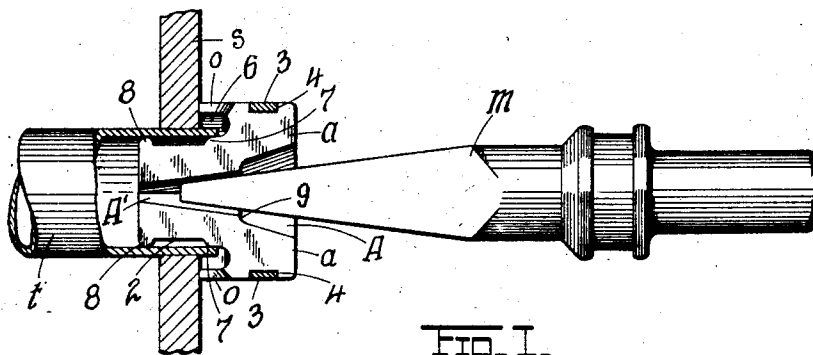
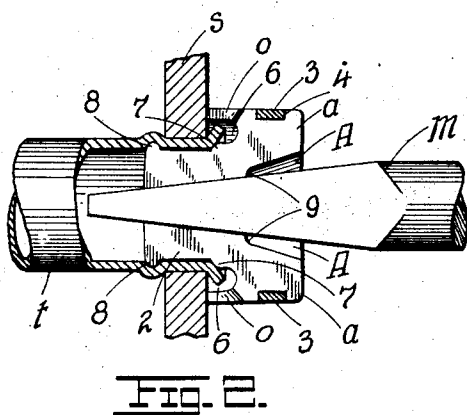
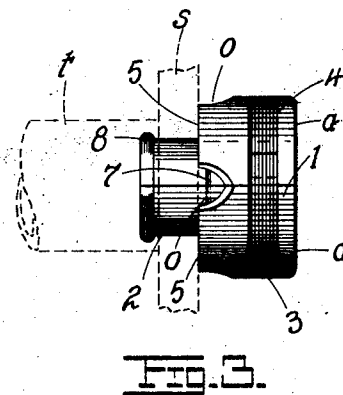
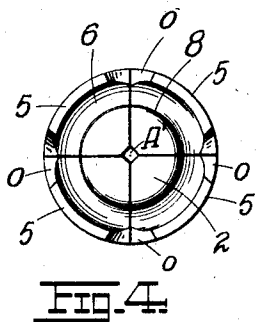
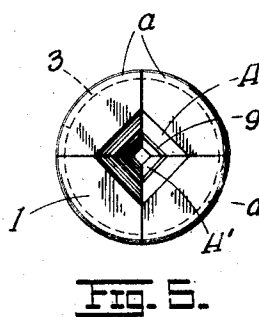


No. 866,644.

PATENTED SEPT. 24, 1907.

T. P. GREEN.
TUBE EXPANDER.
APPLICATION FILED MAY 18, 1907.



WITNESSES:

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THOMAS P. GREEN, OF ST. LOUIS, MISSOURI.

TUBE-EXPANDER.

No. 866,644.

Specification of Letters Patent.

Patented Sept. 24, 1907

Application filed May 18, 1907. Serial No. 374,343.

To all whom it may concern:

Be it known that I, THOMAS P. GREEN, a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Tube-Expanders, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in tube-expanders; and it consists in the novel details of construction more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a middle longitudinal section of the expander taken along the plane of separation between its component sections, and showing the boiler tube before expansion; Fig. 2 is a similar view showing the tube expanded and the mandrel advanced the necessary distance to effect the separation of the sections; Fig. 3 is a side elevation of the complete expander; Fig. 4 is a front end view thereof; and Fig. 5 is a rear end view of the expander.

The object of my invention is to construct a tube-expander whose operating pin or mandrel may be readily withdrawn from the socket of the tool to allow the expander to release its hold on the tube when occasion requires the turning of the expander during its legitimate course of operation; one which shall penetrate the tube to the proper distance beyond the inner face of the tube-sheet thereby insuring uniformity in results; one permitting a free inspection of the end of the tube during the process of expansion; and one possessing further and other advantages better apparent from a detailed description of the invention which is as follows:

Referring to the drawings, *a, a*, represent a series of sections of which the expander is composed said sections being separated along planes of division radiating from the central longitudinal axis of the tool, said sections being of any convenient number, and in the present instance four such sections being preferred. The sections when assembled form an inner hollow cylindrical body 1 and an outer hollow smaller cylindrical plug 2, the sections being yieldingly held together by an open spring band 3 embedded in an annular peripheral groove 4 formed near the base of the body portion 1. The inner end of the peripheral wall of the body portion terminates in an annular flange 5 having excised terminals contiguous to the planes of separation between the several sections, such excised portions forming sight-openings *o* for observing the condition of the outer end of the tube *t* projecting beyond the tube-sheet *s*. The edge of the flange 5, in the operation of the expander, bears against the outer face of the tube-sheet thereby limiting the depth of penetration of the plug 2 into the tube. There is thus formed between the

base of the plug 2 and the flange 5, an annular basin 6 which receives the projecting end of the tube *t*.

Disposed around the base of the plug 2 in a plane interior to the plane of disposition of the free outer edge of the flange 5 is an annular shoulder 7 which, in the spreading of the sections *a, a*, during the expanding process, engages the end of the tube *t* at points removed a suitable distance beyond the plane of intersection of the outer face of the sheet *s* with the tube. The outer face of the sheet *s* thus serves as a fulcrum about which the projecting end of the tube may bend (Fig. 2) as it is being gradually expanded against the sheet. Were the shoulder 7 disposed in the same plane with the free edge of the flange 5, the effect of the separation or expansion of the sections would be to shear or flake off the tube instead of bending it against the sheet. So that the position of the shoulder 7 is an important feature of the present invention. The outer end of the plug 2 terminates in a bead or rim 8 whose base is substantially in or just beyond the plane of the inner face of the sheet *s* and in the separation of the sections expands the tube against the inner face of the sheet (Fig. 2).

As stated above, the expander is hollow, being provided with a tapering socket A terminating in a reduced section or socket A', the two sections being separated by an offset or shoulder 9 whose position is approximately in the plane of disposition of the base of the basin 6. This socket receives the tapering end of the pin or mandrel M which may receive its blows by a pneumatic hammer (not shown). The cross section of the socket A, A', is square or polygonal (the tapering end of the mandrel being pyramidal), the engagement of the mandrel being confined to the walls of the socket section A', so that while sufficient to effect the spreading of the sections *a, a*, as the mandrel is being driven inwardly, the surface of engagement is not so extended as to interfere with the ready retraction of the mandrel for purposes of loosening the expander from the tube when occasion arises to impart a slight rotation to the tool in the course of its normal operation (for it is well understood in the art that the tool or expander is turned about its axis from time to time until the operation is completed).

The type of expander here shown is well understood in the art, and while generally composed of five or more sections I find that with my qualified construction four sections are sufficient. The advantage of limiting the engagement of the mandrel to the section A' of the socket, is that in the driving of the mandrel, the sections *a a* will more nearly separate or spread apart in directions at right angles to the axis of the tool, and will be less liable to oscillate about a common center. That is to say the sections while spreading under the driving

action of the mandrel will move parallel to themselves, so that the expansion of the tube against both faces of the sheet *s* will be practically equal. The manner of assembling the sections is well understood in the art and
5 no comment is necessary thereon.

Having described my invention, what I claim is:

1. A tube expander comprising a series of hollow separable sections disposed about a common central axis, said expander having a socket comprising an outer reduced
10 tapering section and an inner enlarged section, an offset or shoulder formed at the adjacent ends of said sections, in combination with a mandrel engaging the walls of the reduced section of the socket, substantially as set forth.
- 15 2. A tube expander comprising a series of hollow separable sections disposed about a common central longitudinal axis, and terminating at the outer end in a plug having a terminal head and an annular basal shoulder, and terminating at the opposite end in an enlarged body

portion having a flange extending around the base of the plug and forming a basin therewith, the edge of the flange being disposed in a plane beyond the plane of disposition of the annular shoulder aforesaid, said flange having excised portions forming sight openings for observing the end of the tube operated on, the expander having a tapering socket formed of a reduced section located in the plug, and an enlarged section formed in the body portion, the sections of the socket being separated by a shoulder or offset disposed in a transverse plane parallel to the plane of disposition of the base of the basin aforesaid, the parts operating substantially as and for the
20
25
30 purpose set forth.

In testimony whereof I affix my signature, in presence of two witnesses.

THOMAS P. GREEN.

Witnesses:

EMIL STAREK,
MARY D. WHITCOMB.