Feb. 10, 1925. 1,525,730

S. C. GATES

METHOD OF MAKING SPIRALLY GRAINED SEAMLESS TUBING

Filed April 18, 1922

Fig. 1.

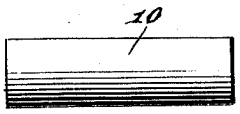


Fig. 2.

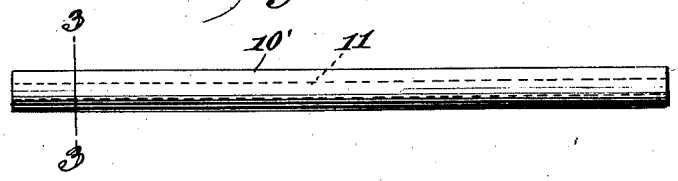


Fig. 3.

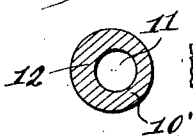


Fig. 4.

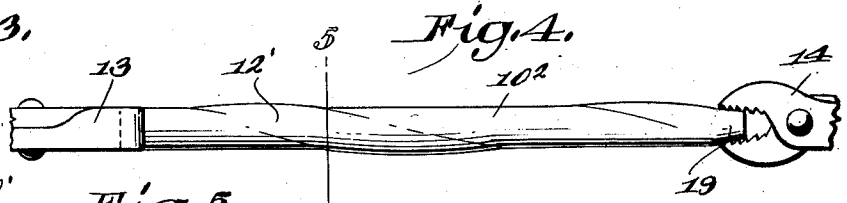


Fig. 5.

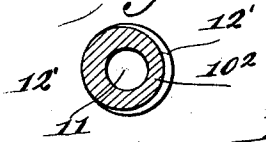


Fig. 6.

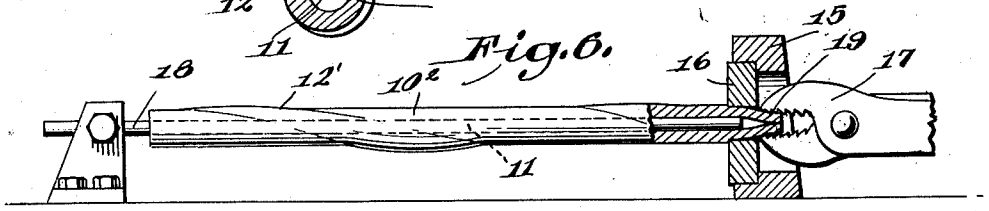


Fig. 7.

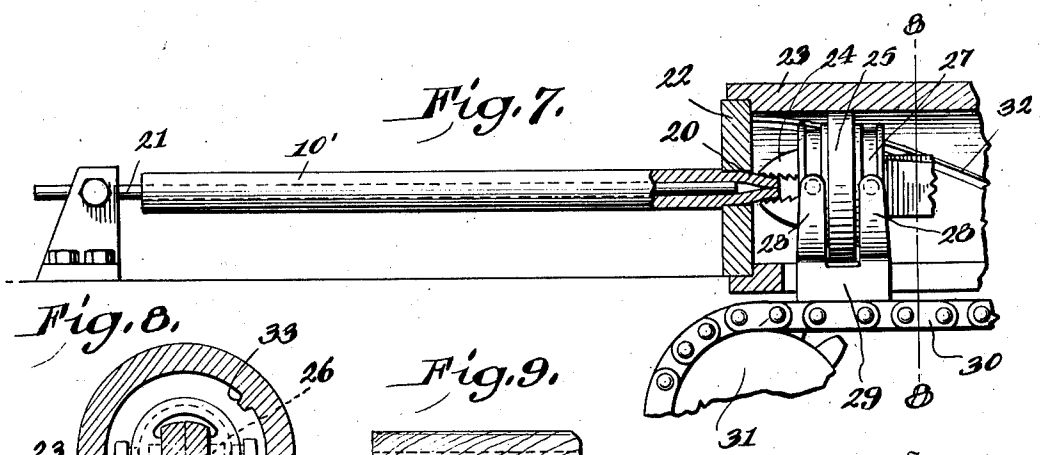


Fig. 8.

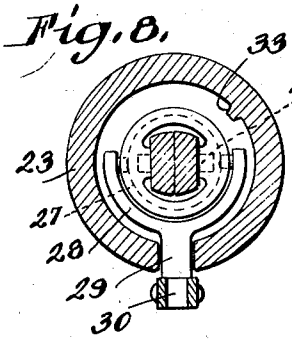
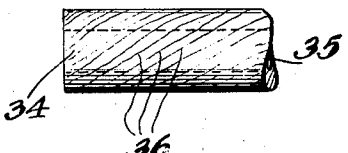


Fig. 9.



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UNITED STATES PATENT OFFICE.

SAMUEL C. GATES, OF SHELBY, OHIO.

METHOD OF MAKING SPIRALLY-GRAINED SEAMLESS TUBING.

Application filed April 18, 1922. Serial No. 554,498.

To all whom it may concern:

Be it known that I, SAMUEL C. GATES, a citizen of the United States, residing at Shelby, in the county of Richland and State of Ohio, have invented certain new and useful Improvements in Methods of Making Spirally-Grained Seamless Tubing, of which the following is a specification.

The present invention relates to the art of making tubes or pipes, and more particularly to those of the seamless character.

An object is to provide an improved method of manufacturing a seamless tube which materially increases the strength of the finished product; which reduces the likelihood of destroying the blanks being worked; which reduces the length of the time period for drawing the tubes; which prevents the breaking of the tube during drawing; and which disposes the fibers of the tubes at an angle to the longitudinal axes thereof for resisting rupture incident to handling in the practice of the method and to internal pressure during subsequent use.

Another object of the invention is to provide a seamless tube which is relatively strong and which is capable of sustaining considerable bursting pressure, and which has its fibers disposed to extend substantially lengthwise of the direction of the strain to resist separation of the fibers and to directly take up the strain.

A further object of this invention is to provide a "spirally grained" seamless steel tube possessing the above and various other advantages and which may be drawn through the die by revolving jaws caused to turn axially to a desired degree proportionate to the length of travel of the jaws.

The above and various other objects and advantages of the improved method and product of this invention will be in part brought out in, and in part understood from, the following detailed description, taken in connection with the accompanying drawing, in which—

Fig. 1 is a side elevation of a blank or billet from which the seamless tube is formed;

Fig. 2 is a similar view of the blank after being punched out;

Fig. 3 is a transverse section taken on the line 3—3 of Fig. 2, showing the uneven thickness of the annular wall of the blank such as frequently occurs incident to punching;

Fig. 4 is a side elevation of the blank of Fig. 2 clamped at opposite ends between pairs of relatively movable pliers, the latter being turned axially at an angle to each other and the blank being correspondingly twisted to dispose the lateral enlargement spirally about the tube;

Fig. 5 is a transverse section taken on the line 5—5 of Fig. 4;

Fig. 6 is a side elevation, partly in section, of a conventional drawing machine having the twisted tube mounted therein and ready to be drawn;

Fig. 7 is a side elevation partly in section of a novel form of drawing machine having the tube blank of Fig. 2 applied thereto, and illustrating a modification in the process wherein the tube is twisted as it is drawn through the die;

Fig. 8 is a transverse section through the same taken on the line 8—8 of Fig. 7; and,

Fig. 9 is a side elevation, enlarged, of a portion of a finished tube, showing diagrammatically the angular disposition of the fibers of the finished tube.

Referring to the drawing, the blank or billet is shown at 10 in Fig. 1, and this blank is in the form of a solid cylindrical body of steel or other suitable material from which the tube may be formed. This billet 10 is heated to the required temperature and punched or pressed out axially in the usual manner and is not only elongated and reduced in diameter as shown at 10′ in Fig. 2, but is also formed with an axial bore 11 providing the interior chamber or passage of the tube.

This is the usual preliminary step in the process or method of manufacturing seamless tubing, and as shown in Fig. 3 at 12, the annular wall is very frequently thicker at one side than at the other sides as it is difficult to form the blank 10′ with a truly consecutive bore or opening 11.

In the manufacturing art it has heretofore been found that when the blank 10′ is drawn through the die, such as shown in Fig. 6, the uneven or thickened side 12 offers considerably more resistance to passage through the die than the other sides of the blank. This results in the uneven drawing of the tube and in the piling up of an increasing shoulder at the side 12. The

shoulder so accumulating against the die at one side of the tube finally increases the strain on the tube to such point as to cause the blank 10′ to break in or beyond the die and to destroy the partly formed product, or to weaken the product by the uneven drawing action.

To remedy this defect the blank 10′ is tortionally twisted either before drawing or during the drawing operation.

In Figs. 4 and 5, the blank, after being again heated, is axially twisted as at 10^2 so as to dispose the thickened side of the blank spirally as shown at 12′. This twisting may be accomplished in any suitable manner as by use of two pairs of pliers 13 and 14 which may engage the opposite ends of the blank and be relatively and axially turned to any desired degree, such as shown in Fig. 4.

After twisting, the tube blank 10^2 may be placed in a drawing machine, as shown in Fig. 6. The drawing machine, is of conventional form and generally comprises a draw head 15 having a die plate 16 therein, a pair of pliers or tongs 17 at the outer side of the draw head, and a core rod 18 supported at one end remotely from the draw head 15 and extending at its other end into the opening of the die plate 16. The blank 10^2 is reduced at one end as at 19 and placed on the rod 18 with the reduced end projecting through the die plate 16 and engaged by the pliers 17. The pliers 17 are now moved away from the head 15 and the tube blank 10^2 is drawn through the die plate 16 and about the end of the rod 18, forming a tube of the desired external and internal diameters. As the enlargement 12′ of the blank 10^2 is formed spirally about the tube blank, the pressure of the thickened side is distributed about all sides of the blank and the pressure is uniform and the accummulating shoulder is eliminated and worked into the intermediate spiral side walls of the blank to produce a uniformly thick annular wall in the finished product.

As a modification of the above described process of method, the blank 10′ of Fig. 2 may have one end 20 reduced and may be mounted on the core rod 21 of Fig. 7 with the reduced end 20 extending through the die plate 22. The die plate 22 is supported in a suitable head 23 shown in the present instance as of cylindrical form and in which is mounted a pair of pliers 24 for grasping the reduced end 20 of the tube blank 10′. The pliers 24 are mounted to turn axially with respect to the blank 10′ and may be rotated in any suitable manner during the drawing action. As illustrating one way in which the pliers may be drawn and rotated, in Figs. 7 and 8 is shown a gear wheel 25 fixed to the pliers at its pivot 26 and which has annularly curved collars 27 at opposite sides of the gear wheel 25 for fitting in forks 28 which rise from the carriage 29 which is connected to the chain 30 or other suitable feeding device.

The chain 30 may be mounted upon a sprocket wheel 31 or the like and is adapted to be moved in such direction as to carry the upper lap of the chain 30 outwardly from the die plate 22 for moving the pliers 24 away from the die plate and thus drawing the tube blank through the die. The head or casing 23 is provided with a spirally disposed rib 32 on its inner side adapted to engage in a transverse curve or slot 33 formed across the periphery of the gear 25 for the purpose of advancing the gear 25 through the desired number of degrees proportionate to the length of the path of travel of the pliers. The pipe is thus not only drawn through the die but simultaneously twisted through the desired angle to consecutively change any uneven lateral pressures on the tube blank about the sides of the tube so that an equally drawn tube is produced which is not only of uniform thickness throughout its annular wall but which is of uniform strength and which is not liable to crack or break at any one side during the drawing action.

In Fig. 9 is shown a fragment or portion of a finished tube 34 having the axial opening or bore 35 and which has been tortionally twisted according to the present invention so as to dispose the normally longitudinal fibers 36 of the tube spirally or at an angle to the longitudinal axis of the tube for taking up strains tending to crack or burst the tube longitudinally of the fibers. Such disposition of the fibers materially increases the strength of the tube as well as facilitating the carrying out of the various steps of the method or process with greater accuracy, the exercise of less skill than is usually required, and with a considerably reduced percentage of distorted blanks and tubes.

It is obvious that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims:

What is claimed is:

1. That method of manufacturing seamless tubing, which consists in punching out a solid blank into tubular blank form, tortionally twisting the tubular blank to dispose lateral inequalities spirally about the tubular blank, and drawing the twisted blank to the desired internal and external diameters.

2. That method of making spirally grained tubing, which consists in twisting a

tubular blank to dispose lateral inequalities and the fibers of the blank spirally therein, and drawing the twisted blank to the desired size of the finished tube.

3. That method of making spirally grained tubing, which consists in axially twisting a tubular blank to dispose lateral inequalities in spiral fashion about the blank, and drawing said twisted blank straight through a die for equallizing lateral pressure on the tube being drawn.

In testimony whereof I affix my signature.

SAMUEL C. GATES.