

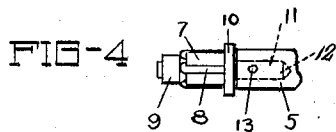
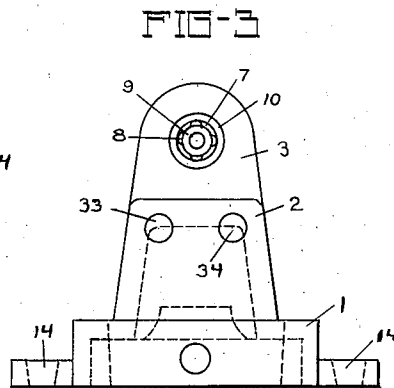
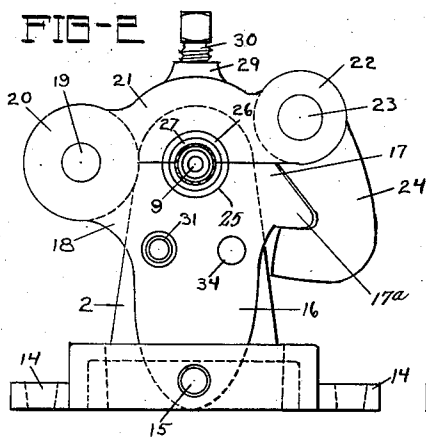
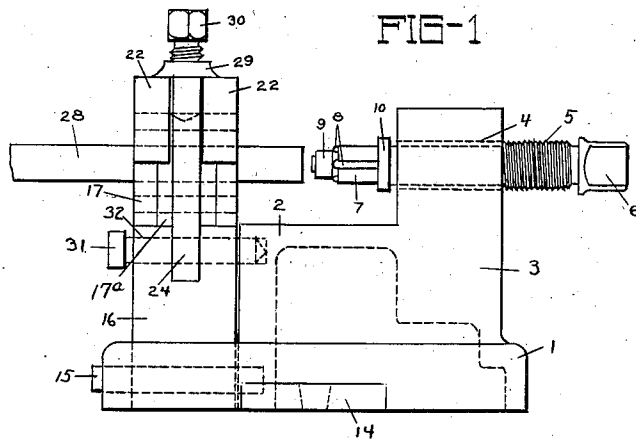
April 23, 1935.

T. BRIEGEL

1,998,654

METHOD FOR FORMING JOINTS IN METAL TUBING

Original Filed Jan. 13, 1933 2 Sheets-Sheet 1



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FIG-5

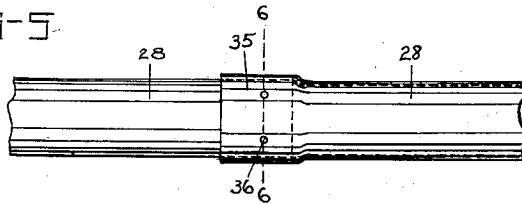


FIG-6

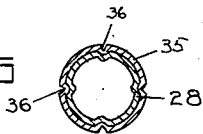


FIG-7

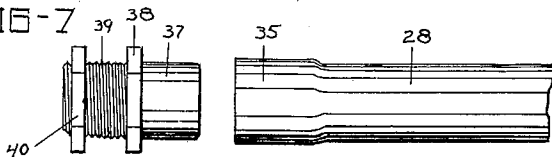


FIG-8

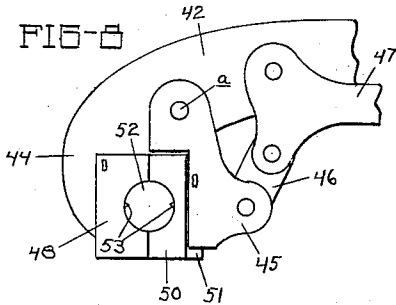


FIG-9

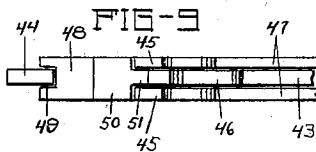
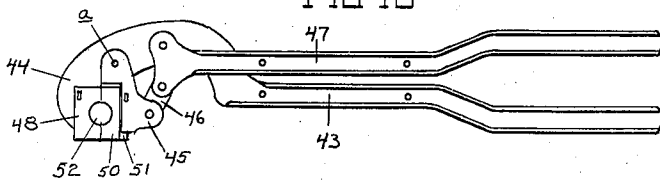


FIG-10



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# UNITED STATES PATENT OFFICE

1,998,654

## METHOD FOR FORMING JOINTS IN METAL TUBING

Theodore Briegel, Moline, Ill.

Original application January 13, 1933, Serial No. 651,547. Divided and this application July 17, 1933, Serial No. 680,821

### 2 Claims. (Cl. 153—2)

My invention has reference to a tube jointing method, of a character similar to that set out in my former application for Letters Patent of the United States, for a tube jointing method and means for practicing the same, filed January 13, 1933, Serial No. 651,547 of which this is a divisional application. It is set forth therein as being more specially designed for use in uniting sections of steel tubing such as are made use of in forming conduits for carrying electrical wires and the like. It is not limited to such use, however, but is of equal utility in uniting sections of tubing formed of copper or other metals.

The purpose of the invention is carried out by expanding one end of one tube section to a diameter to receive the end of the next adjacent section, uniting the ends of said sections, and compressing the expanded portion until the end of the adjacent section is tightly grasped thereby. At the same time the ends are fastened together by indentations formed in the outer telescoping part.

In said former application certain mechanisms and tools were set forth as being instrumental in carrying out the method, and in the present application said mechanisms and tools will be retained as being illustrative of devices for use in carrying out such method; it being understood that other mechanisms and tools can be substituted therefor for making the method effective, or that changes can be made in the form and manner of operation of those which are shown, and still keep within the scope and purpose of the invention.

By the method herein set forth the ends of a pair of tube sections of similar diameter can be readily united, forming a joint of great rigidity and strength, and which will resist a considerable amount of lengthwise stress, tending to separate said sections. This makes it of great advantage in connecting copper tubing or other tubing which is to be drawn through a duct of considerable length, and wherein the tube sections must be united before they enter the duct. With coupling methods such as are now employed there is always danger of the sections separating in the duct.

Other advantages of the invention consist of the possibility of having the connections in the tubing made by workmen on a job, as set forth in said former application, with greater convenience than is at present possible, and with a considerable saving of time.

The mechanical devices set forth herein are of a portable type, and convenient for carrying

on a repair or construction truck, for use on the job, including a swaging or compression tool, for hand operation. In some cases, as in the copper tubing referred to, the expansion work could be done away from the work, if desired, and the sections delivered ready for being united. The rest of the operation could then be performed by the swaging tool, as the sections were being introduced into the duct.

The foregoing, and other features and advantages of the invention will more fully appear from the following specification, taken in connection with the accompanying drawings, in which:—

Fig. 1 shows a machine for expanding the end of a tube section and performing other work thereon.

Fig. 2 is an end view thereof from the left side.

Fig. 3 is a similar view with the vise mechanism removed.

Fig. 4 is a detail of the expansion head 7.

Fig. 5 shows fragmentary portions of two of the tube sections after being united.

Fig. 6 is a cross-section on the broken line 6—6 of Fig. 5.

Fig. 7 shows the fragmentary section of a tube and connection for use therewith in attaching the same to a metal box.

Fig. 8 shows the head of a swaging tool, in side view.

Fig. 9 is an edge view thereof.

Fig. 10 is a complete view of said tool.

Referring first to the first three figures of the drawings, the reference number 1 indicates the base of a machine, mounted upon which is a bench 2, projected at one end into a column 3. In the upper part of said column, longitudinally of the machine, is a bore 4, threaded to receive a similarly tapped shaft 5, provided at its outer end with a tool-hold 6, for the attachment of a crank or other tool by means of which said shaft may be rotated. On the other end of said shaft is an expansion head 7, in the sides of which are rollers 8, held rotatably in a cap 9 at one end and in a collar 10 at the other end. The expansion tool is preferably connected with the shaft 5 so as to be detachable therefrom, as by means of a shank 11 extending from said tool into a recess 12 in the end of said shaft, and held therein by a pin 13. An expansion tool of one diameter can therefore be substituted for one of another diameter.

In that end of the base 1 farthest from the column 3 is fixed a shaft 15, upon which is rockingly mounted a vise mechanism for holding a section of tubing. Said mechanism consists of a support 16, having an opening in its lower part

through which the shaft passes, and extending upwardly into a body portion 17, projected at one side into a bearing 18, in which is fixed a pivot 19, on the ends of which is supported a pair of ears 20 on the end of a crown-plate 21, supported on the body 17. The other end of said crown-plate is provided with a pair of ears 22, containing a pin 23 upon which is pivoted a hook 24 for engagement with a detent 17a on the body 17. The crown-plate 21 is thereby held from movement on the body portion 17. Formed jointly in the crown-plate 21 and support 17 is a circular opening 25, in which is held a split sleeve 26, containing a similarly split bushing 27, adapted to receive a piece of tubing, as shown at 28. Above said crown-plate is a boss 29, said boss and plate being vertically bored and tapped to receive a set-screw 30, the lower end of which bears upon the upper plate of the sleeve 26. By tightening said screw a section of tubing can be rigidly clamped in the bushing 27. The support 17 is held normally in operative position, with the tube section in axial alignment with the expansion head 7 by means of a pin 31 passing through a perforation in the support 17 at 32, and entering a hole 33 in the face of the bench 2. For some purposes hereinafter pointed out the pin is removed from the hole 33, the vise structure tilted to the right and the end of the pin replaced in an opening 34 in the bench, locking the support 17 and parts carried thereby in the adjusted position.

With the section of tubing positioned rigidly in the vise structure, as shown in Fig. 1, by rotating the screw 5 in a direction to feed the same toward the tubing the expansion head is caused to enter the end of the tubing and cause an enlargement thereof into a head 35, with an inner diameter slightly greater than that of the outer diameter of the main piece of tubing. This enables the end of one section to enter the head of the next adjacent section, and form a joint therewith, as shown in Fig. 5. The head 35 is then tightly compressed upon the end of the other section and simultaneously provided with indentations shown at 36, which fasten the ends securely from separation. In this operation a force is applied first on opposite sides of the tubing and a pair of indentations formed oppositely therein, after which the force is applied in a similar manner at right angles with the parts first compressed, and another pair of indentations provided coincidentally therewith. These indentations extend through into the inner tube end, as shown in Fig. 6.

In Fig. 7 is shown a connection for use with the head 35, consisting of a short tube section 37 provided with a collar 38 and projected into a threaded end 39 for insertion into an opening in the wall of a switch-box or similar device, wherein it may be held by means of a nut 40. The tube end 37 is inserted in the head 35 and secured therein in the same manner as above set forth for joining the tubes.

When the sections of tubing have been united in the manner hereinbefore set forth a continuous conduit of uniform diameter is produced, and one into which and through which electrical wires and cables can be readily threaded. There is some frictional engagement of the ends of the tubing, but in addition thereto the indentations in the tubing hold said ends in rigid engagement, and resist a considerable amount of force tending to separate the tubes, equal to several hundred pounds.

The pieces of tubing are furnished in lengths of approximately ten feet, and when a shorter

piece is required to form part of a conduit the vise mechanism is tilted to one side as before explained and locked in such position. The length of tubing is then positioned therein, with the end to be cut extending along the side of the bench 2 and column 3, whereupon such end can be severed by use of a saw or other tool. The vise mechanism is then tipped back into place with the tube in position for the expansion operation.

When a section of tubing has been provided with the expanded head on one of its ends it is removed from the machine and united with another section of tubing which is already in position, the swaging and indenting operations being performed "on the job" after the sections are joined. This is accomplished by a separate hand tool, an embodiment of which is set forth in the last three figures of the drawings, and comprising a head 42, provided at one end with a handle member 43 and at the other end with a fixed jaw 44 and a movable jaw 45, pivoted to the head 42 as at a, and formed of a pair of spaced plates. Said plates are connected by a link 46 with the end of a double handle bar 47, which end has a pivotal connection with the head 42. By moving the handles 43 and 47 towards each other the jaw 45 is forced in the direction of the jaw 44. Attached to the latter jaw is a die 48 formed in one of its edges with a channel 49, in which a portion of the jaw is engaged. In opposition to said die is a die 50, attached to the jaw 45, and provided on one edge with a rib 51, fitting between the plates of the jaw. In each of said jaws is formed a portion of a circular opening 52, the diameter of which corresponds with that of the expanded head of a section of tubing, and is adapted to closely engage the same for the purpose of securing said head on the end of an adjacent section of tubing. Each of said dies is provided with a prong 53, which are oppositely disposed, and capable of forming indentations in the opposite sides of a piece of tubing, coincidentally with the action of the die faces thereon. Said dies are removable, and interchangeable for the purpose of substituting dies having openings of different diameters. In use, the expanded head of the tubing is embraced by the dies and force exerted to clamp said head tightly upon the tubing inserted therein. This clamping action is applied mostly on two sides of the tube, and at the same time two indentations are formed in said sides. The tool is then given a quarter-turn, and a similar action applied to the tubing at right angles with that of the first operation, the prongs operating again to form another pair of indentations in the head of the tube. The tool is of light build but strong, and takes up little room in the kit of a workman. The showing herein is merely illustrative of a tool for use in the carrying out of the method set forth herein, and other means can be substituted therefor.

It is the practice to draw a length of copper tubing through an enclosed duct for a considerable distance, the tubing being formed of relatively short sections of approximately sixty feet, with the ends of the sections joined by means of couplings having a tapped connection with the ends of the tubing. The method set forth herein is of special advantage for uniting such sections, a better connection being formed thereby, and one giving ample resistance to a separating strain. It also forms joints of less diameter and presenting less frictional resistance in the movement of the tubing.

What I claim, and desire to secure, is;

1. A method for preparing a section of thin wall tubing of relatively small diameter and seating the same on another section of the same diameter in a substantially continuous operation, consisting of holding the same rigidly, cutting the same to desired length, expanding one of the ends thereof, overlapping said expanded end with the end of another section in a piece of work, compressing said expanded section by hand operated means, and simultaneously indenting said expanded portion on opposite sides thereof to engage the same with the enclosed end of the other section.

2. A method for joining two sections of thin

wall tubing of the same diameter consisting of holding a section of said tubing in a fixed position, gradually expanding one end of said section to possess an inner diameter substantially the same as the outer diameter of the unexpanded portion without injury to the tubing, telescoping the end of another section of tubing within said expanded portion, applying a compressive force manually to the expanded portion to cause the same to tightly engage the end of the other section telescoped therein, and simultaneously engaging portions of the expanded portion with the telescoped end therein.

THEODORE BRIEGEL. 15