Dec. 18, 1928. 1,695,616

H. A. STAPLES

METHOD OF AND TOOL FOR PACKINC CONDENSER TUBES OR THE LIKE

Filed March 14, 1927

FIG 1

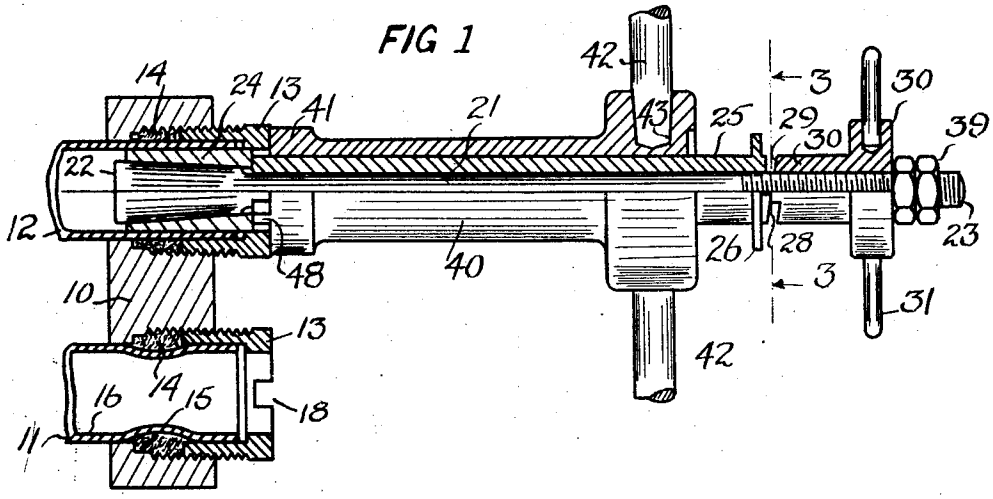


FIG 2

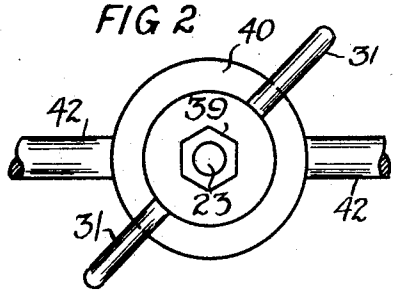


FIG 3

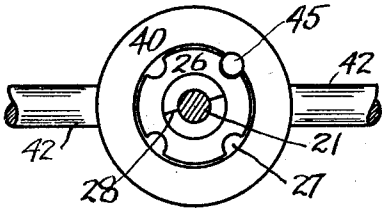
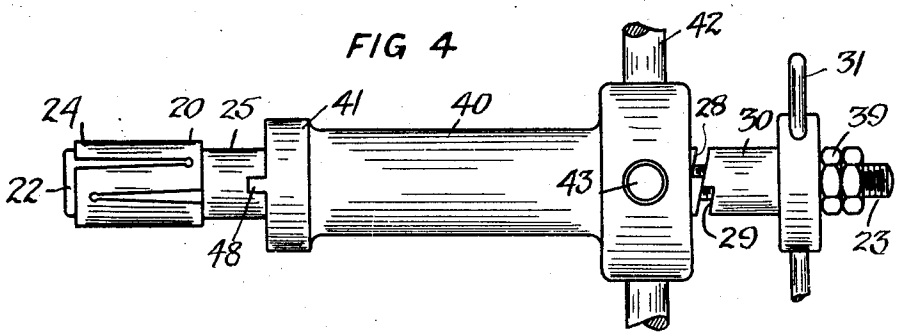


FIG 4



HORACE A STAPLES
INVENTOR

BY Edward Rauhinsky
HIS ATTORNEY

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UNITED STATES PATENT OFFICE.

HORACE A. STAPLES, OF PLAINFIELD, NEW JERSEY, ASSIGNOR TO NATIONAL ELECTRIC PRODUCTS CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

METHOD OF AND TOOL FOR PACKING CONDENSER TUBES OR THE LIKE.

Application filed March 14, 1927. Serial No. 175,355.

My invention relates to a method of packing the tubes contained in a condenser and has for its object to provide a method that will permit the tightening of the packing gland without any crimping or deformation of the tube.

A further object is to provide a simple and convenient tool that will permit the practicing of my method by inexperienced or careless workmen without damage to the tube.

In the packing of a condenser tube it is customary to use a screw ferrule at least on one end of the tube to allow for contraction and for expansion of the tube. Frequently in screwing in of this ferrule into the tube sheet the workman will crimp the tube or cause it to collapse, forming an annular ring which acts against the tube from freely expanding and/or contracting and results in leaky tubes. This is especially true with tubes of the lighter gauges, such as wall thickness of .049 or less but is also true to a certain degree in heavy wall hard drawn tubes. This crimping of the tube is frequently caused by the specifications demanding that the ferrules shall not protrude beyond the tube sheet by some specified amount, so that any variation in the hardness of the packing will result in that those tubes which are packed with hard or oversized packing will crimp or deform to provide room for the excessive packing which is used. This fact causes, besides leaky tubes, a restricted orifice which tends to cause corrosion of the tube back of the crimped portion.

The foregoing and other features of my invention will now be described in connection with the accompanying drawing forming part of this specification in which I have illustrated a form of tool which I may employ in the carrying out of my method, after which I shall point out in the claims those features which I believe to be new and of my own invention.

In the drawings:

Figure 1 illustrates a side view of my tool, the upper half being in section, inserted in a tube sheet in part section.

Figure 2 is an end view of my tool looking from the right hand end of Figure 1.

Figure 3 is a section along the line indicated as 3—3, Figure 1.

Figure 4 is a side view of my tool showing the position of the elements when the mandrel or arbor is expanded.

My method is simply rigidly supporting the condenser tube against collapse or deformation during the tightening of the ferrule of the packing gland.

In Figure 1, I illustrate a tube sheet 10 in part section showing two tubes 11 and 12. The tube 11 illustrates a conventional tube packed by screwing the ferrule 13 in hard against the packing 14 which crimps or deforms the tube contracting the end forming a Venturi orifice 15, which is so undesirable in condenser practice. This causes excessive and rapid corrosion at 16. My method is shown being put in practice in tightening tube 12 in the tube sheet.

For the purpose of carrying out my invention I provide a tool which is a combination expanding mandrel or arbor 20 and wrench 40 coaxially arranged and adapted to be freely moved on one another, and to be locked against such movement during the expanding and/or contracting of the expanding arbor or mandrel for withdrawing from or inserting in, the tube.

My expanding arbor or mandrel may be any desirable type but for the purpose of illustration I provide a spindle 21 provided with a cam-shaped end 22 and a screw threaded end 23. An expandable arbor 24 is mounted on the cam 22 and adapted to be radially expanded thereby. A sleeve 25 slides over the spindle 21 and has mounted on its end a collar 26 provided with means 27 for engaging the wrench 40 to keep the parts from turning when so desired. On the outer face of the collar 26 I provide teeth or cam-faces 28 which engage or co-act with the teeth or cam 29 on the threaded nut 30. This nut 30 is provided with handles 31 for convenience of operation.

For tightening the ferrules I provide a wrench 40 which may be provided with any shape of head 41. I have illustrated a wrench with two bosses 48 adapted to fit in the slots 18 of the type of ferrule shown. It will be readily understood that if the ferrule had some other shaped head, the head of my wrench would of necessity be made to fit that type head, and I may even provide a head on my tool that is adapted to grip and securely hold a smooth ferrule. My wrench 40 is

adapted to freely slide on and revolve about the sleeve 25 of my arbor member and on the end opposite the head 41 I provide handles 42. I have shown four tapered holes 43 in my wrench 40 in which the two handles are turned, but it will be readily understood that other types of handles may be used, and I may even employ any well known ratchet construction without departing from the invention.

In the tool on the handle end I provide a means 45 which co-operates with the means 27 on the arbor member to lock the wrench and arbor from relatively turning.

The parts are then in the locked position as shown in Figure 4. This makes it possible to turn the nut 31 which is held on the screw threaded portion of spindle 21 by the lock nuts 39 so that the teeth or cams 29 coacting with the cams 28 pulls the cam or wedge 22 into the arbor head 24 thereby expanding it to its desired size. This head 24 is shown in its expanded position in Figure 4.

The operation is as follows: The tube 12 is inserted in the tube sheet, the packing 14 inserted around the tube and the ferrule 13 screwed loosely into the screw threaded portion of the tube sheet. My tool is then inserted so that the arbor is within the tube at the point of packing, all as shown in Figure 1. The wrench portion 40 is then withdrawn to position on the sleeve 25 as shown in Figure 4. This locks the arbor member and the wrench member together. The nut 30 is then turned expanding the arbor until it tightly fits in the tube 12. This action will true any condenser tube that may be slightly out of round and thereby will materially aid in providing longer life for the tube. The wrench is then slid forward into engagement with the ferrule which unlocks the wrench from the arbor and permits it to revolve thereon and the ferrule is tightened in place. The supporting of the tube in this manner against collapse, crimp and/or otherwise deformation makes it quite impossible to have defective tubes due to careless or inexperienced workmen.

I wish it distinctly understood that my method of and tool for the packing of condenser tubes or the like herein described and illustrated is in the form in which I desire to practice the method and construct the tool and that changes or variations may be made as may be convenient or desirable without departing from the salient features of my invention and I therefore intend the following claims to cover such modifications as naturally fall within the lines of invention.

I claim:

1. A method of packing a tube in a tube sheet having a packing gland with a screw threaded ferrule, which comprises rigidly supporting the tube against deformation at the packing during the tightening of the ferrule.

2. A tool of the class described in combination, an expanding mandrel with means to expand the mandrel, an independent wrench co-axial therewith and adapted to revolve and slide thereon without operating the mandrel.

3. A tool of the class described in combination, an expanding mandrel, a wrench coaxial therewith and adapted to revolve and slide thereon, means to lock the two from turning and means to expand the mandrel when the two are in locked position.

4. A tool of the class described in combination, an expanding mandrel, with operating means therefor, an independent wrench coaxial therewith, means to expand the mandrel without moving the wrench, means to turn the wrench without turning the mandrel.

In testimony whereof I affix my signature.

HORACE A. STAPLES.