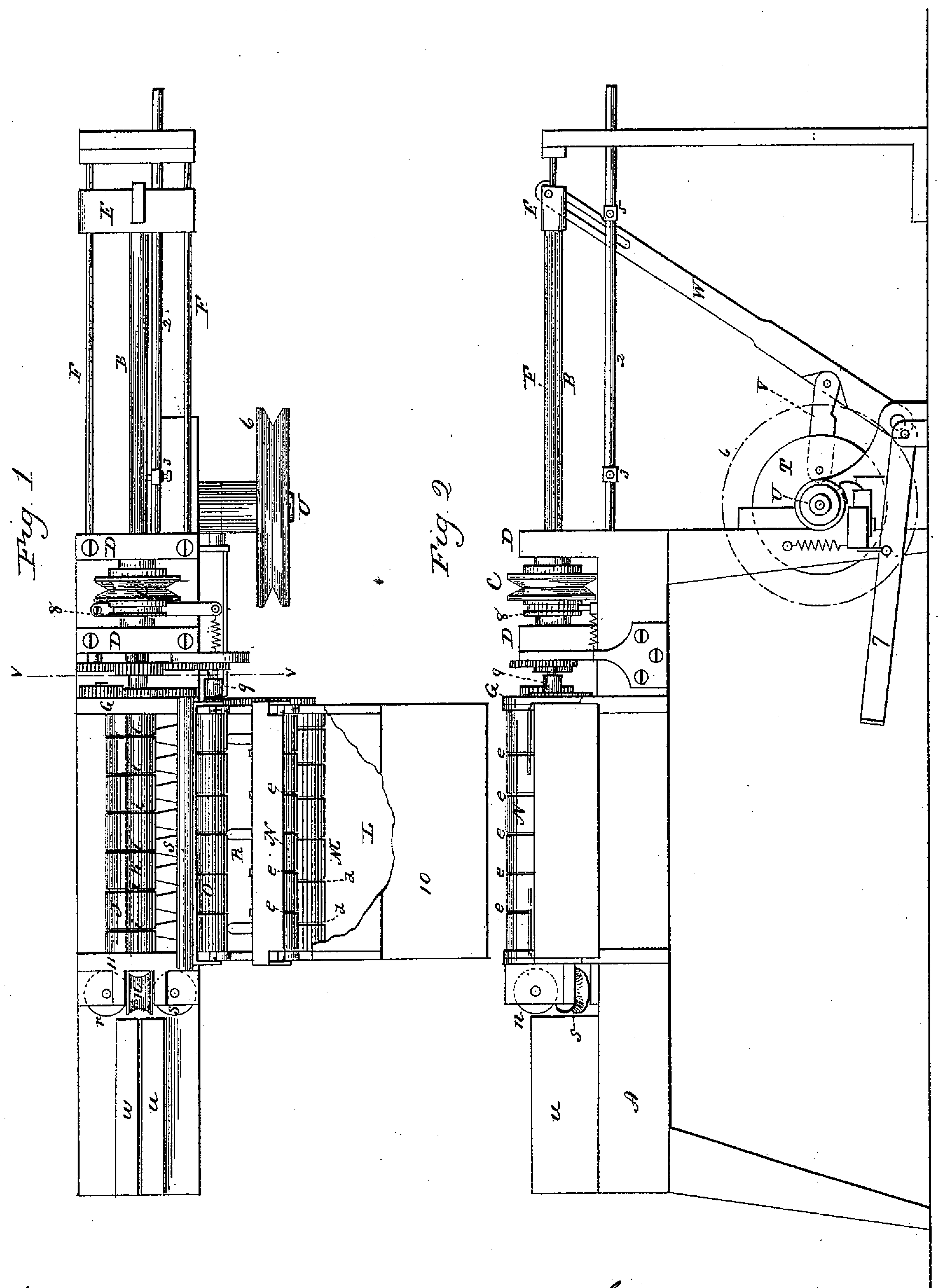
(No Model.)

3 Sheets—Sheet 1.

H. O. WHITNEY.

MACHINE FOR ROLLING PAPER TUBES.

No. 405,138. Patented June 11, 1889.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3

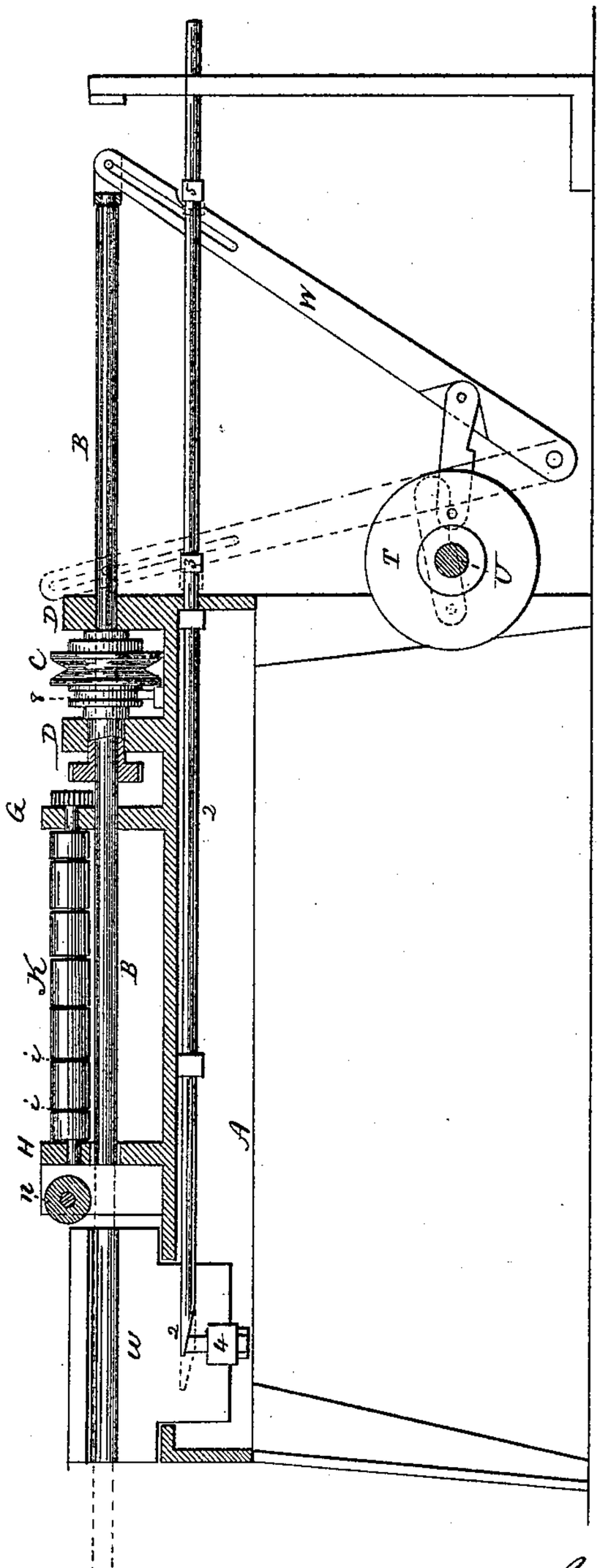

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Fig. 8

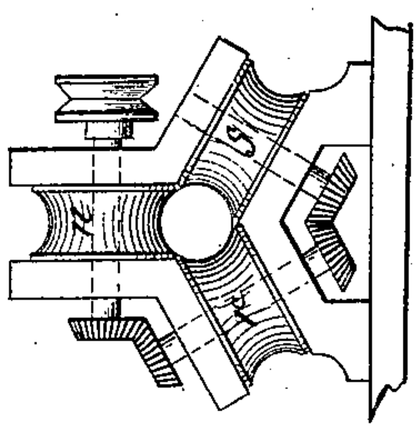

Fig. 5

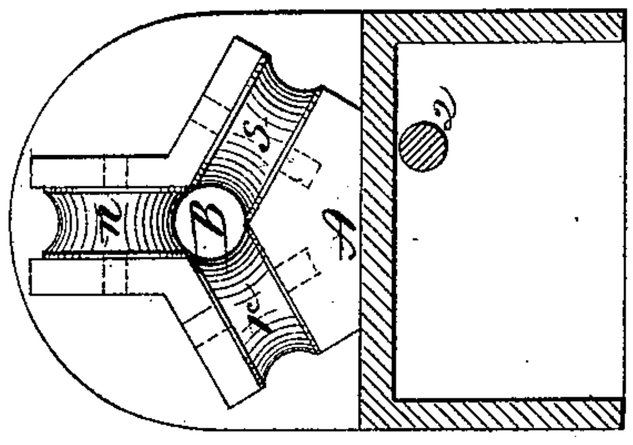

Fig. 4

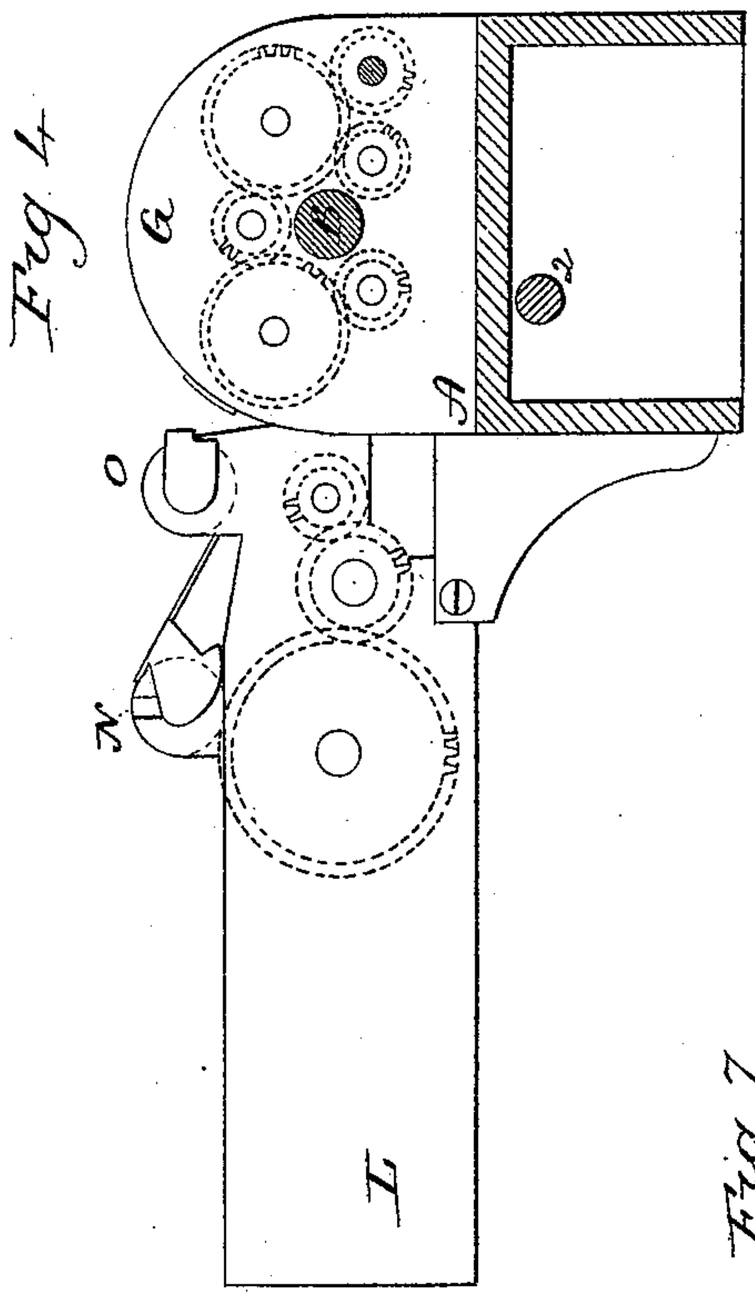

Fig. 6

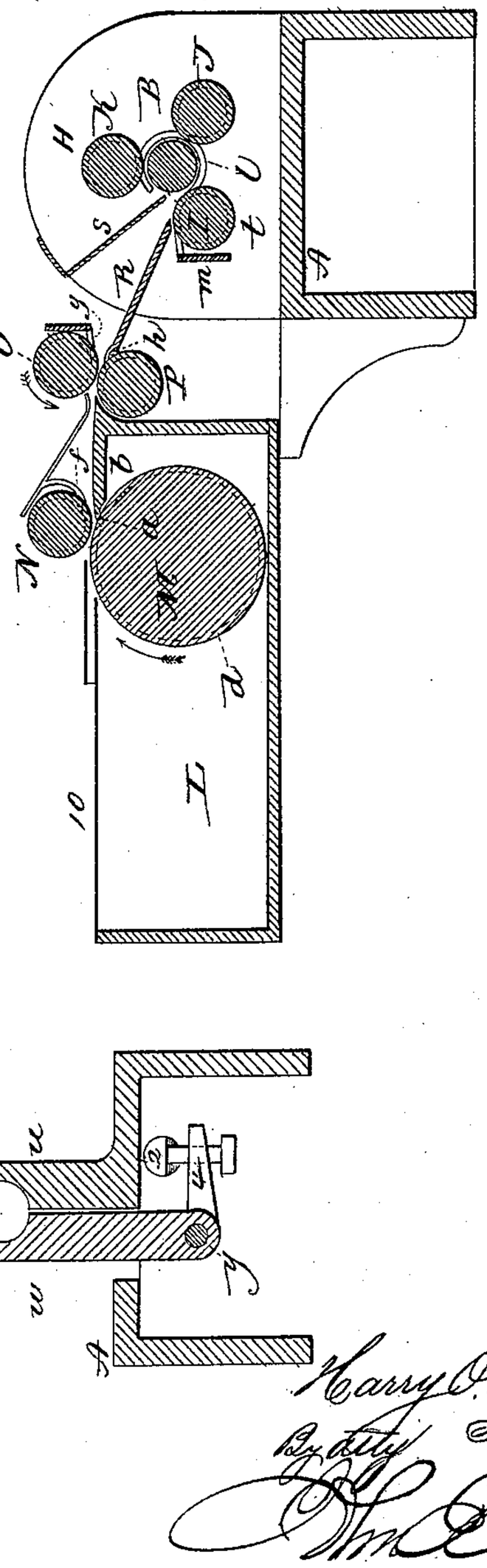

Fig. 7

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UNITED STATES PATENT OFFICE.

HARRY O. WHITNEY, OF NEW HAVEN, CONNECTICUT, ASSIGNOR TO THE WINCHESTER REPEATING ARMS COMPANY, OF SAME PLACE.

MACHINE FOR ROLLING PAPER TUBES.

SPECIFICATION forming part of Letters Patent No. 405,138, dated June 11, 1889.

Application filed June 25, 1888. Serial No. 278,124. (No model.)

To all whom it may concern:

Be it known that I, HARRY O. WHITNEY, of New Haven, in the county of New Haven and State of Connecticut, have invented a new Improvement in Machines for Rolling Paper Tubes; and I do hereby declare the following, when taken in connection with accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a top or plan view of the machine complete, a portion of the cover of the reservoir broken away to show the pasting-roller; Fig. 2, a side view of the machine complete; Fig. 3, a longitudinal sectional view; Fig. 4, a transverse section-cutting on line *z z*, Fig. 1; Fig. 5, a transverse section-cutting immediately in advance of the grippers, showing the wheels *n r s;* Fig. 6, a transverse section through the pasting and feeding apparatus and cutting between the uprights G H; Fig. 7, a transverse section through the gripping-jaws; Fig. 8, a modification.

This invention relates to an improvement in machines for making paper tubes from which cartridge-shells are made. These tubes are usually formed by taking a sheet of paper of the required size, pasting one surface, and then rolling the sheet upon a mandrel into tubular shape, the paste causing the several convolutions of paper to adhere to each other. The paper is thin, so that each tube is composed of several convolutions or thicknesses. Generally this rolling of the tube has been performed by hand.

The object of my invention is to produce a machine which, receiving the sheets of paper, will automatically paste one surface, roll the pasted sheet to form a tube, and discharge the tube complete from the machine; and it consists in a mandrel of a size corresponding to the interior of the tube to be formed, the mandrel supported in bearings, so as to leave the one end portion over which the paper is to be wound free, combined with several rollers arranged in bearings around said mandrel and parallel therewith, the said mandrel and rollers adapted to receive continuous revolution, and the mandrel also adapted for longitudinal movement between said rollers, with a pasting and feeding device, whereby the sheet of paper is first pasted upon one side and then delivered between the mandrel and rollers to be wound into tubular form, the longitudinal movement of the mandrel produced after the rolling operation serving to take the formed tube longitudinally from between the rollers, and a gripping device in line with the said mandrel adapted to clasp upon the tube on the mandrel so delivered from between the rollers, and whereby on the return of the mandrel the formed tube will be stripped therefrom, preparatory to its ejection from the machine, and in details of construction more fully hereinafter described, and particularly recited in the claims.

A represents the bed of the machine; B, the mandrel, which is considerably more than twice the length of the tube to be formed.

C is the driving-pulley, supported in bearings D D, like the head-block of a lathe, and through the arbor of which pulley the mandrel B runs, and is free for longitudinal movement, but is connected with the pulley by a spline and groove, so that while the mandrel is free for such longitudinal movement through the pulley revolution imparted to the pulley will be communicated to the mandrel, so that the mandrel will revolve with the pulley. The mandrel extends outside the head-block, its outer end resting in a cross-head E, supported on parallel guides F, as seen in Figs. 1 and 2.

On the bed upon the other or inner side of the head-block are two uprights G H, distant from each other somewhat greater than the length of the tube to be formed. The mandrel extends longitudinally through these head-blocks, as seen in Fig. 3, and in bearings in the said uprights several rollers I J K, more or less in number, are arranged parallel with the mandrel B, as seen in Fig. 6. These rollers are in such working contact with the mandrel that the sheet of paper introduced between the mandrel and, say, the one roller I will be taken to the next roller J and to the third roller K, and so on until the sheet is wound entirely around the mandrel, the rollers pressing upon the surface of the paper, which has been previously pasted upon

its under surface—that is, the outer surface as it is applied to the mandrel—and so that the convolutions of the paper thus formed will be pressed hard upon each other to cause perfect adhesion.

Revolution is imparted to the several rollers I J K by means of gearing, as seen in Figs. 1, 2, and 4, and so that the surface velocity of the rollers is substantially the same as that of the mandrel.

At the rear of the rollers the pasting and feeding device is arranged, which is adapted to receive the sheet, apply a coating of paste or other suitable adhesive material to the under side of the sheet, and deliver the advancing edge of the sheet between the mandrel and the first roller. As here illustrated, this pasting device consists of a reservoir L, in which is a revolving roller M parallel with the mandrel. This roller works in the reservoir, so as to receive a coating of adhesive material therefrom. Above it is a pressure-roller N, and between which and the pasting-roller M the paper is introduced, revolution being imparted to the said rollers in the direction indicated by the arrow and so as to advance the paper toward the mandrel.

Preferably between the rollers M and N, I arrange other rollers O P parallel with the mandrel, and between which the paper will be delivered by the pasting-rollers, the pasting-rollers serving also as feed-rollers. Revolution is imparted to the rollers O P, as to the rollers M N, by gearing, as represented in Figs. 1 and 2, the train of gearing receiving its rotation from the mandrel to which the power is applied. Suitable guards R S are arranged to direct the pasted sheet between the mandrel and first roller, as seen in Fig. 6.

To avoid adhesion of the paper to the several rollers over which the pasted surface passes, the several rollers are constructed with annular grooves into which fingers project, so as to stand beneath the paper as it is advanced by the rollers. In Fig. 6 *a* represents the fingers, which project from a bed *b*, forward of the roller M, and into the annular grooves *d* in the pasting-roller, the grooves of the roller being also seen in Fig. 1. The pressure-roller N is also constructed with annular grooves *e*, (see Figs. 1 and 2,) into which stationary guard-fingers *f* extend, as seen in Fig. 6. The rollers O P are also provided with similar guard-fingers *g h*, working in the grooves of the respective rollers, as also seen in Fig. 6.

The rollers surrounding the mandrel are also constructed with annular grooves *i*, in which lie stationary fingers *l*, projecting from a stationary bar *m* in rear of the rollers, as seen in Fig. 6. In all these cases the guard-fingers serve to prevent the paper following upon the surface of the rollers, and in the case of the rollers around the mandrel they deflect the sheet from its natural path and cause it to follow the surface of the mandrel, and so that a sheet of paper pasted and delivered between the mandrel and its rollers will be wound close upon the mandrel in successive convolutions or thicknesses, the surrounding rollers serving to press the convolutions one upon another and so as to produce perfect adhesion throughout the tube formed upon the mandrel. After the tube has been thus formed upon the mandrel a longitudinal movement is imparted to the mandrel, which will force the mandrel and the tube thereon beyond and from the surrounding rollers. This longitudinal movement is imparted by means of a crank-wheel T, arranged upon the shaft U below the bed, which is connected by a pitman V to a lever W, arranged to vibrate in a plane parallel with the mandrel, and which lever is connected at its upper end to the cross-head E, as seen in Figs. 2 and 3, so that, revolution being imparted to the crank-wheel T, the lever will be thrown forward, as represented in broken lines, Fig. 3, and thereby force the mandrel longitudinally through between the rollers, so as to take the tube which has been formed upon the mandrel outside the rollers, where it may be stripped from the mandrel.

The rollers working in connection with the mandrel operate only in a circumferential direction. To apply to the surface of the tube, after it is wound, a longitudinal operation, which may give to the surface of the tube a better finish, I arrange at the delivery end of the tube-forming rollers finishing-wheels *n*, *r*, and *s*, which are arranged upon axes at right angles to the axis of the mandrel and so that the plane of the wheels is parallel with the axis of the mandrel. The several wheels are grooved corresponding to the external surface of the tube of the mandrel and are arranged radially to the mandrel, so as to substantially surround it, as clearly seen in Fig. 5, the space between the several wheels being concentric with the mandrel. These wheels *n r s* are adapted to bear with considerable pressure upon the surface of the tube as it is advanced by the mandrel in the discharging operation. Hence the tube on the mandrel will receive from said wheels a longitudinal rolling under a considerable pressure, which will not only make the adhesion more perfect, but will give to the exterior of the tube a finished surface.

Beyond the finishing-wheels *n r s*, I arrange a pair of grippers to clasp the tube on the mandrel and hold it, so that as the mandrel returns under the action of the crank-wheel it will be drawn from the tube so held by the grippers. As here represented, these grippers consist of a stationary jaw *u* and a hinged jaw *w*, the plane of the jaws being parallel with the mandrel, and their adjacent faces are grooved, as seen in Fig. 7, corresponding to the outer surface of the tube, and the grooved surface of the jaws may be provided with any suitable means to insure a strong holding-grip upon the tube. The jaw *w* is arranged to

swing, as upon a hinge *y*, toward and from the stationary jaw *w*. This swinging movement is imparted by means of the lever W through a sliding rod 2, arranged beneath the bed. (See Fig. 3.) On the rod is a collar 3, which the lever W in its advance will strike and force the said rod forward, as indicated in broken lines, Fig. 3. The rod extends to a convenient point near the hinge-jaw *w*, where it is beveled, and works over an arm 4, projecting from the jaw *w*, as seen in Figs. 3 and 7, so that the advance movement of the rod will impart a closing movement to the swinging jaw *w* to produce the required grip upon the tube, and then as the lever W returns it will strike the second collar 5 on the rod 2 and withdraw that rod so as to release the grip of the jaws upon the tube. This will, however, leave the tube within the jaws; but as the mandrel next advances with the second tube it will eject the previously-delivered tube from the jaws and present the said second tube for a like grip. Successive sheets of paper being furnished to the machine, correspondingly successive tubes will be automatically formed and delivered complete from the machine.

The advance of the mandrel to deliver the tube is best made independent of the rotating mechanism, and as here represented it is produced by connecting the power with the crank when in the opinion of the operator the rolling operation has been completed. This connection is well made by providing a loose pulley 6 on the shaft U and a foot-pedal 7, by which any suitable clutching mechanism may connect the pulley 6 with the shaft and crank-wheel, so that the revolution of the pulley may be imparted to the crank and disconnected therefrom, according to the judgment of the operator. The mechanism for engaging the loose pulley with the shaft may be any of the known mechanisms for so doing, not necessary to be particularly described; but it must be of such a nature that the disconnection will be made when the mandrel is returned to the position for forming the tube. The clutching mechanism for performing this operation is also well known and employed in many machines—such as power-presses—and does not require particular description.

For convenience the pulley C may be made loose upon its shaft, the mandrel working through the shaft, and a clutch 8 provided, by which the revolving pulley may be made to engage with its shaft and impart revolution to the mandrel. This also is a common and well-known device, and does not require particular description. For convenience, also, the pasting mechanism may be connected or disconnected with the train of gearing by a clutch 9, so that should occasion require, while the machine is running, the pasting and feeding devices may be disconnected.

The reservoir may be provided with a cover 10, which will serve as a table upon which to place the sheets to be fed to the machine.

It will be evident to those skilled in the use of this class of machines that the finishing-wheels may be omitted, and that the gripping devices may also be omitted, in which case the tube may be removed by hand, the operator grasping the tube and drawing it from the mandrel. It will also be understood that various substitutes may be employed to mechanically take the tube from the mandrel, as, for illustration, power may be applied to the wheels *n r s*, so that those wheels grasping the tube will draw it from the mandrel, in which case they will perform the double operation of longitudinally rolling the tube and also drawing it from the mandrel.

In Fig. 8 I illustrate the said wheels as having power applied thereto to enable them to perform the discharging operation.

It will be evident that there may be more or less of the wheels *n r s*, it only being necessary that the periphery of the wheels shall correspond to the shape of the mandrel, and so as to substantially surround it.

The intermediate feed-rollers O P may be omitted, the paste-roller and its pressure-roller being competent to deliver the paper to the machine. It will also be understood that any of the known equivalents for the crank-wheel may be employed to impart the longitudinal reciprocating movement to the mandrel. Such equivalents are too well known to require illustration.

I do not wish to be understood in this application as claiming, broadly, a revolving mandrel with parallel rollers surrounding it, combined with a pasting and feeding device adapted to paste and deliver a sheet of paper to the said mandrel and its surrounding rollers, and whereby the said sheet will be wound upon the mandrel to the form of a tube, the several convolutions pressed upon the mandrel by the surrounding rollers, as such combination, broadly considered, is not my invention.

I claim—

1. In a machine for making paper tubes for cartridge-shells, the combination of the revolving and longitudinally-reciprocating mandrel, several rollers arranged around said mandrel and parallel therewith, mechanism, substantially such as described, to impart longitudinal reciprocating movement to said mandrel, and a pasting and feeding mechanism, substantially such as described, in rear of said mandrel, the combination being substantially as specified, and whereby a sheet of paper is coated with adhesive material upon one side, advanced toward and wound into a tube upon said mandrel between it and the surrounding rollers, and then the mandrel with the tube thereon moved longitudinally out from between the rollers for the discharge of the tube.

2. The combination of the revolving and longitudinally-reciprocating mandrel B, several rollers, as I J K, arranged in stationary bearings around said mandrel and parallel

therewith, a pasting and feeding device, substantially such as described, to coat and deliver the sheet of paper to said mandrel and rollers, two or more wheels *n r s*, arranged upon axes at right angles to the said mandrel and surrounding the same, the periphery of the said wheels grooved corresponding to the mandrel, and between which wheels the said mandrel passes in its longitudinal reciprocation, substantially as and for the purpose described.

3. The combination of the longitudinally reciprocating and revolving mandrel B, several rollers, as I J K, arranged in stationary bearings around said mandrel and parallel therewith, a pasting and feeding device, substantially such as described, adapted to coat and deliver the paper to said mandrel and its surrounding rollers, a pair of grippers in the path of said mandrel in its longitudinal movement, and adapted to grasp the tube formed upon the mandrel, substantially as specified.

4. The combination of the longitudinally reciprocating and revolving mandrel B, several rollers, as I J K, arranged in stationary bearings around said mandrel and parallel therewith, the said rollers constructed with annular grooves *i*, stationary guard-fingers *l*, lying in said grooves, with a pasting and feeding mechanism, substantially such as described, adapted to coat and deliver the paper between the said mandrel and its surrounding rollers, substantially as specified.

5. The combination of the longitudinally reciprocating and revolving mandrel B, several rollers, as I J K, supported in stationary bearings around said mandrel and parallel therewith, wheels, as *n r s*, arranged upon axes at right angles to the axis of the mandrel and in the longitudinal path of the mandrel, the said wheels grooved corresponding to the surface of the mandrel, and a pair of grippers *w u*, arranged beyond the said wheels and adapted to grasp the tube which has been formed on the mandrel, substantially as and for the purpose described.

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