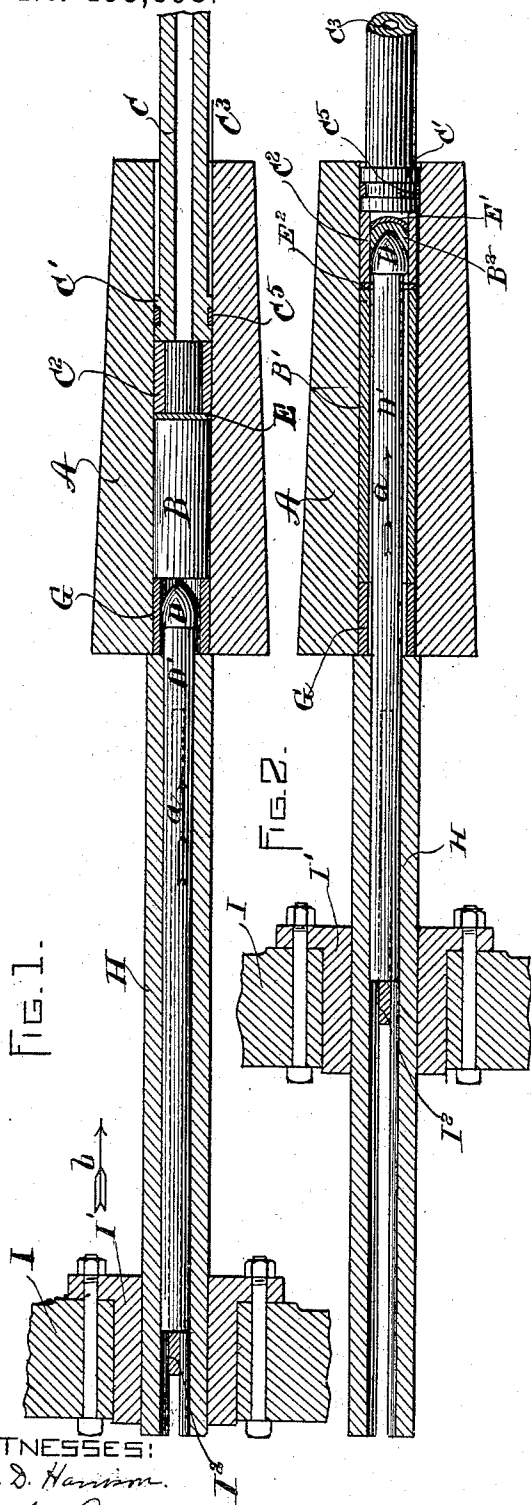


(No Model.)

J. ROBERTSON.
APPARATUS FOR MAKING TUBES.

No. 493,898.

Patented Mar. 21, 1893.



WITNESSES:
A. D. Harrison.
H. C. Brown.

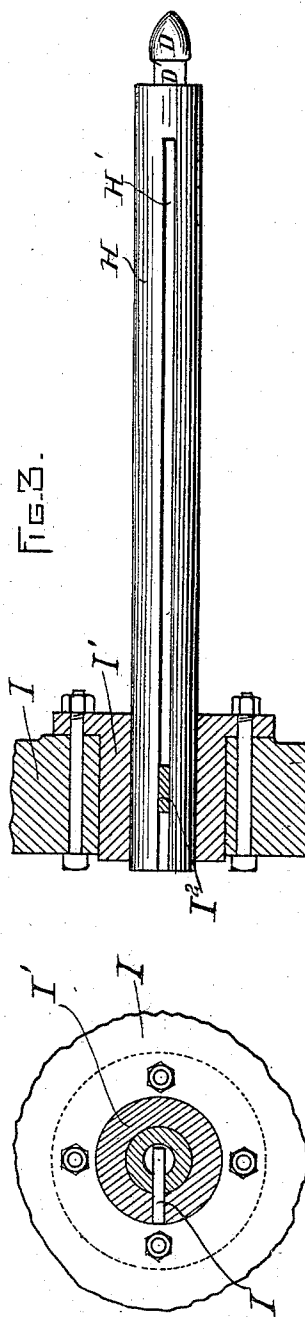


FIG 4

INVENTOR:
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by
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UNITED STATES PATENT OFFICE.

JAMES ROBERTSON, OF MANCHESTER, ENGLAND.

APPARATUS FOR MAKING TUBES.

SPECIFICATION forming part of Letters Patent No. 493,898, dated March 21, 1893.

Application filed July 15, 1892, Serial No. 440,150. (No model.) Patented in England July 6, 1891, No. 11,436.

To all whom it may concern:

Be it known that I, JAMES ROBERTSON, of Manchester, England, have invented certain new and useful Improvements in Apparatus for Making Tubes, (for which British Letters Patent No. 11,436, dated July 6, 1891, have been granted to me,) of which the following is a specification.

This invention relates to tube-making apparatus, comprising a metal holding cylinder or die having a tubular bore or forming surface, and a mandrel adapted to enter said die and pierce a billet of metal therein, the die and mandrel co-operating in converting a metal billet into a tube, the rear end of the billet being yieldingly supported, so that the displaced metal retreats before the mandrel, leaving portions of the metal laid up against the walls of the die in tube form, until all the metal is thus disposed of. The mandrel is supported by a stem-rod, which connects the mandrel with the driving-head or ram which impels the mandrel into the die and causes it to penetrate the billet. In making tubes of small diameter in this way, and particularly tubes of considerable length, the mandrel stem-rod is necessarily made of small diameter and considerably elongated, so that it is liable to be sprung or bent by the longitudinal pressure exerted upon it during the tube-forming operation.

My invention has for its object to prevent this liability, and to this end it consists in combining with a metal holding cylinder or die, mandrel and stem-rod, a guide, surrounding the stem-rod a support for a billet of metal at the rear of the cylinder and adapted to prevent the bending or buckling of the same, and a driving-head or device outside of said guide, having an arm or cotter projecting through a slot in the guide, and bearing upon the mandrel stem-rod, all of which I will now proceed to describe.

Of the accompanying drawings, forming part of this specification: Figure 1 represents a longitudinal section of a tube-forming apparatus embodying my invention, the mandrel and billet being shown as they appear before the tube-forming operation. Fig. 2 represents a similar section, showing said parts after the tube-forming operation. Fig.

3 represents a side elevation of the mandrel guide, and a sectional view of a portion of the driving-head. Fig. 4 represents a section on line 4—4, Fig. 3.

The same letters of reference indicate the same parts in all the figures.

In the drawings: A represents a metal holding cylinder or tube-forming die, the same having a cylindrical bore of considerable length, adapted to co-operate with the mandrel D in forming a tube. The mandrel D is affixed to or formed on an elongated stem-rod D'.

H represents a tubular guide, having a longitudinal slot H', the interior of said guide fitting the stem-rod D' with sufficient closeness to prevent the latter from bending and yet permit the independent endwise movement of the stem-rod, the guide occupying a fixed position and having no endwise movement.

I represents a driving-head or ram, which may be impelled by hydraulic means or otherwise, in the direction indicated by the arrow b in Fig. 1. Said driving-head is provided with a bushing I', to which is affixed an arm or cotter I², which is arranged to project through the slot H' in the guide H, and to bear on the rear end of the stem-rod D'. It will be seen, therefore, that, when the driving-head is moved forward, the cotter I², moving with it, impels the stem-rod D' and mandrel D in the same direction, the cotter sliding through the slot in the guide. The guide therefore, while permitting the free endwise movement of the stem-rod, prevents any lateral bending or displacement thereof.

The billet B is heated until it becomes soft and viscid, and placed in the die, as shown in Fig. 1, the rear end of the billet being supported by a stem-rod C, which is supported yieldingly, so that it yields to the pressure exerted upon it by the displacement of the metal of the billet caused by the penetration of the billet by the mandrel. A yielding stem-rod and means for yieldingly supporting it, suitable for use in this connection, are shown in Figs. 18, 19 and 20 of Letters Patent of the United States, No. 429,098, granted to me May 27, 1890.

The general operation of the apparatus is

as follows: The billet being in place, the mandrel is forced forward, and penetrates the billet, displacing portions of the metal, and leaving portions laid up in the form of a tube 5 on the walls of the die. This operation goes on until all the metal of the billet is thus disposed of, the stem-rod C retreating as fast as the displacement of the metal requires.

I show in Fig. 1 an abutment E, adapted to 10 sustain the piercing pressure of the mandrel until said pressure is unrelieved by the compression of the metal, as shown in my Letters Patent of the United States No. 481,060, said abutment being in this case a plate of metal, 15 supported by a tube C², bearing against the stem-rod C, and adapted to be sheared away by the action of the mandrel when the latter comes in direct contact with said plate.

I do not limit myself to the particular arrangement here shown and described, as, under some circumstances, the die A may be moved endwise toward the head I, the guide H moving with the die, and the head, cotter, mandrel and stem-rod remaining fixed. In

this case, the stem-rod C would either be held 25 stationary or might move forward with the die, but at a sufficiently slower rate to compensate for the displacement of the metal of the rear end of the billet.

I claim—

30 An apparatus for making tubes, comprising a metal holding cylinder or die, a stem-rod having a mandrel adapted to co-operate with the die in converting a heated billet of metal into a tube, a support for the said billet at 35 the rear of the die a slotted guide for said stem-rod, and a head outside of the guide having a cotter or arm engaged with the stem-rod, as set forth.

In testimony whereof I have signed my 40 name to this specification, in the presence of two subscribing witnesses, this 2d day of June, A. D. 1892.

JAMES ROBERTSON.

Witnesses:

ARTHUR C. HALL,
ARTHUR H. POPE.