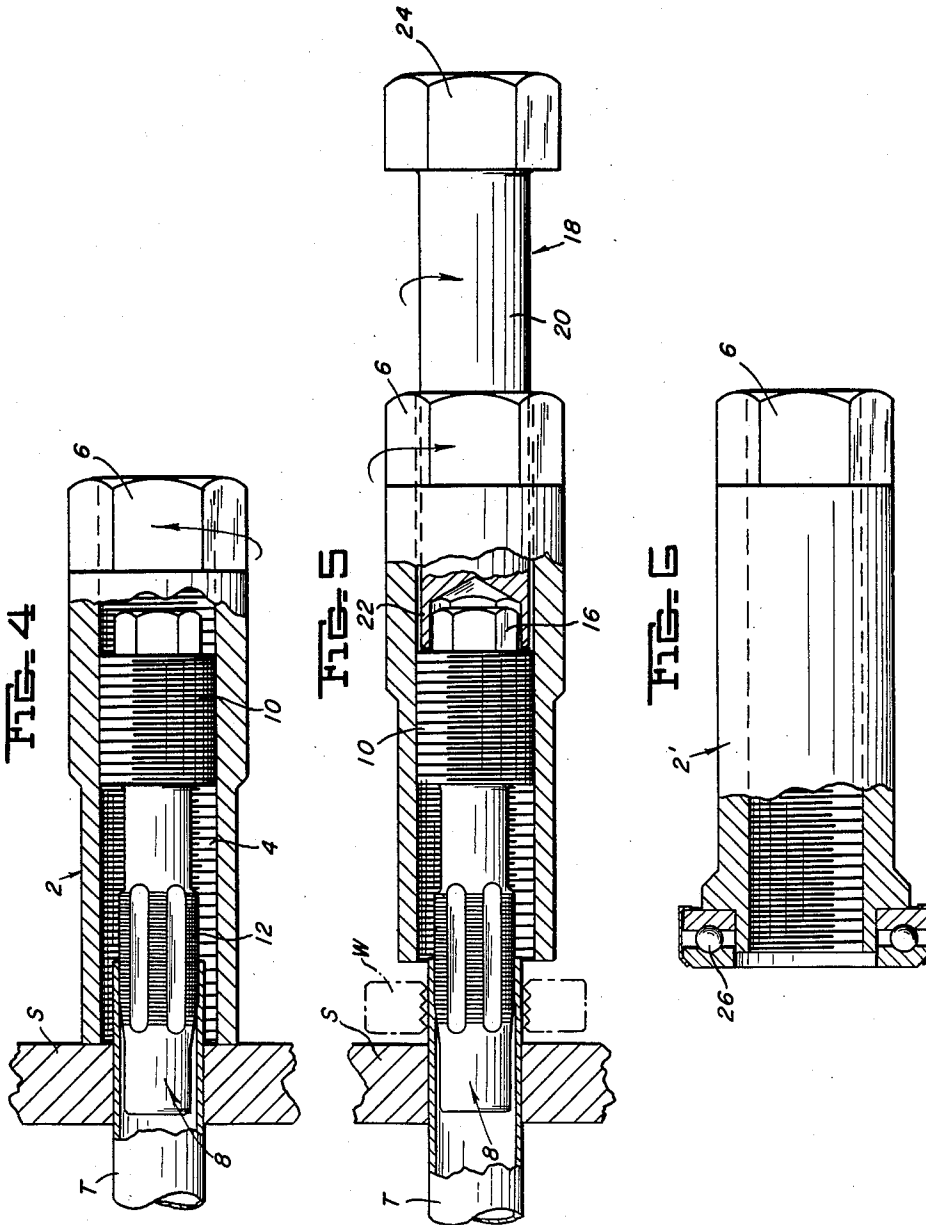
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TUBE PULLER

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The present invention relates generally to extraction tools and more particularly to a tube puller especially suitable for removing condenser tubes from a heat exchanger.

Prior to my invention, the method generally used for removing condenser tubes from a heat exchanger involved cutting each of the tubes in two and then loosening each cut section from its respective tube sheet by driving it outwardly from the interior of the heat exchanger. The outwardly projecting ends of the cut sections were then pulled through the tube sheets to complete the tube removal operation.

This method of removing condenser tubes was hazardous, crude and inefficient at best. In practicing the prior art method, the workmen driving the cut tubes from the interior of the heat exchanger were exposed to the danger of injury by the ends of the cut sections. The method also required considerable time and consequently resulted in excessive down-time whenever it was necessary to re-tube a heat exchanger. A further disadvantage of this method was the possibility of damage to other parts of the heat exchanger when the cut sections were being driven from the interior of the heat exchanger to loosen them from the tube sheets.

Due to the numerous difficulties involved in removing condenser tubes by the prior art method, it was usual practice, when individual condenser tubes became damaged, to plug each tube as it failed pending a complete re-tubing operation. This practice resulted in operation of the heat exchanger at less than peak efficiency much of the time.

It is, accordingly, a primary object of my invention to provide a tool for extracting tubes from the tube sheets of heat exchangers and the like whereby the tubes can be pulled for removal in a manner devoid of the disadvantages inherent in methods of tube removal practiced heretofore.

As a corollary to the object above, it is a further object of my invention to provide a tube puller which includes a tapping element for engaging the tube to be pulled and a pulling element operatively combined with the tapping element in a novel arrangement.

It is a further object of my invention to provide a tube puller which is inexpensive to manufacture, simple in structure, rugged in construction and efficient in operation.

These and other objects will become more apparent after referring to the following specification and attached drawings in which:

FIGURE 1 is an exploded view partly in section;

FIGURES 2, 3, 4 and 5 are elevational views partly in longitudinal section showing the device of the invention in various stages of operation; and

FIGURE 6 is an elevational view partly in longitudinal section showing a modification of the invention.

Referring more particularly to the drawings, reference numeral 2 designates a jack nut in the form of an elongated member having an internally threaded axial bore 4 therethrough and a hexagonal head 6 at one end whereby the elongated member can be engaged and turned by a conventional impact wrench (not shown).

Reference character 8 designates, generally, the tapping element of the invention which is in the shape of an

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elongated stud formed with an externally threaded portion 10 intermediate its ends, a tap 12 of reduced diameter including a tap pilot 14 integral with one end, and an integral hexagonal head 16 at its other end. The hexagonal head 16 has a diameter less than the inside diameter of bore 4 so as to permit free passage of the head 16 through the bore and also to provide clearance so that the head can be engaged by the socket of a tap driver as will be more fully described. The stud 8 is disposed in the jack nut 2 for relative axial movement therewith with the threaded portion 10 of the stud screwed into the bore 4.

Reference numeral 18 designates a tap driver adapted to engage and rotate the stud 8 within the bore of jack nut 2. Tap driver 18 includes an elongated shank 20 having a socket 22 formed on one end and a hexagonal head 24 at its other end. The outside diameter of the shank 20 and the socket 22 are uniform and less than the inside diameter of the bore 4 so that the shank can be inserted into the bore to effect engagement of the socket 22 with the head 16 of the stud. The hexagonal head 24 is preferably of the same size as the head 6 of the jack nut so that the same size impact wrench can be used to engage either head. The tap 12 is dimensioned to suit the internal diameter of the tubes to be pulled and is tapered at its leading end to permit quick cutting into and tapping of the inside of the tube to be pulled so as to effect a firm grip thereon.

In operation, removal of a tube T from the tube sheet S of a heat exchanger begins by threading the stud 8 into the bore 4 of the jack nut 2 until only the tap pilot 14 projects beyond the end of the jack nut remote from the head 6. The device is then positioned with the tap pilot inserted in the end of the tube T. After the device is thus positioned, the shank 20 of the tap driver 18 is inserted into the bore 4 to engage the head 16 of the stud with the socket 22. An impact wrench (not shown) is then applied to head 24 and the tap driver is rotated to rotate the tap stud and force the tap 12 into the tube end. The tap driver is then withdrawn and the impact wrench is applied to the head 6 of the jack nut to rotate it and cause it to travel along the stud 8 until its end abuts the tube sheet S as shown in FIGURE 3. Continued rotation of the jack nut after it engages sheet S causes the stud 8 to retract into the bore 4 and the tube T to be pulled out of the tube sheet. After the tube has been pulled out a short distance the jack nut is rotated in the reverse direction to cause it to back off along the stud 8 to its original position, i.e. to the position where only the tap pilot projects outwardly of the jack nut. Then the pulled-out portion of the tube T can be gripped with a pipe wrench W to prevent it from rotating and the stud is rotated by means of the tap driver to remove the tap from tube and thus disengage the tube puller from the tube. Pulling of the tube from the tube sheet S may then be completed manually.

FIGURE 6 illustrates a modified jack nut 2' having an anti-friction bearing 26 circumferentially disposed around its end remote from its hexagonal head 6'. A portion of bearing 26 projects beyond the end of the jack nut and serves to facilitate rotation of the jack nut when its end abuts the tube sheet S during the tube removal operation as described above.

While one embodiment of my invention has been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. Apparatus for pulling an unthreaded tube from the tube sheet of a heat exchanger which comprises an elongated main body having an internally threaded axial bore therethrough, the diameter of said bore being greater

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than the outside diameter of said tube, an elongated stud having an externally threaded portion intermediate its ends threadingly disposed in said bore for relative axial movement therein, said stud having a threading tap of reduced diameter adjacent one end adapted to be inserted in said tube to tap the same, the end of said stud remote from said tap having a nut integral therewith, and means on the end of said stud remote from said tap for turning the stud to move it axially along said bore, said stud-turning means including an elongated member having a socket at one end adapted to engage said nut, the outside diameters of said nut and said socket, respectively, being less than the inside diameter of said bore whereby said nut is engageable by the socket within said bore.

2. Apparatus for pulling an unthreaded tube from the tube sheet of a heat exchanger which comprises an elongated main body having an internally threaded axial bore therethrough, the diameter of said bore being greater than the outside diameter of said tube, an elongated stud having an externally threaded portion intermediate its ends threadingly disposed in said bore for relative axial movement therein, said stud having a threading tap of reduced diameter adjacent one end adapted to be inserted

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in said tube to tap the same, said one end of said stud having a diameter less than the inside diameter of said tube whereby the insertion of said threading tap into said tube is facilitated, means on the end of said stud remote from said tap for turning the stud to move it axially along said bore, said main body having a reduced outside diameter portion at the end thereof remote from said turning means forming a shoulder, an anti-friction bearing circumferentially disposed around said reduced diameter portion with one end thereof juxtapositioned against said shoulder and its other end projecting beyond said last-mentioned end of said body, said projecting end of said anti-friction bearing being adapted to bear against said tube sheet when said threading tap is inserted in said tube to thereby facilitate rotation of said main body relative to said tube sheet.

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