(No Model.)

S. P. M. TASKER.

MACHINE FOR MAKING TAPER TUBES FROM HOLLOW INGOTS.

No. 513,218. Patented Jan. 23, 1894.

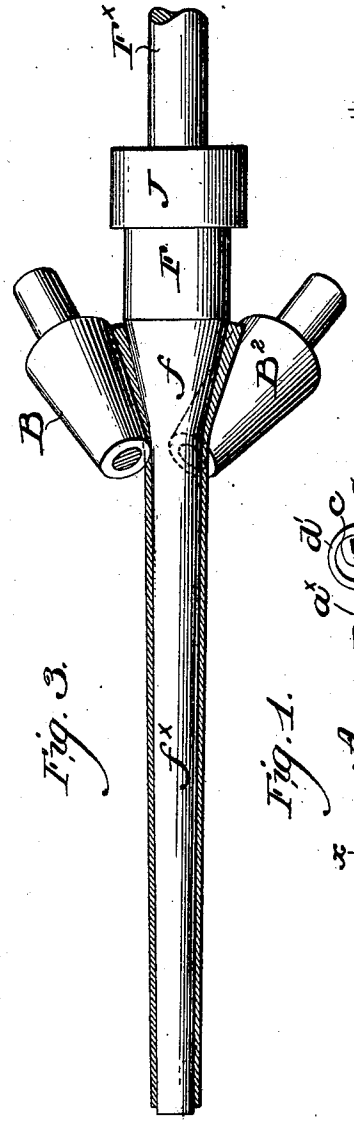

Fig. 3.

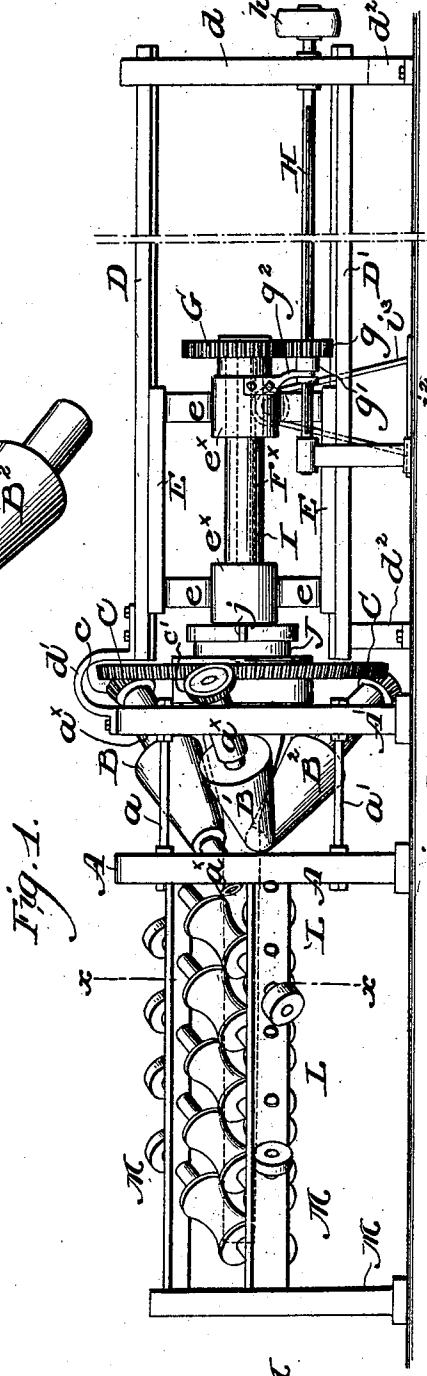

Fig. 1.

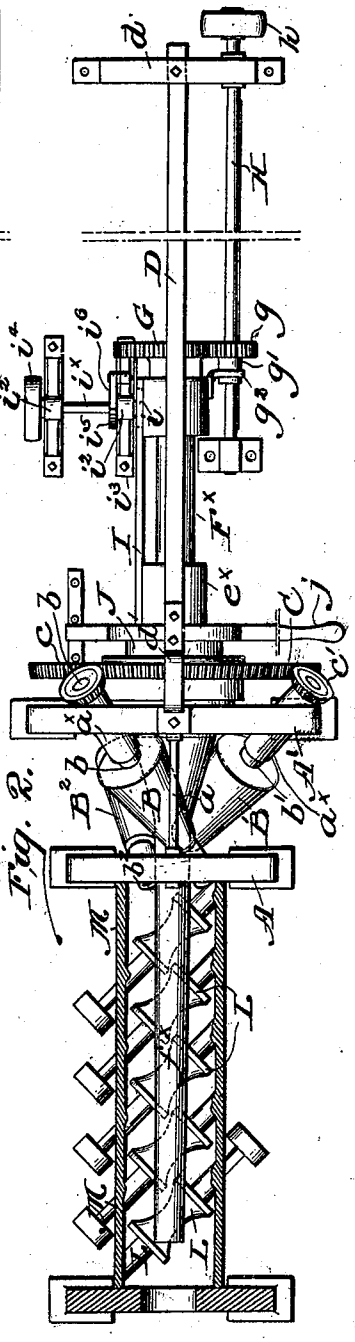

Fig. 2.

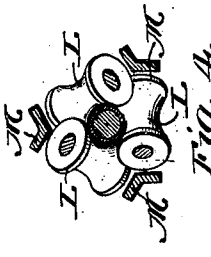

Fig. 4.

WITNESSES:

David S. Williams.

F. Norman Dixon

S. P. M. Tasker
INVENTOR:
By his Attorneys
Wm. C. Strawbridge
Bonsall & Taylor

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

STEPHEN P. M. TASKER, OF PHILADELPHIA, PENNSYLVANIA.

MACHINE FOR MAKING TAPER TUBES FROM HOLLOW INGOTS.

SPECIFICATION forming part of Letters Patent No. 513,218, dated January 23, 1894.

Application filed July 29, 1893. Serial No. 481,848. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN P. M. TASKER, a citizen of the United States, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Machines for the Manufacture of Tapering Tubes from Hollow Metal Ingots, of which the following is a specification.

The object of my invention is the manufacture of a tapering tube from a hollow, cylindriform, metal ingot, by rolling the said ingot, either hot or cold, by means of the apparatus hereinafter described, with the result of compacting and consolidating the substance of the metal ingot into a tapering tube of the required proportions. The ingots which I employ are, as stated, of a hollow cylindriform structure, and are open at both ends.

An apparatus embodying a good form of my invention is represented in the accompanying drawings, and described in this specification, the particular subject matter claimed as novel being hereinafter definitely described.

In the accompanying drawings, Figure 1 is a side elevation of an apparatus embodying my improvements. Fig. 2 is a top plan view of the same, partly sectional. Fig. 3 is a side elevational detail of the mandrel removed from the machine, and of two of the set of compressing rolls which act upon the ingot to effect its initial compression; and Fig. 4 is an end elevational view, partially sectional, of one set of the finishing rolls.

Similar letters of reference indicate corresponding parts.

Before proceeding to describe my apparatus in detail, it is proper to say that I form the tapering tube by the employment, in connection with a prolonged tapering mandrel head encompassed by a series of sets of finishing rolls, as hereinafter particularly described, of an apparatus for manufacturing tubes from hollow metal ingots, in which a tapering mandrel is employed in connection with a set of exterior compressing rolls,—the set consisting of two, three, or more rolls,—arranged at an angle to each other, and each roll at a common angle to its neighbors and to the mandrel, conveniently an angle of about forty-five degrees,—upon which mandrel, or, rather, upon the cylindrical extension of the tapering portion of its head, the ingot is in the first instance placed, and from which the said ingot is forced into the grasp of the compressing rolls and by them consolidated and elongated into a tube.

In the operation of the aforesaid apparatus, the series of external compressing rolls is positively driven at a uniform speed and in the same direction, while the mandrel is held stationary against longitudinal movement but is rotated about its axis. After the working up of a given ingot, the mandrel is retracted from its position of encompassment by the compressing rolls, and in its retracted position is provided with another ingot before it is again advanced into its position for rolling. The apparatus referred to is, however, designed for the production of cylindrical or parallel walled tubes, and it is employed simply as an element of my apparatus, the abruptly tapering portion of its mandrel head being prolonged to any desired degree to form a tapering extension possessing the form and length which it is desired that the tube to be produced shall possess; and, in conjunction with the said prolonged tapering extension of the mandrel head, I employ a series of sets of finishing rolls, each set consisting of a series of two, three, or more, concave-faced rolls arranged at an angle to each other, and each roll at a common angle to its neighbors, so that the concave-faced surfaces of all the rolls form a circular pass, encompassing the mandrel,—the pass of each succeeding roll being, in consonance with the taper of the mandrel, proportionately smaller than the pass of the set last preceding, to the end that the finished tube may possess the desired tapering form.

Referring now to the apparatus represented in the drawings, A A′ represent two vertically erected, transversely extending, housing or frame plates, which are conveniently tied together by tie bars *a a′*, and between which housings is mounted a series of, in the construction represented, three, conical-faced rolls, B, B′, B^2, arranged at an angle to each other, and each roll at a common angle to its neighbors. These rolls may be mounted for their rotary movement in such a manner relatively to their housings as mechanical convenience may dictate. I find it convenient to provide them with axles or journals *b b′* b^2, which are adapted to suitable bearings or

boxings $a^{\times}$, formed or applied to the frame plates A A'. The inner extremities of the axles, or those projected from the basal portions of the rolls, are equipped with beveled pinions c c' c^2, of appropriate pitch to mesh with a common beveled spur wheel C, mounted for rotary movement upon a tubular journal, and adapted to be actuated to any desired rotation by any preferred contrivance, which I have not deemed it necessary to illustrate.

Extending rearwardly from the housing A is a pair of longitudinal ways D D', vertically aligned the one above the other, and connected at the rear by a standard d, the upper way being at its front portion conveniently secured to the frame plate A' by a bracket d', and the lower way being rigidly supported upon pedestals d^2. These ways, which obviously may be connected and supported otherwise than as above, are simply a means for supporting and permitting the longitudinal travel in either direction of a mandrel-carrying frame, which I herein term the mandrel carrier E, and which is conveniently composed of two longitudinally extending parallel frame plates to which the letter E is directly applied, and which are adapted by being suitably grooved or otherwise conformed to slide between the ways D D',—and of two vertical connecting bars e, each of which is formed into or provided with a boxing $e^{\times}$, the axes of the two boxings being longitudinally aligned. Through these boxings the rod $F^{\times}$ of the mandrel F f, is journaled and adapted for rotary movement. At its rear extremity the mandrel rod is provided with a spur wheel G engaged with a spur pinion g feathered upon a countershaft H adapted to be driven by a pulley h or by any other preferred means. The hub g' of the spur pinion g is circumferentially grooved to cause the pinion, through the instrumentality of a forked arm g^2 springing from the mandrel carrier and adapted to said groove, to slide longitudinally upon the countershaft in consonance with any longitudinal movement of the mandrel carrier and spur wheel G, without disengagement therefrom. By virtue of the foregoing contrivance, which is one of many that may be employed for the same purpose, the mandrel is caused to revolve.

The longitudinal traverse of the mandrel for the application of the ingot, may be accomplished by many devices. I find it convenient to accomplish it by the following mechanism:—I is a longitudinally extending rack, connected with, or formed as a part of, the mandrel carrier, and adapted to be engaged with a rack pinion i, upon the extremity of a pinion shaft $i^{\times}$, supported in suitable bearings i^2, conveniently erected upon standards i^3. This pinion shaft may be driven by a pulley i^4, or otherwise as desired, and it is provided with a ratchet wheel i^5 adapted to be engaged by a pawl i^6, to maintain the frame fixedly in its position of ultimate advance. The mandrel head or mandrel proper, which is applied to or formed as a part of the rod at its advance end, and just beyond the front end face of the forward boxing $e^{\times}$ of the mandrel carrier, is composed of a cylindric body to which the letter F is applied, and of an abruptly conical head f, which bears such relation to the conical compressing rolls as to cause their surfaces to overlie its own in the manner represented in the drawings. J is a stripper, the same being a cylindric collar adapted to have longitudinal movement upon the cylindric body of the mandrel for the purpose of stripping said body of the ingot K originally placed thereupon, and forcing it into the grasp of the rolls. This stripper may be operated in any preferred manner. I find it easy to remove it by a stripper lever j of any preferred form and connected with the stripper in any preferred manner.

The apparatus hereinbefore described is not in itself claimed by me. In connection with it, however, I employ certain devices which as so employed are novel with me and which adapt the apparatus as a whole to the manufacture of tapering tubes. These devices are the following: $f^{\times}$ is a tapering extension of the mandrel head, the extent of the taper of which is slight and very much less than the taper of the abruptly tapering portion f, with which, however, it merges by gradual curves. This tapering extension projects beyond the housing A' to a length equal to the desired length of the finished tube, and it is encompassed by a series of sets of finishing rolls, each of which sets consists, as already stated, of a series of three, although less or more than three might be employed, concave-faced rolls disposed each roll with its axis at an angle to that of every other roll, and all of the axes at a corresponding inclination. These finishing rolls I designate L, and they are suitably supported and journaled in any well known manner, in a frame M of any preferred construction. They are adapted to be positively driven, conveniently by the aid of beveled gearing. In the drawings, I have represented a series of five sets of these finishing rolls, but it is to be understood that the series may be composed of less or more than five sets, the pass of each succeeding set being, of course, proportionately less than that of the set preceding. The speed at which the finishing rolls are driven is the same as that at which the compressing rolls are driven.

While I prefer to positively drive the mandrel, it is not essential to the operation, and if the mandrel be left free to be rotated, it will be rotated by the friction exerted upon it by the ingot under the action of the compressing rolls.

It will now be understood that in the operation of the apparatus as an entirety, the initial compression and consolidation of the ingot are performed by the compressing rolls upon the abruptly tapering head f, of the mandrel, and that the extension and elonga-

tion of the compressed ingot into a tapering tube are performed by the finishing rolls acting in conjunction with said compressing rolls.

Having thus described my invention, I claim—

1. In a machine for making tapering tubes from hollow metal ingots, the following elements in combination:—a rotatable mandrel having a cylindric body upon which the ingot is placed, an abruptly conical head formed as a continuation of said body, and a prolonged tapering extension formed as a continuation of said head,—a mandrel-carrying frame in which said mandrel is supported free for rotation,—a set of angularly disposed conical rolls encompassing the conical mandrel head, and disposed at an angle to each other and each roll at a common angle to its neighbors,—a housing for supporting said set of rolls,—mechanism for driving said set of rolls,—and a series of sets of concave-faced finishing rolls encompassing the tapering extension of the mandrel,—substantially as set forth.

2. In a machine for making tapering tubes from hollow metal ingots, the following elements in combination:—a rotatable mandrel having a cylindric body upon which the ingot is placed, an abruptly conical head formed as a continuation of said body, and a prolonged tapering extension formed as a continuation of said head,—a mandrel-carrying frame in which said mandrel is supported free for rotation,—a set of angularly disposed conical rolls encompassing the conical mandrel head, and disposed at an angle to each other, and each roll at a common angle to its neighbors,—a housing for supporting said set of rolls,—mechanism for driving said set of rolls,—means for positively rotating the mandrel,—and a series of sets of concave-faced finishing rolls encompassing the tapering extension of the mandrel,—substantially as set forth.

3. In a machine for making tapering tubes from hollow metal ingots, the following elements in combination:—a rotatable mandrel having a cylindric body upon which the ingot is placed, an abruptly conical head formed as a continuation of said body, and a prolonged tapering extension formed as a continuation of said head,—a mandrel-carrying frame in which said mandrel is supported free for rotation,—a set of angularly disposed conical rolls encompassing the conical mandrel head, and disposed at an angle to each other and each roll at a common angle to its neighbors,—a housing for supporting said set of rolls,—mechanism for driving said set of rolls,—means for positively rotating the mandrel,—means for positively advancing and retracting the mandrel from its position of encompassment by the rolls,—and a series of sets of concave-faced finishing rolls encompassing the tapering extension of the mandrel,—substantially as set forth.

4. In a machine for making tapering tubes from hollow metal ingots, the following elements in combination:—a rotatable mandrel having a cylindric body upon which the ingot is placed, an abruptly conical head formed as a continuation of said body, and a prolonged tapering extension formed as a continuation of said head,—a mandrel-carrying frame in which said mandrel is supported free for rotation,—a set of angularly disposed conical rolls encompassing the conical mandrel head, and disposed at an angle to each other and each roll at a common angle to its neighbors,—a housing for supporting said set of rolls,—mechanism for driving said rolls,—means for positively rotating the mandrel,—means for maintaining the mandrel fixedly in its advanced position within the rolls,—and a series of sets of concave-faced finishing rolls encompassing the tapering extension of the mandrel,—substantially as set forth.

5. In a machine for making tapering tubes from hollow metal ingots, the following elements in combination:—a rotatable mandrel having a cylindric body upon which the ingot is placed, an abruptly conical head formed as a continuation of said body, and a prolonged tapering extension formed as a continuation of said head,—a mandrel-carrying frame in which the said mandrel is supported free for rotation,—a set of angularly disposed conical rolls encompassing the conical mandrel head, and disposed at an angle to each other and each roll at a common angle to its neighbors,—a housing for supporting said set of rolls,—mechanism for driving said rolls,—mechanism for forcing the ingot from off the cylindric body of the mandrel into the grasp of the rolls,—and a series of sets of concave-faced finishing rolls encompassing the tapering extension of the mandrel,—substantially as set forth.

In testimony that I claim the foregoing as my invention I have hereunto signed my name this 22d day of July, A. D. 1893.

STEPHEN P. M. TASKER.

In presence of—

F. NORMAN DIXON,

JAMES LAUGHRAN.