

(No Model.)

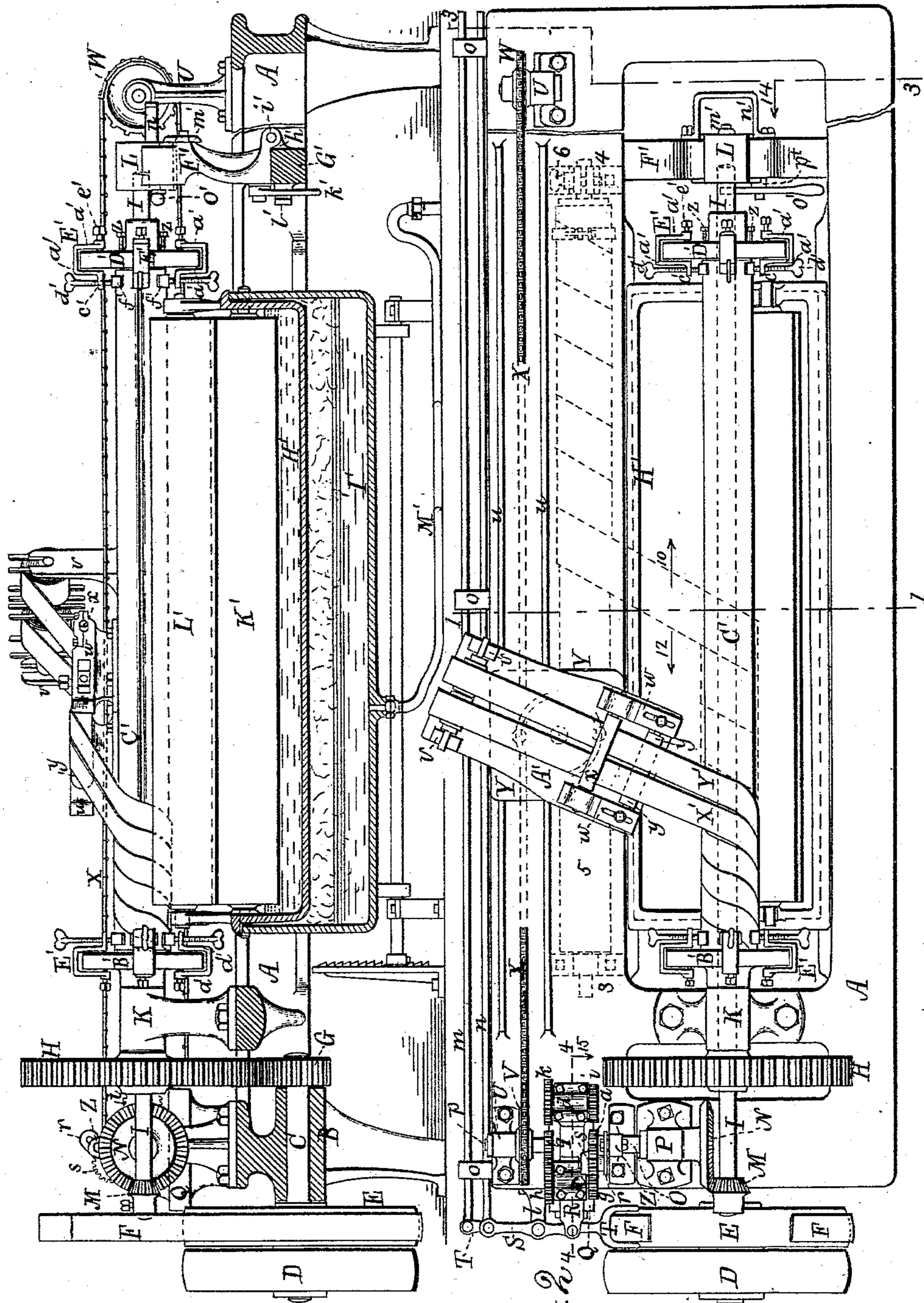
2 Sheets—Sheet 1.

J. MACFARLANE.

MACHINE FOR SPIRALLY WINDING STRIPS OF WOOD.

No. 414,649.

Patented Nov. 5, 1889.



witnesses
Thos W. Hobday
A. F. Piper,

Fig. 1.

Fig. 2.

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James MacFarlane.
by Singleton & Piper, attys.

(No Model.)

2 Sheets—Sheet 2.

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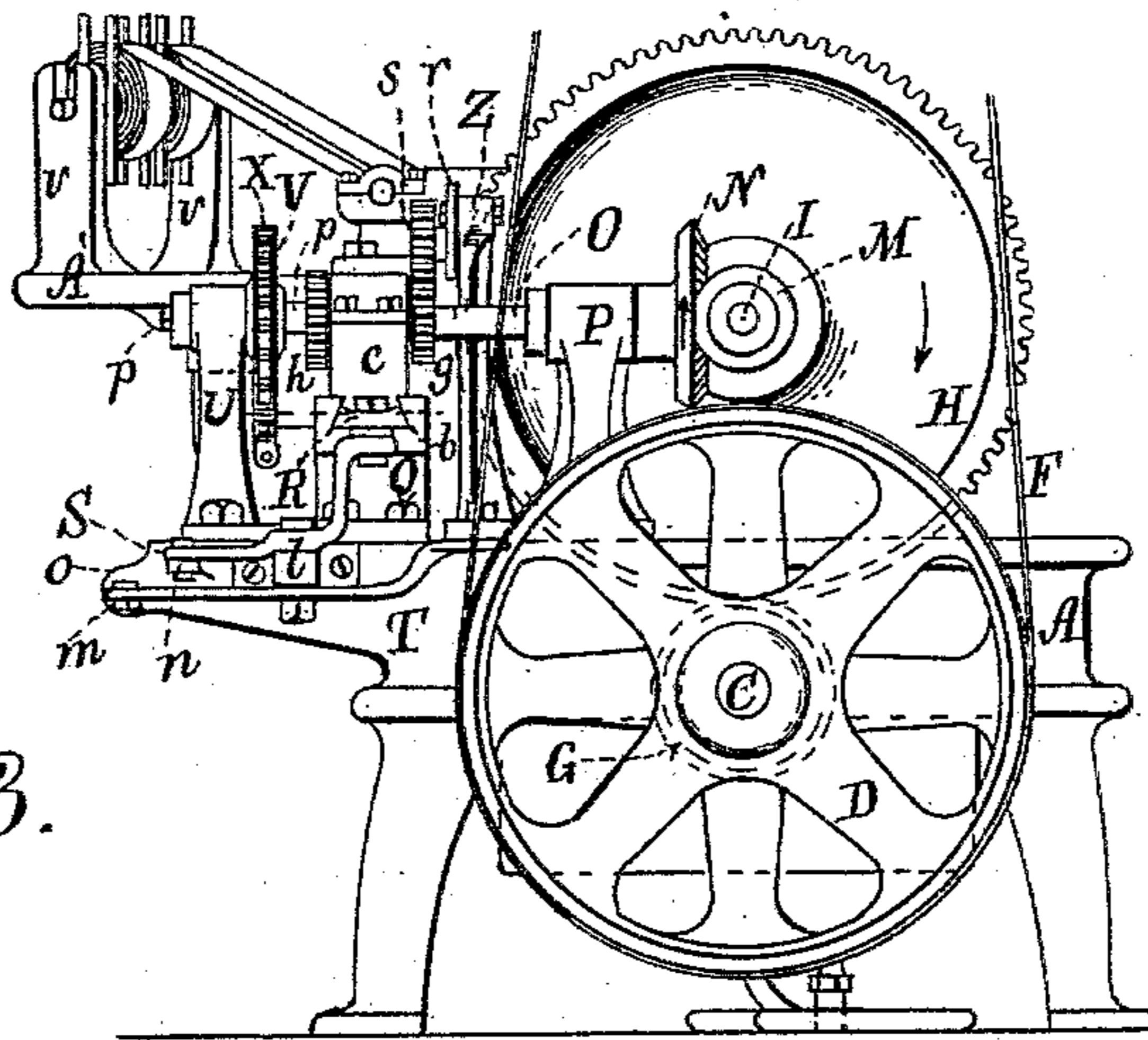


Fig. 3.

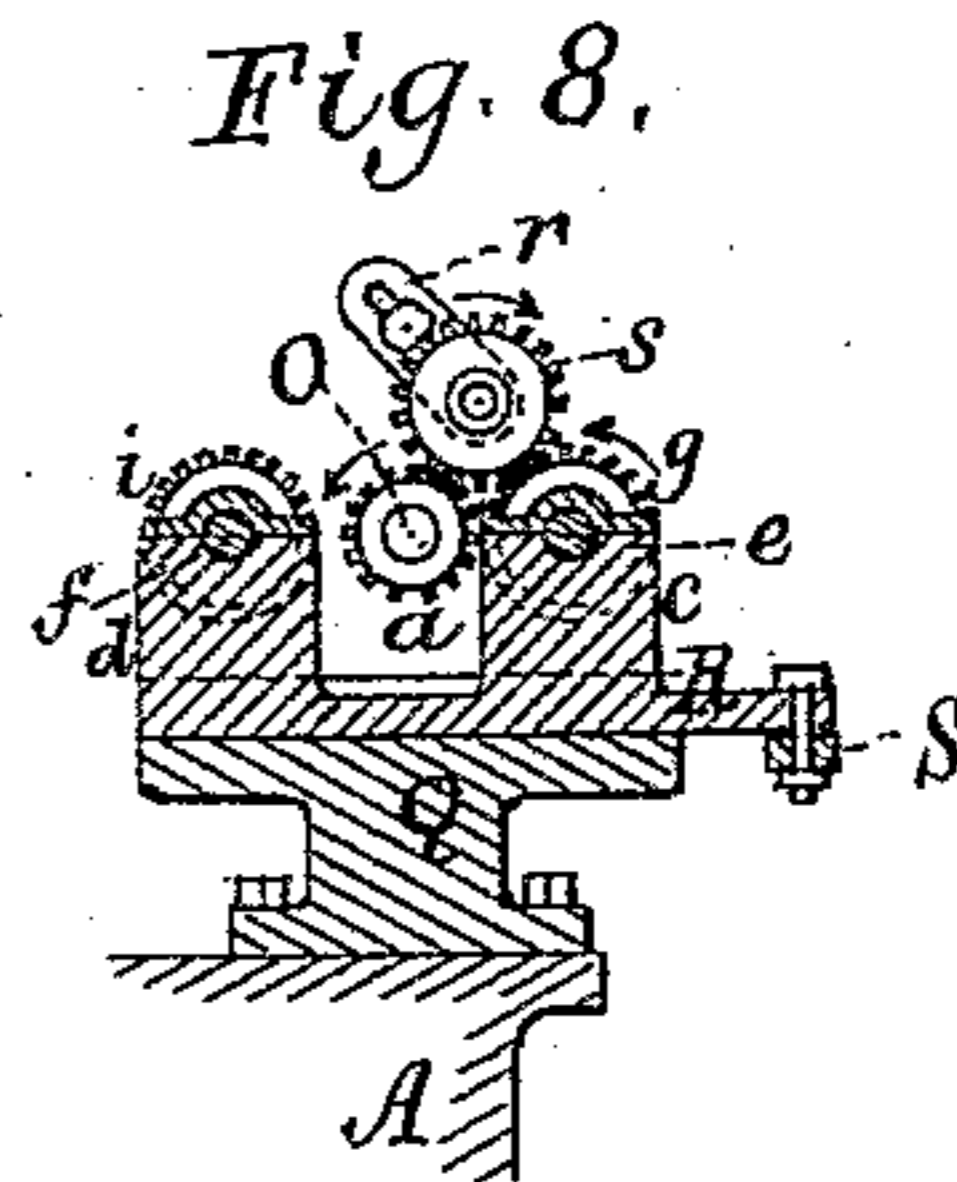


Fig. 8.

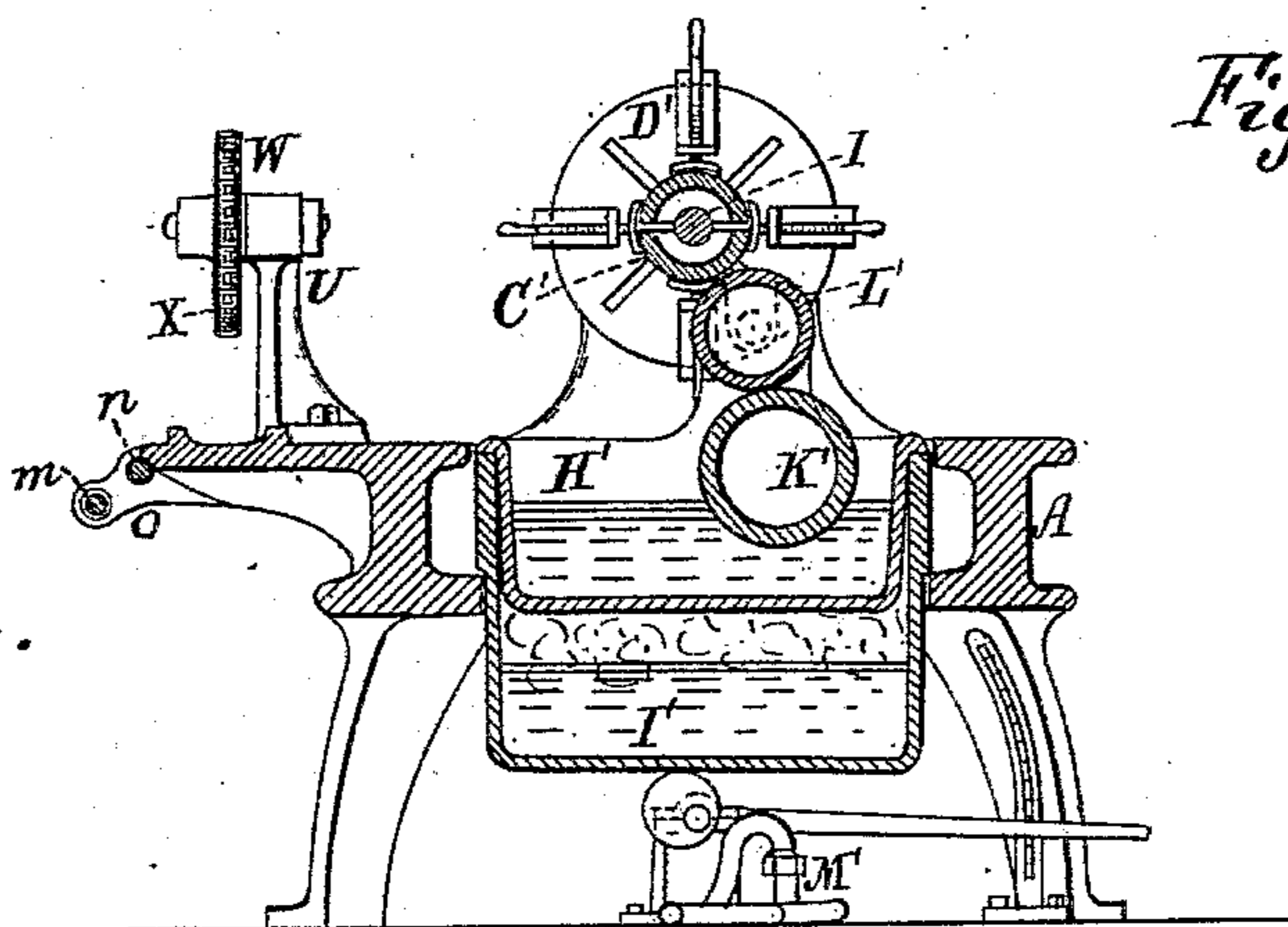


Fig. 4.

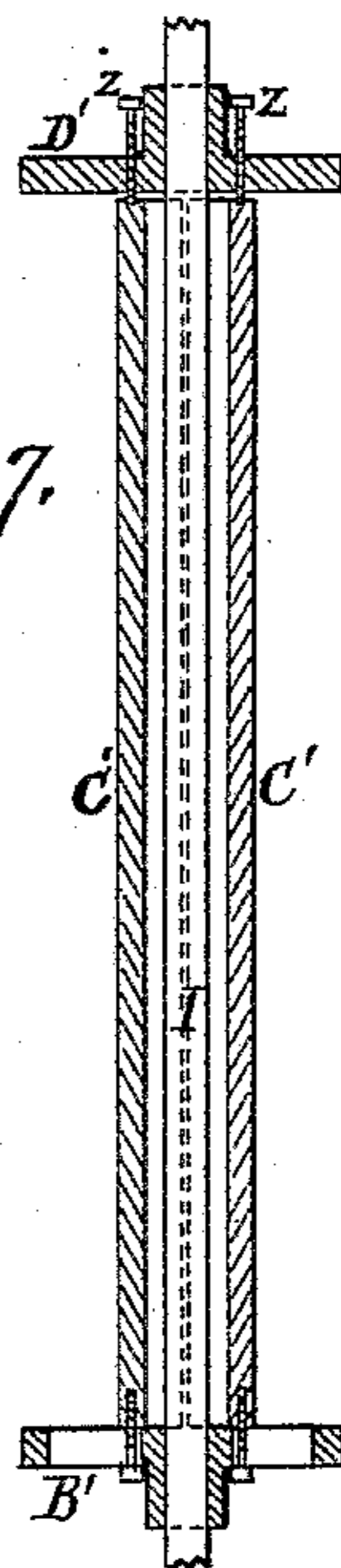


Fig. 7.

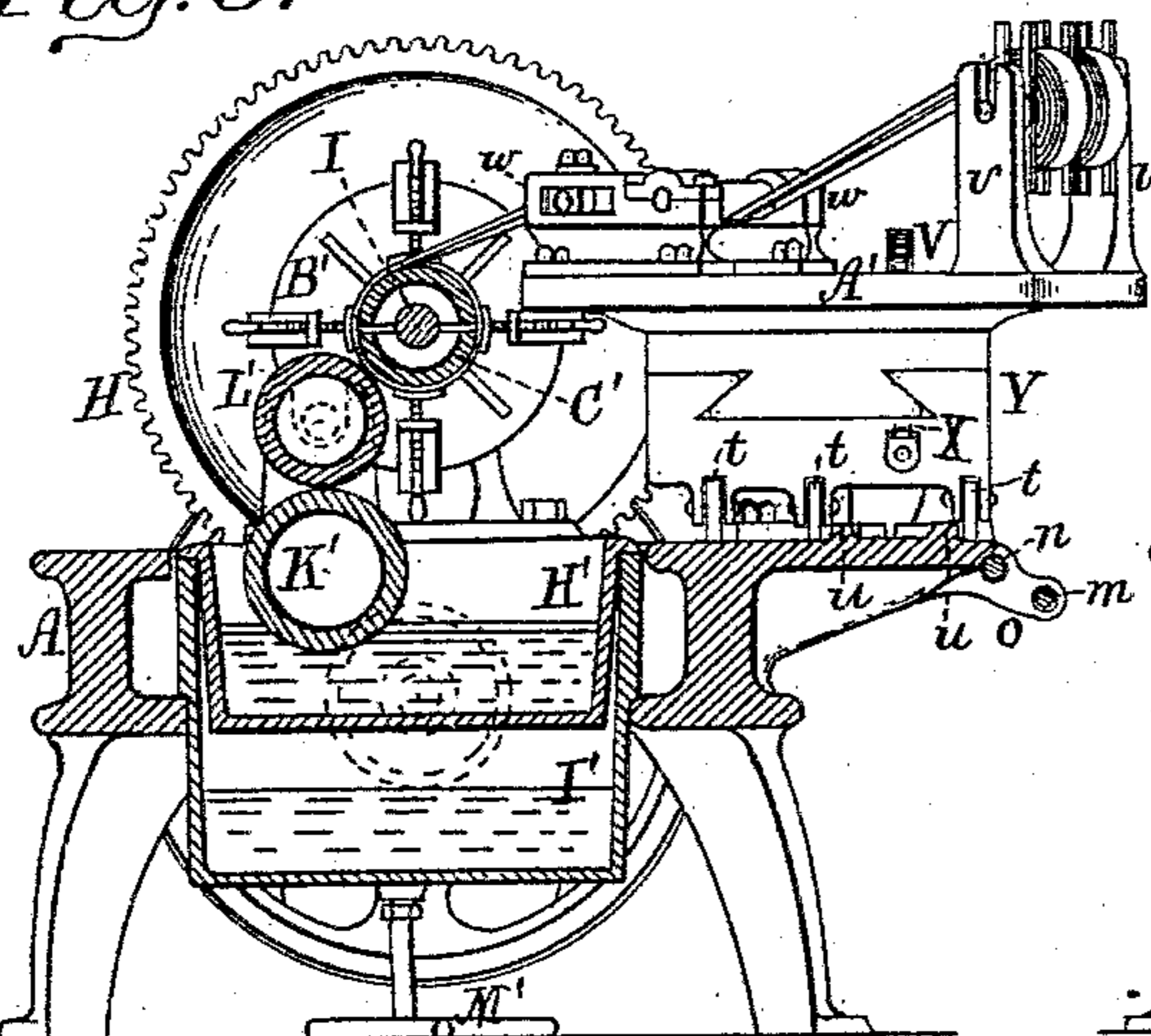


Fig. 5.

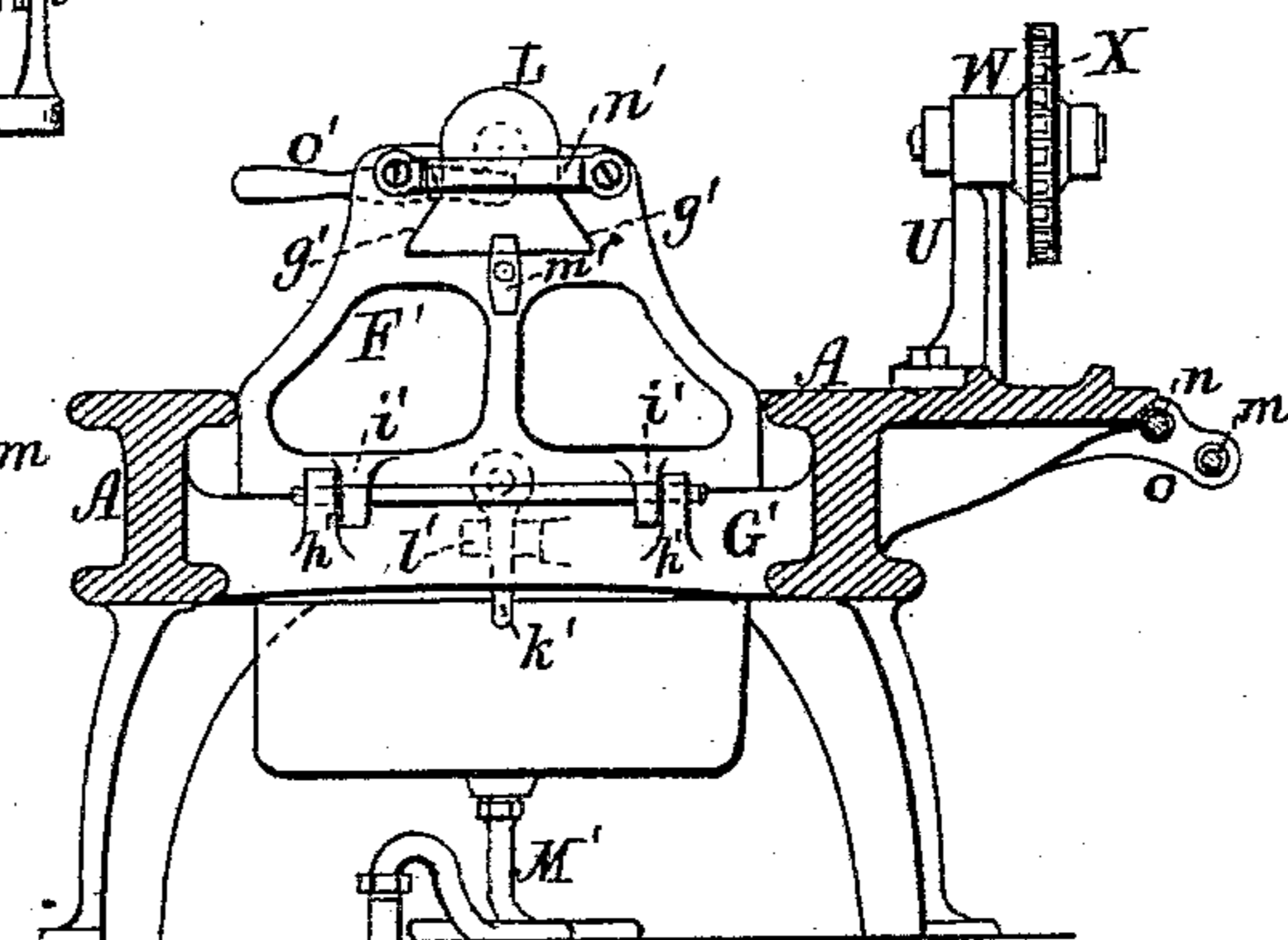


Fig. 6.

Witnesses
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UNITED STATES PATENT OFFICE.

JAMES MACFARLANE, OF MALDEN, MASSACHUSETTS, ASSIGNOR TO THE
LIGNIFORM TUBING COMPANY, OF PORTLAND, MAINE.

MACHINE FOR SPIRALLY WINDING STRIPS OF WOOD.

SPECIFICATION forming part of Letters Patent No. 414,649, dated November 5, 1889.

Application filed January 2, 1889. Serial No. 295,164. (No model.)

To all whom it may concern:

Be it known that I, JAMES MACFARLANE, a citizen of the United States, residing at Malden, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Machinery for Spirally Winding One or More Strips of Wood for Converting it or them into a Cylinder; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

Figure 1 is a sectional side elevation, Fig. 2 a plan or top view, and Fig. 3 an end view, of a machine of my invention. Figs. 4 and 5 are transverse sections of said machine on line 1 1 of Fig. 2, the former showing those portions of the machine lying to the right of said line denoted by arrow 10, and the latter those portions lying to the left of it indicated by arrow 12. Fig. 6 is a transverse section of the machine on line 3 3 of Fig. 2, looking in the direction indicated by arrow 14. Fig. 7 is a longitudinal section of the mandrel and the heads with which it is connected to confine it to the shaft I. Fig. 8 is a longitudinal and vertical section of the slide R, taken on line 4 4 of Fig. 2, looking in the direction indicated by arrow 15.

The nature of my invention is defined in the claims hereinafter presented.

Referring to the drawings, A denotes the frame of the machine, in one end of which is supported, in a long bearing B, a driving-shaft C, on which are arranged a loose pulley D and a fast pulley E, to which power is communicated by a belt F from a suitable motor. Secured to the driving-shaft is a spur-pinion G, which works with a gear H, keyed to a long shaft I, supported in bearings in the boxes K and L, sustained on the frame of the machine.

Fixed on the shaft I, near one end of it, is a bevel-pinion M, which acts with a bevel-gear N, fixed to a short shaft O, the axis of which is in the same horizontal plane with that of the shaft I, but at right angles to it,

said shaft O having on its other end a gear *a* and being supported in a bearing P, sustained on the frame. Secured also to the frame is a block Q, provided with a dovetailed groove *b*, in which is sustained a slide R, dovetailed to correspond with the groove. On said slide R are fixed two boxes *c d*; in which are supported so as to revolve therein two short shafts *e f*, the former *e* having fixed to it two gears *g h*, and the latter *f* two gears *i k*.

Pivoted to the outer end of the slide R is a lever S, fulcrumed to a projection *l* from the frame. (See Figs. 2 and 3.) A lever T, forked as shown to receive the belt F, is also fulcrumed to the said projection *l* and has pivoted to its outer end a rod *m*, and pivoted to the outer end of the lever S is a rod *n*, both of said rods being supported in bearings *o*, extended from the frame, as represented.

Arranged in bearings in standards U, erected on the frame, are sprocket-wheels V W, about which passes a chain X, to the under portion of which is connected a carriage Y, to be hereinafter described. To the inner end of the shaft *p* of the sprocket-wheel V is fixed a gear *q*, which, when acted upon by the gear *h*, is caused to revolve the wheel V in the direction to move the carriage Y toward the wheel W, and when acted upon by the gear *k* will revolve the wheel V in the opposite direction, and consequently will move the carriage toward said wheel V.

To a standard *z*, erected upon the frame, is clamped an arm *r*, slotted in the end of it, which is confined to the standard, and near its other end is provided with a journal on which is arranged an intermediate gear *s*, which acts with the gear *a* and transmits the motion imparted to said gear *a* by the gears intervening between it and the driving-shaft to the gear *g*, shaft *e*, and gear *h*. The speed of the wheel V, and consequently that of the carriage Y, is governed by the number of teeth in the intermediate gear applied to the journal of the arm *r* and acting with the gears *a* and *g*, the number of teeth in said intermediate gear being such that during each revolution of the mandrel and the shaft I, with which it is connected, the carriage Y, which supports the strip or strips, shall be moved by the chain X the requisite distance to insure

that a single strip or two or more strips, as may be desired, shall be wound spirally on the mandrel with their edges touching each other, so as to form a cylinder, essentially as shown in Figs. 1 and 2. The carriage Y is supported on wheels *t* pivoted thereto, and which bear and roll on the top of the frame-rails *u u*, guiding the rolls, and consequently the carriage, in longitudinal movements on said frame. On the top of the carriage is a plate *A'*, so applied to it as to swivel thereon, and erected on and near the rear end of said plate are two standards *v v*, each slotted in its upper part to receive a rod on which are arranged so as to turn thereon one or more reels on which are placed the coiled strips of wood to be spirally coiled on the mandrel and converted into a cylinder. (See Figs. 1 and 2.) Near the end of the plate *A'* next the mandrel are two supports *w w*, in which are arranged the journals of two rolls *x y*, those of the roll *y* nearest the mandrel being sustained in boxes arranged in slots in the supports, so as to be adjustable with reference to the rear roll *x*. The strips from the reels are led under the roll *x* and over the roll *y* and secured to the mandrel, and by varying the distance between said rolls the draft on the strips can be increased or diminished to produce the necessary tension thereon as may be required to insure the close winding of the strips on the mandrel.

In some cases, particularly when making the larger classes of cylinders, I disconnect the carriage Y from the chain and remove said carriage from the frame, and to bearings in standards 3 and 4, erected on the frame, (see dotted lines in Fig. 2,) is applied a long cylinder 5, parallel to the mandrel and of the same diameter with it, the bearings in which its journals rest being so constructed as to readily admit of one or either end of the cylinder being raised to receive on its raised end a coiled strip of wood which has been previously steamed and coiled while in a pliable state and dried while so coiled, which treatment of the strip causes it to resist the uncoiling of it. This strip, after its coil has been sufficiently expanded to admit of it, is slipped onto the cylinder 5, and the end of its inner coil secured to the cylinder near one end of it to hold the strip while it is being drawn out. Then by laying hold of the outer end of the strip and drawing it toward the other end of the cylinder the strip will coil spirally on and tightly hug the cylinder. The said outer end of the strip is next clamped to the mandrel, which on being put in motion will wind the strip from the cylinder onto said mandrel, sufficient friction, if any is required, to cause the strip to wind tightly on the mandrel being created by a screw 6, suitably applied to one of the bearings of the cylinder-journals.

Arranged on the shaft I and on the opposite side of the bearing K to the gear H is a head *B'*, which is provided with radial slots and is clamped to the shaft so as to turn with it,

and bearing at one of its ends against the face of said head, and secured thereto by bolts passing through the head and encompassing the shaft I, is the mandrel *C'*, it being made in two or more longitudinal sections sustained around the shaft I and fastened to the head *B'*, as described, and at its other end to another head *D'*, clamped to the shaft I, the outer periphery of the said mandrel being arranged concentric with the shaft I. Set-screws *z z* are screwed through the head *D'* and against or into the end of the mandrel next said head to confine its sections in position.

Clamps *E'* are applied to the heads *B'* and *D'*, as represented, their office being to confine the end of each strip to the mandrel. They are each shown as made approximately in the shape of the letter U, the arms *a' a'* extending along and against the sides of the head, as shown, and the bottom resting against or near to the periphery of the head. One arm is provided with a clamp-screw *e'* to secure the clamp to the head, and the other has an ear *c'*, through which a screw *d'* passes, it being in parallelism with the side of the head, and has pivoted to it a foot *f'*, curved to conform to the circumference of the mandrel, or thereabout. By means of the said screw and the foot a strip can be clamped to the mandrel. Sometimes the head *D'* is so formed as not to project beyond the circumference of the mandrel, in which case the shape of the clamp is changed to conform to the requirements of such construction.

The box L of the shaft I is dovetailed in its lower part to fit to a correspondingly-shaped groove *g'*, formed in the upper portion of a frame *F'*, arranged to bear, when in an upright position, on a portion or bar *G'* of the frame extending transversely of the machine and provided with ears *h'*, to which are pivoted ears *i'*, projecting from the frame *F'*.

Pivoted to the side of the frame *F'* opposite to that side of it on which the ears *i'* are located is an arm *k'*, which, when turned down into a vertical position, bears against a hooked ear *l'*, extending from the bar *G'*, and securely locks the frame *F'* in an upright position. Pivoted to the upper part of the said frame *F'*, on the same side of it on which the ears *i'* are located, is a button *m'*, against which the box L bears when the end of the shaft I is in its bearing in said box. A stop *n'*, formed as shown in Figs. 2 and 6, is fastened to the frame *F'*, and a lever *o'* is pivoted to the frame at *p'*, the shorter arm of which bears against the under side of the shaft I. On turning the button *m'* away from the box and bearing down the outer arm of the lever *o'* sufficiently to relieve the bearing in the box L of the weight of the shaft the box can be slid in its groove away from the shaft, and next, by turning the arm *k'* out of engagement with the ear *l'*, the frame *F'* can be turned on its pivot down within the frame A, the stop *n'* preventing the box from becoming disengaged from the frame *F'*, and by loosening the set-

screws confining the head D' to the shaft the said head can be removed therefrom to admit of the removal from the mandrel of a cylinder which has been formed thereon.

5 Beneath the mandrel and of nearly equal length therewith is arranged a pair of long tanks H' and I' , the upper of which is supplied with a suitable cement and is sustained within and by the other, the outer one, for
10 holding water, being supported on a mechanism by which its altitude can be varied, as may be desired. It is represented as resting at its bottom on cams secured to a shaft supported in bearings, the shaft having secured
15 to it an arm operating with a rack to hold the tank in any position within the range of its motion. Supported in bearings in the inner tank are one or more rolls K' and L' , which convey the cement from the tank and
20 apply it to the strip or strips wound spirally around the mandrel. A steam-pipe M' , connected to the tank I' , conveys steam from a generator to the tank to heat the water therein, and consequently the cement in the upper
25 tank.

The operation of making a cylinder of one or more strips of wood by the aid of my machine may be thus explained. We will suppose that two strips are to be simultaneously
30 wound upon the mandrel to form a cylinder, as represented in the drawings. In the first place, the said two strips, which have previously been prepared by being steamed to make them pliable, and next each coiled
35 and secured to prevent them from unwinding, and next dried while in the coiled state, are placed edge to edge in the carriage, the reels on which they are arranged being placed on a rod supported in the standards $v v$ of
40 the carriage Y , as shown in Figs. 1, 2 and 3. The outer ends of the strips are then passed between the rolls x and y and next clamped to the mandrel—the strip X' to the top, for instance—and the strip Y' is carried half-
45 way around the mandrel and clamped to it underneath and directly opposite to the strip X' , the carriage Y being set so that the strips will range at the required angle to properly coil on the mandrel and the proper
50 intermediate gear to impart the requisite speed to the carriage by means of the intervening mechanism placed on the journal of the arm r and connected with the gears a and g . Everything is now ready and the machine set in operation by shifting the belt F
55 from the pulley D to the pulley E . (See Figs. 1 and 2.) Motion is communicated from the driving-shaft C by the pinion G to the gear H , which revolves the shaft I , the mandrel, and beveled pinion M , and movement is also imparted to the carriage Y by means of the bevel-gear N , engaged with the pinion M , the shaft O , gear a , intermediate gear s , gear g ,
60 shaft e , gears h and q , the shaft p , sprocket-wheel V , and chain X . When the carriage has advanced and fed the strips as near to the other end of the mandrel as can be done,

the strips are secured to the mandrel so that they cannot unwind, and are then severed from that remaining on the reels; and the
70 carriage run back to its starting-point, which is done by moving the slide R , by means of the rod n and lever S , so as to connect the gears i and k to the gears a and q , which will reverse the motion of the wheel V and cause
75 the chain X to return the carriage. The gears of the slide R are then disengaged from the gears a and q , and the cementing-roll L' is next raised into contact with the strips wound on the mandrel, and the said mandrel
80 being in revolution a coating of the cement will be applied by the roll to the said strips. Next the motion of the mandrel is stopped and two other strips are secured to it, as before. The carriage Y is again set in motion,
85 and another course wound on the first course, care being taken to arrange the second and each succeeding course so that the strips thereof will break joints with those on which they are wound. The operation described is
90 repeated until the cylinder has attained the required thickness, after which it is removed from the mandrel as follows: The button m' and arm k' are turned on their pivots, the former away from the box L and the latter
95 so as to disconnect it from the ear l' . The weight of the shaft I is relieved from the bearing in the box L by the lever O' , and the said box is slid in its groove in a direction away from the said shaft I . The frame F is
100 turned on its pivots down within the frame of the machine. The screws z are next turned back away from the mandrel, and the head D' , when of larger diameter than the said mandrel, is unclamped from its shaft and removed from it. Then by freeing the cylinder from the clamps of the head B' and laying hold of the other end of said cylinder it can be readily withdrawn from the mandrel,
105 the sections of which at its free end will approach each other sufficiently to admit of the ready removal of the cylinder from the said mandrel.

Instead of strips of wood, I sometimes use in making cylinders strips of other fibrous
115 material in place of the wood or in combination with it, as may be desired.

For applying the cement to the cylinder in some cases one or more rotary brushes can be used to advantage in place of the rolls.
120

Having described my invention, what I claim is—

1. The combination of the driving-shaft and the mandrel-shaft connected to the driving-shaft so as to revolve therewith, both shafts
125 being supported in bearings in the frame, the said mandrel-shaft having heads fixed to it, with the mandrel made in sections and secured to said heads, all substantially as shown and set forth.
130

2. The combination of the driving-shaft and the mandrel-shaft geared to the driving-shaft, both sustained in bearings in the frame, the mandrel made in sections and secured to its

shaft so as to revolve with it, with the box L, formed essentially as shown, its frame F', provided with the button *m'*, stop *n'*, and arm *k'*, pivoted to the machine-frame and having the locking-ear *l'*, all substantially as shown and set forth.

3. The combination of the driving-shaft and the mandrel-shaft, connected so as to revolve together, the supporting-frame, the mandrel secured to its shaft or to heads fixed thereto, with one or more cementing rolls or brushes supported in bearings in tanks, the said tanks arranged in the frame, they being sustained on mechanism by which they can be raised or lowered so as to carry a cementing roll or brush into contact with the surface of a course of strips wound on the mandrel to coat said course with cement when desired, all substantially as shown and set forth.

4. The combination of the driving-shaft and the mandrel-shaft, connected so as to revolve together, the supporting-frame, the mandrel made in sections and secured to the shaft or to heads fixed thereto, and the frame F', pivoted to the machine-frame for the purpose described, with the carriage Y and the

mechanism for reciprocating said carriage on the frame, such mechanism consisting of the chain X, sprocket-wheels V W, shafts *p*, *e*, and O, gears *q h g s a N M*, the shaft *f*, gears *i k*, and slide R, all being supported, arranged, and operated substantially as shown and set forth.

5. The plate A', applied to the carriage Y so as to swivel thereon and provided with the slotted standards *v v*, for supporting one or more strips while being coiled on the mandrel, the supports *w w*, the rolls *x y*, and the carriage Y, in combination with the mechanism for reciprocating said carriage on the frame, said mechanism consisting of the chain X, sprocket-wheels V W, shafts *p*, *e*, and O, gears *q h g s a N M*, the shaft *f*, and gears *i k*, the slide R, the driving-shaft and mandrel-shaft geared together, and the supporting-frame, all being supported, arranged, and operated substantially as shown and set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JAS. MACFARLANE.

Witnesses:

S. N. PIPER,
L. HAMILTON.