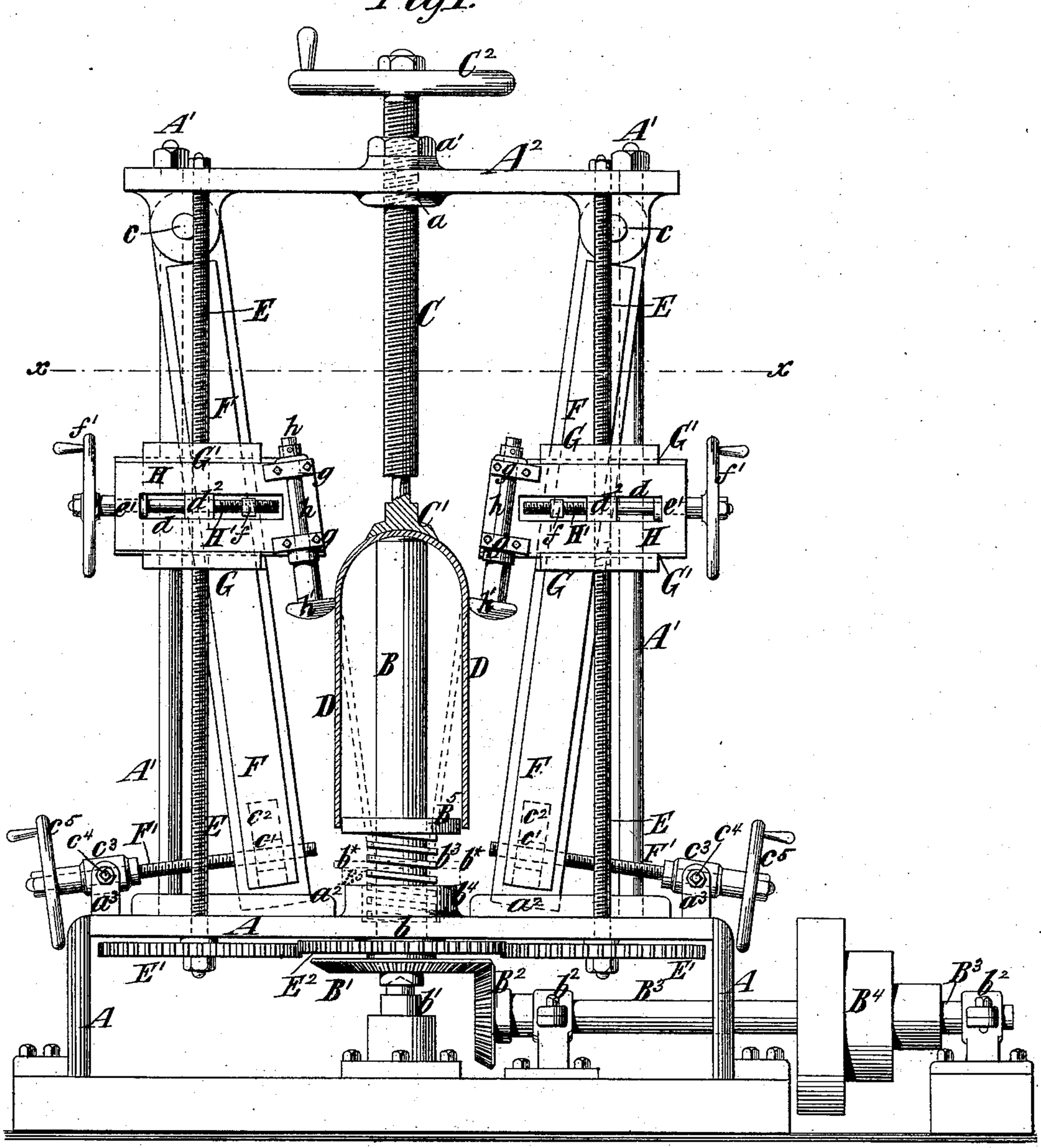
(No Model.) 2 Sheets—Sheet 1.

# F. J. SEYMOUR.

## MACHINE FOR SHAPING WROUGHT METAL CYLINDERS.

No. 376,167. Patented Jan. 10, 1888.

Fig 1.

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(No Model.) 2 Sheets—Sheet 2.

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Fig 2.

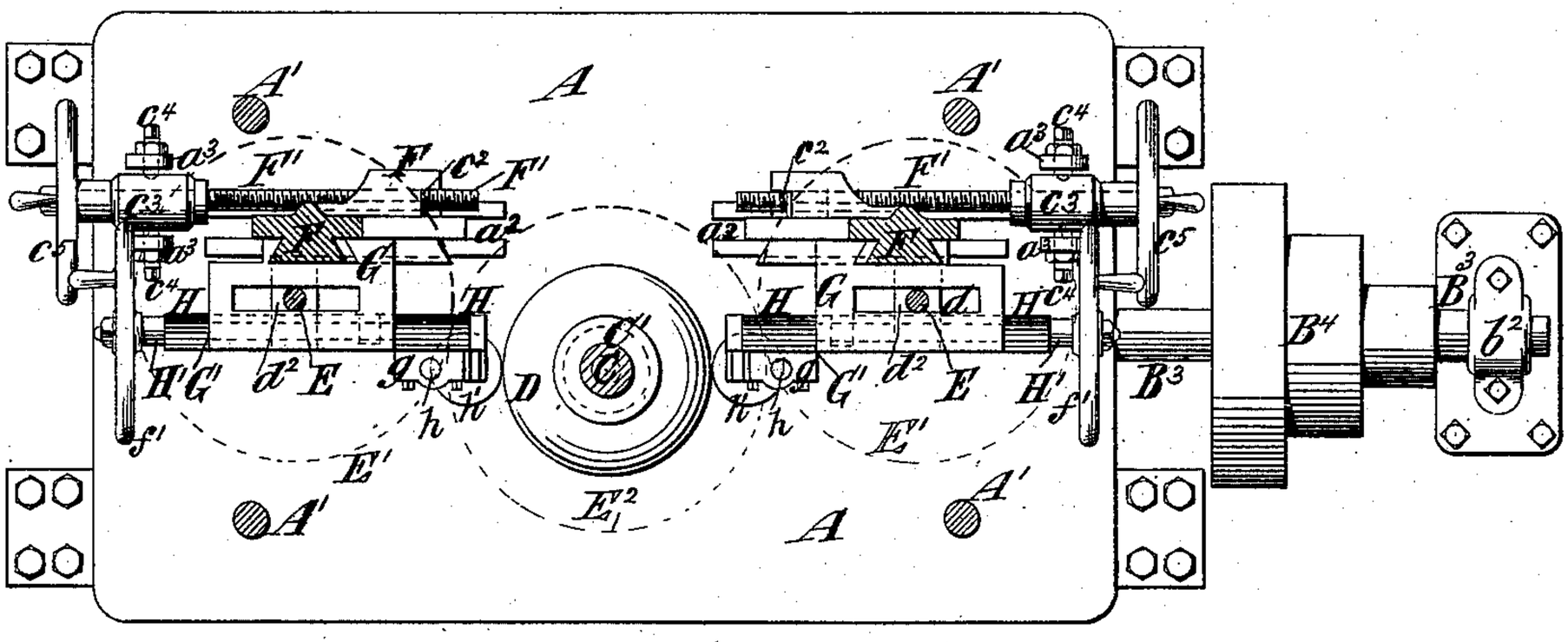
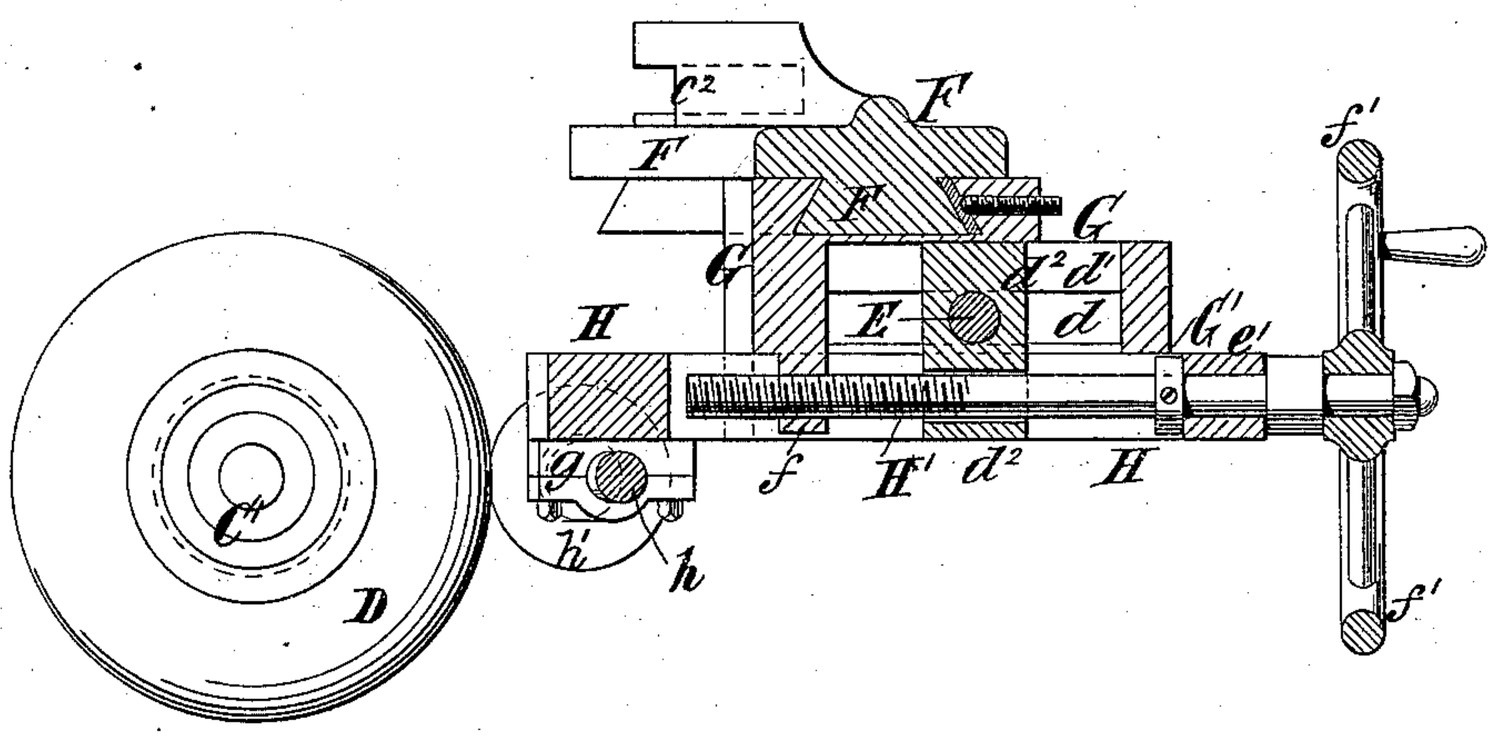



Fig 3.

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# UNITED STATES PATENT OFFICE.

FREDERICK J. SEYMOUR, OF CLEVELAND, OHIO, ASSIGNOR TO THE BROWN'S SEAMLESS METAL COMPANY, OF JERSEY CITY, NEW JERSEY.

## MACHINE FOR SHAPING WROUGHT-METAL CYLINDERS.

SPECIFICATION forming part of Letters Patent No. 376,167, dated January 10, 1888.

Application filed June 15, 1885. Renewed June 17, 1887. Serial No. 241,610. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERICK J. SEYMOUR, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented a new and useful Improvement in Machines for Shaping Wrought-Metal Cylinders or Shells, of which the following is a specification.

The object of my invention is to provide a machine whereby cylinders of steel, copper, or other wrought metal, and particularly cylinders closed and rounded at one end, may be rapidly and accurately contracted in diameter, either for the purpose of giving them a tapering form or for the purpose of contracting or shrinking them from end to end. The machine may be employed for operating upon such cylindric shells or cylinders either in a heated or cold state, and it is particularly useful for forming from such a cylinder an air-chamber having a downwardly-tapered form and necked, or having an outwardly-projecting flange at the lower open end. In this way air-chambers for pumps and other apparatus may be produced of thin steel or copper of great tensile strength and finely finished. The machine may also be employed for the purpose of contracting a number of cylindric shells one upon another, in order to make therefrom a piece of ordnance or cannon, each cylindric shell forming a mandrel upon which the next outer cylindric shell is tightly and permanently contracted.

This machine comprises a base portion or bed-plate, upon which are erected columns or posts, and a head or top plate surmounting such columns or posts. It also has a central rotary mandrel or spindle, upon which the cylinder to be operated upon is placed, and a rotary and screw-actuated steadiment, which may be brought down upon the closed end of the cylinder to hold it upon the mandrel or spindle. By the rotation of the mandrel or spindle the cylindric shell to be operated upon, whether in a heated or cold state, is turned or rotated. At opposite sides of the central mandrel or spindle are two carriages, each containing a slide having mounted upon it a rotary spinning wheel or tool, and by means of vertical feed-screws these carriages and their slides and tools are moved upward and downward or traversed along the cylinder. The two carriages are mounted upon slideways or guides, which may be pivoted at one end, as at the top, and adjustable by means of adjusting-screws toward and from the central mandrel or spindle at their lower ends. As the carriages and their slides and tools are traversed up or down by the feed-screws, they will follow the direction of these slideways or guide-bars, and if the slideways or guide-bars are set with an inward inclination toward the central mandrel or spindle the carriages and their slides and tools as they traverse downward will be gradually moved inward toward the mandrel or spindle, and will thereby impart to the cylindric shell operated upon a downward-tapering form, such as would be required for the air-chamber of a pump. By means of the adjusting-screws, which are at the lower end of the guide-bars, they may be set inward or outward relatively to the central mandrel or spindle, so that the spinning tools or wheels will be moved downward in lines parallel with the mandrel or spindle for producing straight work, or in lines more or less inclined relatively to the central axis for producing a downward taper or downwardly-flaring work.

In the accompanying drawings, Figure 1 is a front elevation of a machine embodying my invention. Fig. 2 is a horizontal section thereof upon the plane of the dotted line *x x*, Fig. 1, and Fig. 3 is a sectional view, upon a larger scale, through one of the guide-bars, its carriage, and slide, and showing also in plan a cylindric shell which is to be operated on.

Similar letters of reference designate corresponding parts in the several figures.

A designates a base-plate or bed, which may be of cast metal, and B designates a central mandrel or spindle, which projects upward through and is fitted to a suitable bearing, *b*, in the bed A. This mandrel or spindle also has a step-bearing, *b'*, of any suitable construction, and has upon its lower end a bevel-wheel, B', with which engages a bevel-wheel, $B^2$, upon a driving-shaft, $B^3$. This driving-shaft is mounted in bearings $b^2$, and has upon it a cone-pulley, $B^4$, adapted to receive a driving-belt for operating the machine. Upon the mandrel or spindle B is fitted a follower or ring, $B^5$,

below which is a spiral spring, $b^3$, whereby the follower or ring $B^5$ is supported. This spring $b^3$ is capable of yielding downward, so as to be received within a chamber or cavity formed in the hub $b^4$ upon the top of the base A, and the follower or ring $B^5$ will or may come down to a bearing upon the top of this hub or projection, as is represented by dotted lines in Fig. 1.

Erected upon the base-plate or bed A are upright posts or columns A′, which are rigidly connected at their upper ends with a head or top plate, $A^2$, the base A, columns A′, and head $A^2$ forming the rigid frame work of the machine.

The top plate or head, $A^2$, has formed in it, in vertical alignment with the mandrel or spindle B, a nut, *a*, and to this nut is fitted an upright screw, C, which is concentric with the mandrel or spindle, and which has fitted in its lower end a rotary steadiment or foot, C′, which comes just above the top of the mandrel.

D designates the cylindric shell which is to be operated upon, and which, as here shown, is closed by a hemispherical head or end portion. This shell is placed upon the mandrel, and the follower or ring $B^5$ should be of such size as to enter and receive upon it the lower open end of the cylindric shell. The shell rests upon the top of the mandrel or spindle B, and by bringing the foot or steadiment C′ down against the outside thereof by turning the screw, the cylindric shell will be held in place and will be clamped to the end of the spindle or mandrel, so that it will rotate therewith. In order to prevent the accidental unscrewing of the tightening-screw C, I provide it with a lock-nut, *a*′, and it may be turned by means of the hand-wheel or handle $C^2$.

E E designate two upright feed-screws, which are supported in suitable bearings in the bed A and top plate or head, $A^2$, and which have spur-wheels E′ upon their lower ends. The wheels E′ engage with and are driven by a wheel, $E^2$, fast upon the mandrel or spindle B, and through them the feed-screws E receive rotary motion.

Extending from top to bottom of the machine are guide-bars F, which, as here represented, are pivotally connected at *c* to the head or top plate, $A^2$, and have their lower ends adjustable toward and from the mandrel or spindle B, so that they may be set into positions inclined more or less relatively thereto.

As here represented, the bed or base A has upon it pairs of upwardly-projecting flanges, which form between them slideways $a^2$, in which the lower ends of the guide-bars F are held, and by which lateral motion of the guide-bars in a direction transverse to their line of adjustment is prevented.

F′ designates adjusting-screws, which engage with nuts *c*′, fitting to slideways $c^2$ in the lower ends of the guide-bars F. These adjusting-screws are fitted to bearings $c^3$, which are pivoted or supported by trunnions $c^4$ in lugs or ears $a^3$ upon the bed A, and the screws may be turned by hand-wheel $c^5$. The bearings $c^3$ and the sliding nuts *c*′ accommodate themselves to the varying positions of the guide-bars F, and by turning these screws F′ in one direction or the other the guide-bars F may be swung upon their pivots *c* and brought into positions parallel with the mandrel or spindle B, or at any desired inclination thereto, either toward or from the mandrel.

As best represented in Figs. 2 and 3, each guide-bar F has a dovetailed rib or slideway upon its face, and to this slideway is fitted a carriage, G, which has dovetailed gibs fitting the slideway, and is capable of adjustment upward and downward thereon. Each carriage is formed with a vertical slot, *d*, which receives through it the feed-screw E, and it also has a horizontal slot, *d*′, in which is fitted a sliding nut, $d^2$, which is fitted upon the feed-screw E. As the feed-screw is rotated, the nut, being prevented from turning, will be moved up or down, and will thereby impart a vertical traverse motion to the carriage G; but the slots *d d*′ will permit of the carriage G moving freely in a lateral direction to accommodate itself to the inclination of the guide-bar F.

In the face of each carriage is a dovetailed slideway, G′, wherein is fitted a horizontally-moving slide, H, as best shown in Fig. 1. This slide H may be adjusted laterally relative to the carriage G by means of a screw, H′, which is held against lengthwise movement in a bearing, *e*′, and engages with a nut, *f*, projecting forward from the carriage G, as will be seen in Fig. 3. The screw H′ may be turned by a hand-wheel or handle, *f*′, and by so turning the screw the slide H will be moved laterally in the carriage G, inward or outward relatively to the mandrel or spindle B. The screw H′ connects the carriage and slide G H, so that as the carriage is moved upward or downward the slide will be moved with it, and will be held against accidental lateral movement. Upon the slide H are bearings *g*, in which is mounted a rotary spindle, *h*, carrying at its lower end a disk or spinning-tool, *h*′. As here represented, the spindles *h* are inclined inward and downward relatively to the mandrel B, so that as they move upward or downward their tools *h*′ will bear upon the cylinder D, while permitting the bearings *g* and slide H to clear the cylinder D.

The spindles *h* and the spinning-tools *h*′ are free to rotate by their frictional contact with the positively-driven cylinder, and as they are traversed upward and downward they contract the cylinder D, and also have a tendency to correspondingly elongate it. If the guide-bars F are set to inclined positions, as shown in Fig. 1, the carriages G and tools *h*′ will move gradually inward toward the mandrel B as the carriages are moved downward, and will thereby contract the cylinder, so that its walls when finished will be parallel with the position of the guide-bars F.

The machine as shown is adjusted for drawing

downward and necking the cylinder, so as to form an air-chamber having a flange, $b^*$, at its lower end, as shown by dotted lines, Fig. 1. After the tools $h'$ have been moved downward and have completed their work, the screws H' may be slightly slackened, so as to move the tools $h'$ from the work, and then by rotating the driving-shaft $B^3$ and the feed-screws E in a reverse direction to their former rotation the carriages G and the tools $h'$ will be traversed upward, or returned to a position for a new operation. The mechanism for reversing the direction of the driving-shaft $B^3$ and the feed-screws E may be of any suitable character ordinarily used in analogous machines. A convenient arrangement of mechanism will be to employ a simple counter-shaft, such as is used for driving a lathe, and which is driven by open and crossed belts capable of being shipped, or by a clutch arranged so that they may be employed in driving the counter-shaft in one or other direction, as may be desired. A single belt driving from the cone on the counter-shaft onto the cone $B^4$ of the driving-shaft will complete the driving-gear. I have not shown the counter-shaft with its pulleys, as they are similar to the counter-shafts and pulleys ordinarily employed in driving lathes.

The cylinder or cylindric shell D may be brought to the form shown by full lines in Fig. 1, preparatory to operating upon it by this machine, by drawing with suitable dies and mandrels, and either in a heated or cold state, or in both a heated and cold state, the first drawing or folding operations being performed while the metal is heated, and the subsequent drawing operations being performed while the metal is in a cold state. The cylindric shell D may be operated upon by my improved machine either in a hot or cold state.

Not only may the machine be employed successfully in giving a downwardly-tapering form to the work D, so as to form air-chambers or other analogous or tapering articles, whether they have flanges at their lower ends or not, but it may be also employed in contracting more or less the diameter of cylindric sections, leaving them straight and of uniform diameter from end to end. The machine may in this way be employed to bind together a number of cylindric shells of different diameters, so as to form a composite gun or piece of ordnance. The shells may be made of such relative diameters by drawing that they will slip one within another, and they may by this machine be contracted one upon another, and by a number of successive operations, each cylinder forming a mandrel on which the cylinder outside it is contracted and permanently secured.

Such a method of forming a gun or piece of ordnance by contracting cylindric sections or shells one upon another is not included in this invention, but forms the subject of a separate application for Letters Patent, Serial No. 168,701, filed June 15, 1885.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with an upright rotary mandrel or spindle adapted to receive and carry a cylindric shell or tube, of guide-bars extending upward and downward at opposite sides thereof, carriages fitting the guide-bars and provided with spinning tools or disks for operating on the shell or tube, feed-screws and nuts for traversing the carriages upward and downward along the guide-bars in a direction lengthwise of the mandrel or spindle, and gearing connecting the feed-screws, whereby they are caused to rotate in unison, substantially as herein described.

2. The combination, with the central rotary mandrel or spindle, B, and a sliding follower or ring, $B^5$, fitted thereto and adapted to support a cylindric shell or tube, of guiding-bars, feed-screws, and carriages arranged at opposite sides of the mandrel or spindle, and spinning tools or disks on the carriages for operating upon the cylindric shell or tube, substantially as herein described.

3. The combination, with a base-frame and top frame or head and posts connecting them, of a rotary upright mandrel or spindle journaled in the base-frame, the oppositely-arranged holding-screw C, fitting a nut in the top frame or head and provided at the lower end with a rotary foot or steadiment, C', guide-bars F, extending between the base-frame and top frame or head, on opposite sides of the mandrel or spindle, carriages fitted to reciprocate upward and downward along the guide-bars and provided with spinning tools or disks, and feed-screws and nuts for reciprocating the carriages and their tools along the guide-bars, substantially as herein described.

4. The combination, with the central rotary mandrel or spindle, B, the follower or ring $B^5$, fitted to slide upon the mandrel or spindle, and the spring $b^3$, for supporting the follower or ring, of guiding-bars or slideways and carriages fitted to slide thereon, spinning tools or disks upon said carriages, and feed-screws and nuts, whereby said carriages, with their tools, will be traversed along lengthwise of the mandrel or spindle, substantially as herein described.

5. The combination, with a central rotary mandrel or spindle for receiving and carrying a cylindric shell or tube, of pivoted guiding-bars or slideways and adjusting-screws, whereby said bars or slideways may be set and held stationary in positions parallel with or at any desired inclination to said mandrel or spindle, carriages fitted to said guiding-bars or slideways and carrying spinning tools or disks, feed-screws and nuts, whereby said carriages, with their tools, may be traversed along the guiding-bars or slideways in a direction lengthwise of the mandrel or spindle, and gearing connecting the feed-screws, whereby they are made to rotate in unison, substantially as herein described.

6. The combination, with the central rotary mandrel or spindle, B, of the guiding-bars F, pivoted at their upper ends, and adjusting-screws F′, engaging with nuts at the lower ends of the said bars, swiveled bearings $c^3$ for said screws, carriages fitted to reciprocate on said guiding-bars and carrying spinning tools or disks, and feed-screws and nuts, whereby said carriages, with their tools, may be traversed along said guiding-bars, substantially as herein described.

7. The combination, with the central upright mandrel or spindle, B, and the oppositely-arranged holding-screw and steadiment C C′, of guide-bars F, extending upward and downward on opposite sides of the mandrel or spindle and the vertical feed-screws E, the carriages G, each fitting a guide-bar and having a horizontal slideway, G′, in its face, and also having a vertical slot, $d$, for the reception of a feed-screw, E, and a horizontal slot, $d'$, the nuts $d^2$, each fitting a feed-screw and received in the slot $d'$ of a carriage, G, the slides H, and screws H′, for adjusting them in their slideways G′, and the tools or disks carried by said slides, substantially as herein described.

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Witnesses:
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