(No Model.)

T. S. JAMES.

TUBE JOINT.

No. 583,379. Patented May 25, 1897.

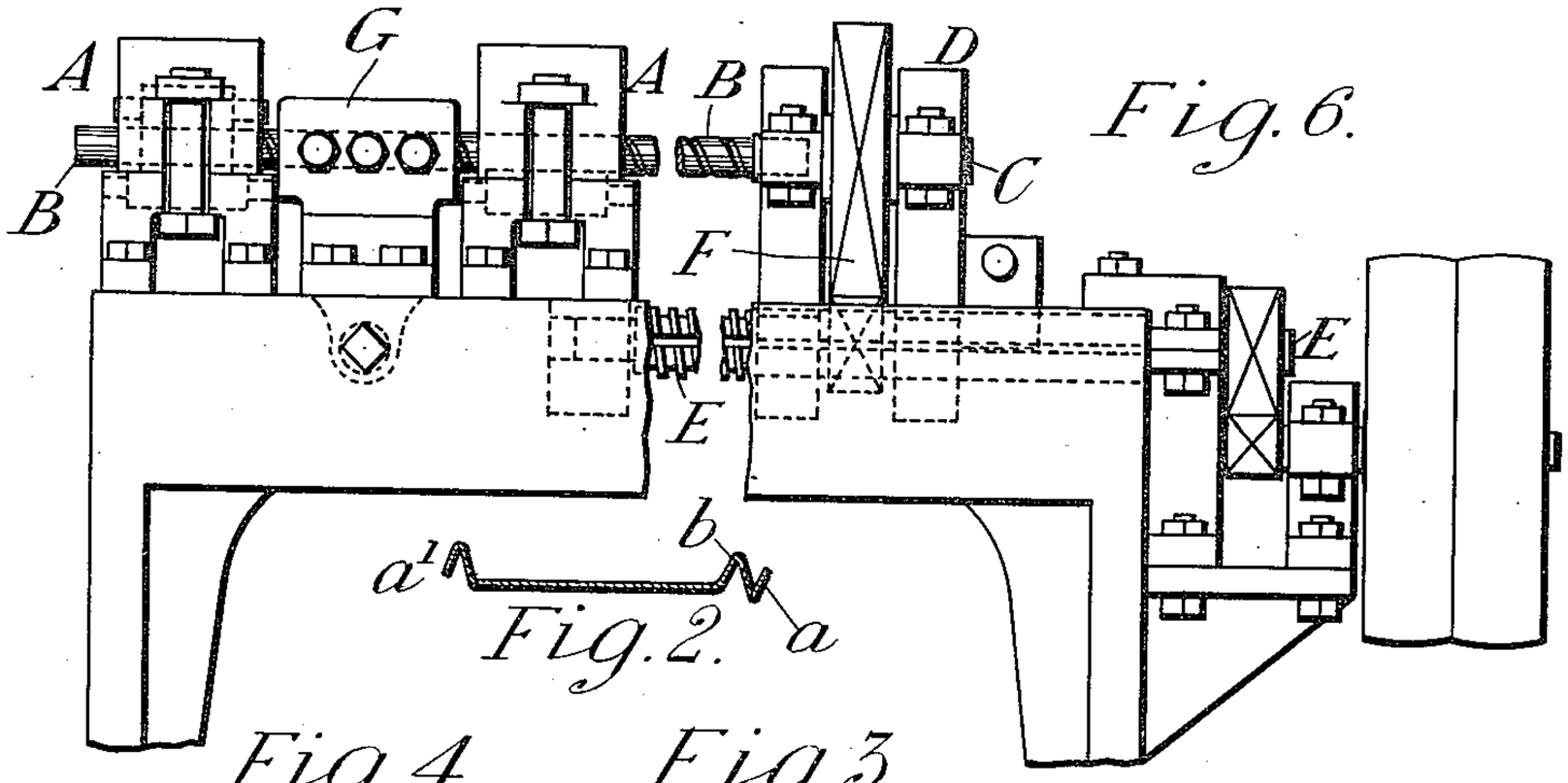

Fig. 6.

Fig. 2.

Fig. 4.

Fig. 3.

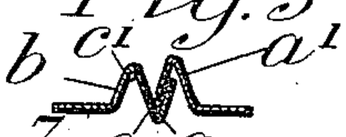

Fig. 7.

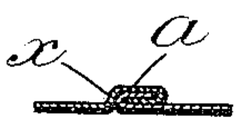

Fig. 1.

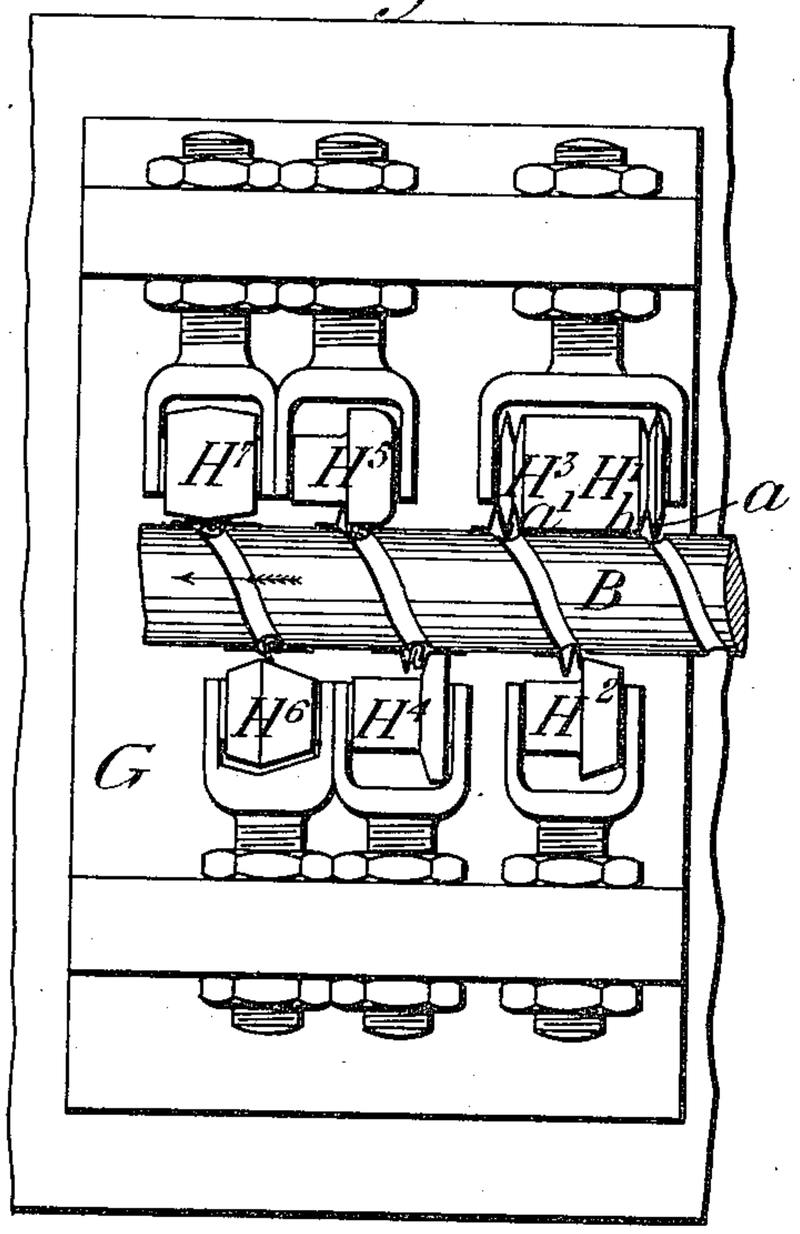

Fig. 5.

Fig. 8

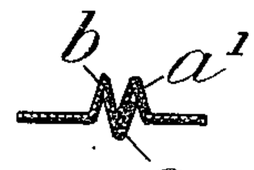

Fig. 9

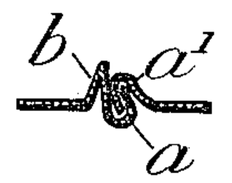

Fig. 10.

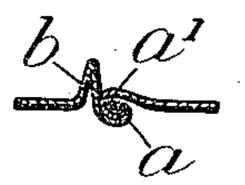

Fig. 11.

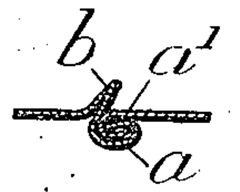

Fig. 12.

Fig. 13.

Witnesses
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Thomas S. James
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his attorney

UNITED STATES PATENT OFFICE.

THOMAS S. JAMES, OF LONDON, ENGLAND.

TUBE-JOINT.

SPECIFICATION forming part of Letters Patent No. 583,379, dated May 25, 1897.

Application filed December 7, 1896. Serial No. 614,789. (No model.)

To all whom it may concern:

Be it known that I, THOMAS SPENCER JAMES, a citizen of England, residing at 172 Camden Grove, Peckham, London, in the county of Surrey, England, have invented new and useful Improvements in Tube-Joints, of which the following is a specification.

My invention relates to an improved manufacture of that description of metal tubes in which a strip of metal has its two edges bent up into a hook shape and is then coiled helically round a mandrel, so that the hooked edges engage with each other, such engaged parts being then subject to pressure, so as to be flattened down upon each other, producing a folded lap-joint, such as indicated at Figure 1 of the accompanying drawings. With this joint it will be seen that the only security against the joint becoming loosened is afforded by the shoulder formed at *x* on the one edge *a*, and consequently if the tubes are made of comparatively thin metal the joint will easily give way to any considerable strain to which the tube may be subjected. According to my present invention I effectually prevent any such loosening of joints of this kind by producing what I term a "locked lapped joint." For this purpose the one edge of the strip of metal is provided, in addition to the hook *a*, with a hollow ridge *b*, as shown in the cross-section of the strip at Fig. 2, so that when the hook *a* has been engaged with the hook *a'* on the contiguous edge of the previous turn of the strip, as at Fig. 3, and these are then subjected to pressure, so as to be flattened down in the manner to be presently described, the ridge *b*, which remains standing during the first part of the operation, in being then flattened down over the joint so formed, as shown at Fig. 4 and at Figs. 5 and 13, will effectually lock the joint formed by the parts *a* and *a'* and prevent it from loosening or giving way, and it will at the same time afford considerably greater strength and stiffness to the tube by reason of the increased depth of the helical rib thus produced. This joint may either be formed so as to project on the outside of the tube, as at Fig. 4, or it may project on the inner surface of the tube, as at Figs. 5 and 13, so as to leave the outer surface smooth, the one arrangement or the other being adopted, according to the purposes to which the tube is to be applied. In the first-named case the tube is formed on a smooth mandrel and in the latter it is formed on a grooved mandrel, as at Figs. 6 and 7, or, again, the joint may be made to project partly on the outer side and partly on the inner side, according to the depth of the mandrel-groove in relation to the thickness of the joint. When a tubular structure of increased strength is required, a tube having the helical joint projecting externally may be fitted into a tube having the joint formed internally, the former being fitted into the latter by a screwing motion.

Instead of forming the tube of a single helically-wound strip it may be made of two or more helical strips coiled like a multiple-threaded screw, or, again, a tube may be formed of a strip having the section at Fig. 2 bent round in a circle, so that the hooked edge *a* engages with the hooked edge *a'* on the other side, so as to form a straight longitudinal locked lapped joint of the kind described, or two or more such strips may be bent into semicircular or arc form and have their hooked edges engaged with each other, so as to produce a tube with two or more such locked lapped joints.

I will now describe by way of example one mode of forming a tube according to my invention by means of a single helically-coiled strip, the locked lapped joint being made to project internally, leaving the outer surface smooth, as shown at Fig. 5. Fig. 6 shows a side elevation of a machine which may be employed for the purpose. Fig. 7 shows an enlarged diagrammatic plan of a series of rollers suitable for forming the locked lapped joint, and Figs. 8 to 13 show the several stages of this during the process of manufacture.

The machine is similar in its general construction to an ordinary lathe.

A A are fixed head-stocks with hinged tops, through which passes the mandrel B, the rear end of which fits in a socket on the end of a revolving shaft C, carried in the sliding head-stock D and receiving rotary motion from the shaft E through gearing F, the shaft E being formed with a screw-thread working through threaded bushes on the head-stock D, so that at the same time that the mandrel is rotated it is also advanced. Between the head-stocks

A A is a bracket G, carrying six adjustable pressing-rollers H′, H², H³, H⁴, H⁵, H⁶, and H⁷, by the consecutive action of which upon the hook-shaped edges of the strip the before-described locked lapped joint is formed. For this purpose the metal strip, which has been previously brought by suitable rolls to the form shown in cross-section at Fig. 2, has its front end attached in any suitable manner to the mandrel B, such as by bending down the end thereof and inserting it into a slot in the mandrel, whereupon on the rotation of the mandrel in the direction of the arrow the strip will first be led under the roller H′ H³, the groove H′ of which will fit the edge having the hook *a* and ridge *b*, while the groove H³ will fit the edge *a*′. This roller will consequently press the strip down on the mandrel. As the strip travels round with the latter the edge *a b* will be brought under roller H², which simply has the effect of straightening up the hook *a*, so as to bring it into the form shown at Fig. 8. On the strip continuing its travel its edge *a b* meets the edge *a*′ of the following turn of the strip as it passes under the groove H³ of the first roller, which consequently presses the two edges together to a certain extent, as shown at Fig. 9. The edges thus engaged then pass on to roller H⁴, the sloping side face of which has the effect of partly pressing down the hooks *a a*′, as shown at Fig. 10. On the joint then passing under roller H⁵ this more or less completely flattens down the hooks *a a*′, as at Fig. 11, still leaving the ridge *b* standing. The joint is now brought under the roller H⁶, the sloping face of which partly presses down the ridge *b* over the hooks, which are thereby also completely flattened down, as at Fig. 12, and finally the joint is brought under the roller H⁷, which completely flattens down the ridge *b* onto the hooks and compresses the completed joint in the groove of the mandrel, as at Fig. 13, the outer surface of the tube then presenting a smooth surface, as at Fig. 5.

When the mandrel B has been advanced to the extent of its full stroke, the front end of the formed length of tube is disconnected from it and the rotation of the mandrel and travel of the head-stocks D are reversed, whereby the mandrel will be screwed backward out of the formed length of the tube, after which the above-described operation may be continued for producing a tube of any desired length.

If desired, the above-described locked lapped joint can be still further strengthened by the introduction of a wire either into hooked edge *a* or into the ridge *b*, as indicated at *c c*′, Fig. 3.

It is to be understood that I do not limit myself to the above-described mode of producing the locked lapped joint, as this only serves as an example of the way in which the invention may be carried out. The arrangement of the rollers H′ to H⁷ (shown at Fig. 7) is only diagrammatic, as they would of course be arranged in oblique positions corresponding to the helical position of the strip.

It will be evident that instead of first producing the metal strip of the section described with reference to Fig. 2 by a separate machine the machine for producing the described locked lapped joint may be combined with suitable rolls for forming a flat strip into the desired section as it is fed forward to the jointing-rollers.

Having thus described the nature of this invention and the best means I know for carrying the same into practical effect, I claim—

A tube-joint, consisting of a V-shaped fold or bend *a*′ on one edge, and a double V-shaped fold *a*, *b* on the other edge, said fold *a*′ hooking into the fold *a* at one side of the fold *b* and said fold *b* being flattened down over the engaging folds for the purpose of securing the fold *a*, both by the fold *a*′ and said fold *b*, substantially as and for the purposes described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 4th day of November, A. D. 1896.

THOMAS S. JAMES.

Witnesses:
OLIVER IMRAY,
JNO. P. M. MILLARD.