No. 616,044.

Patented Dec. 13, 1898.

W. T. WILSON & G. E. GRIMM.

MACHINE FOR MANUFACTURING CONTINUOUS SPIRAL TUBING.

(No Model.)

(Application filed Feb. 28, 1895.)

4 Sheets—Sheet 1.

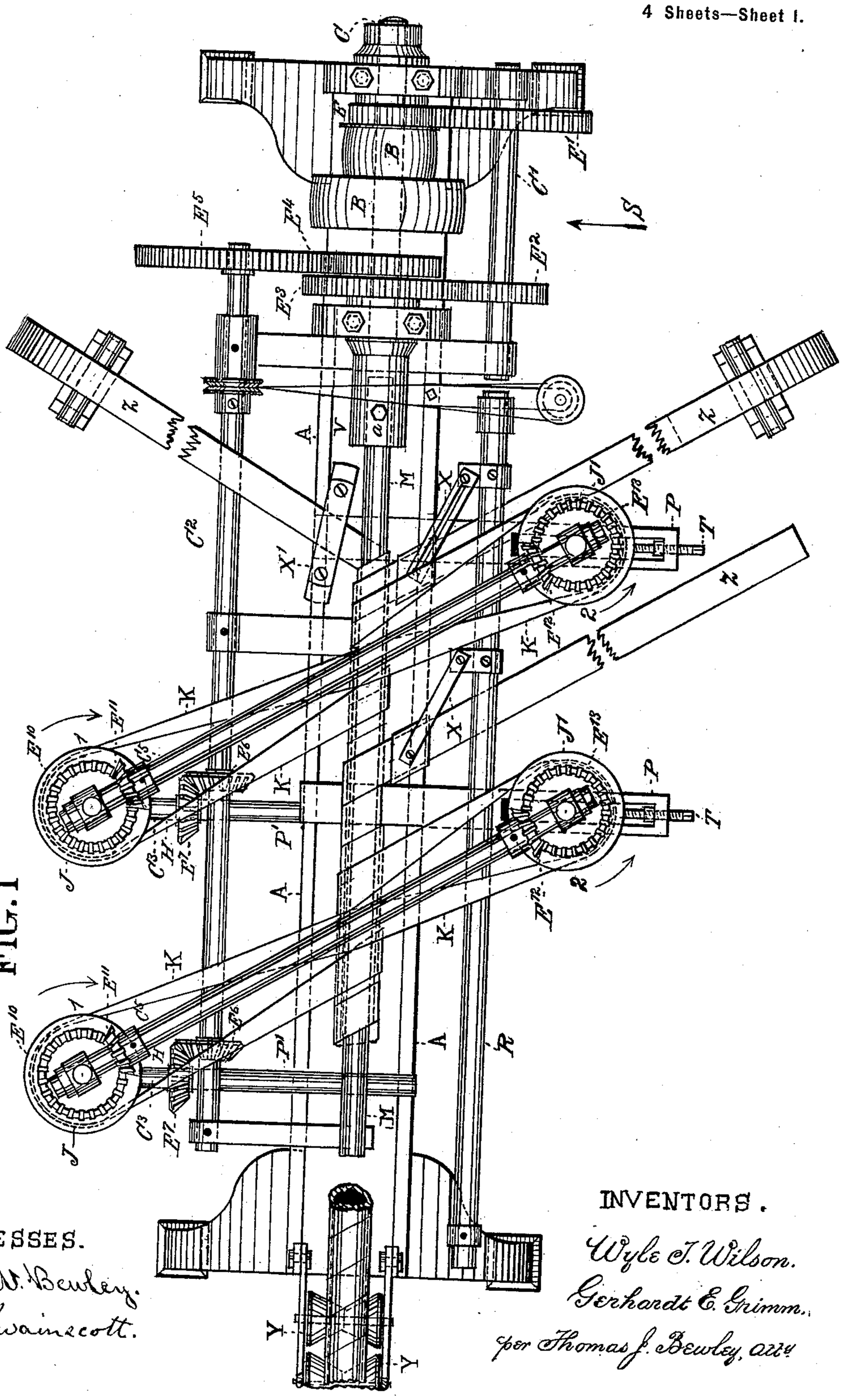

FIG. 1

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FIG. 2

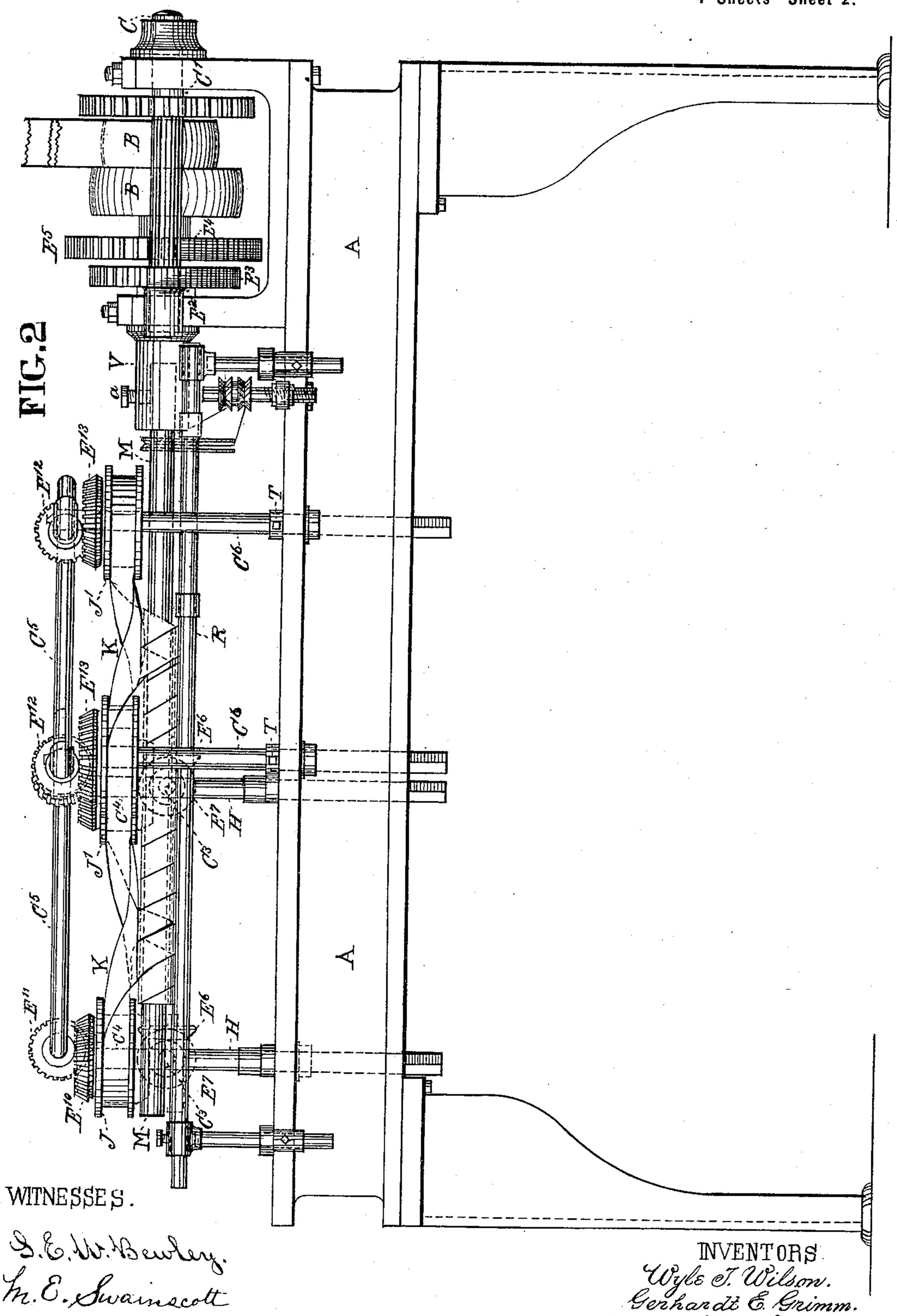

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FIG. 3

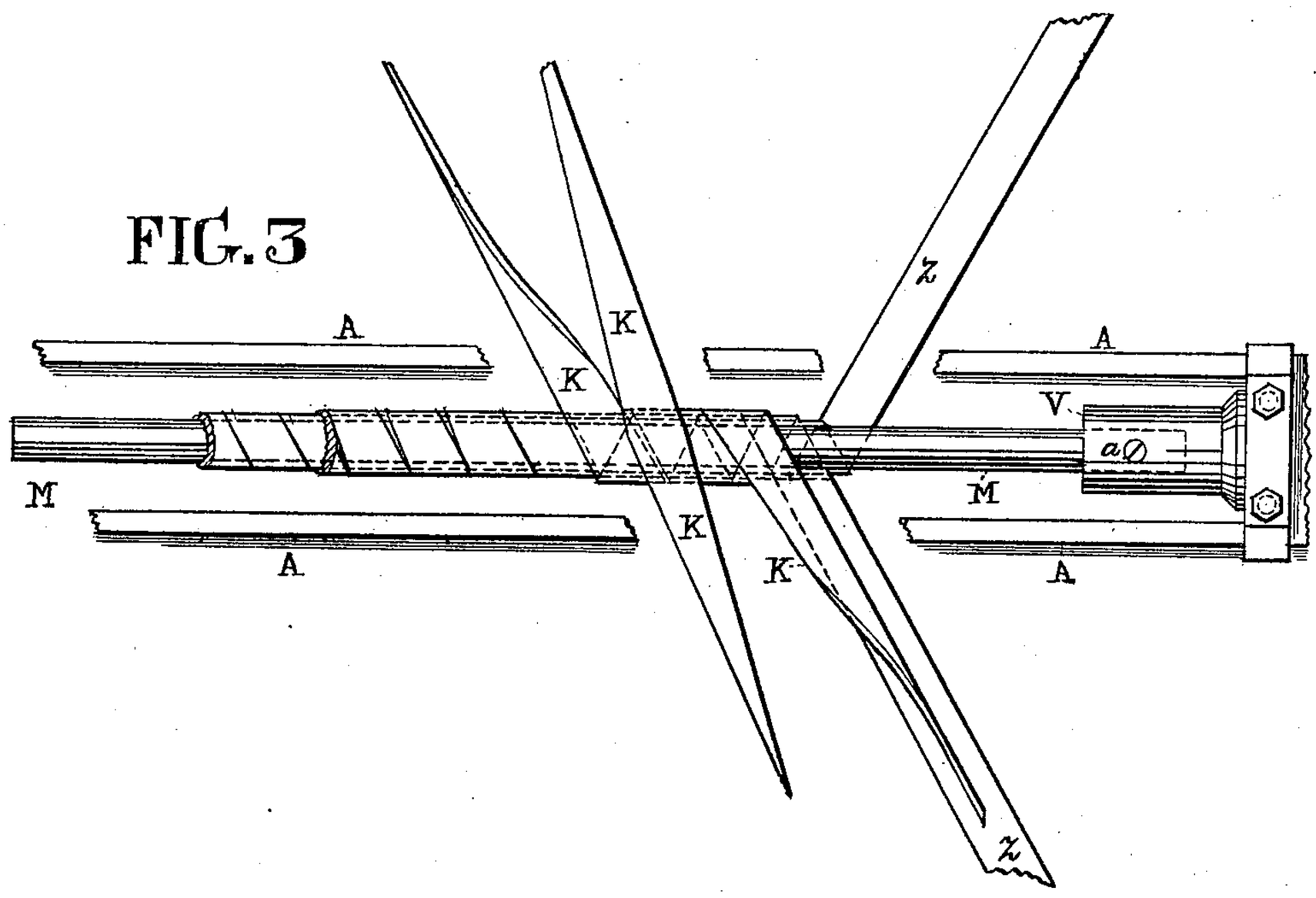
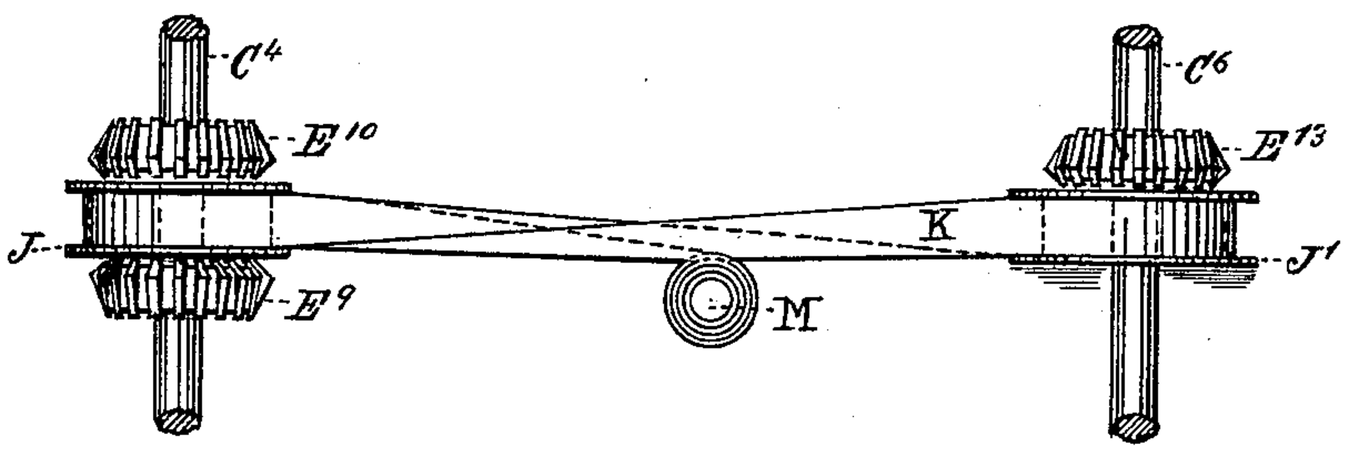


FIG. 4



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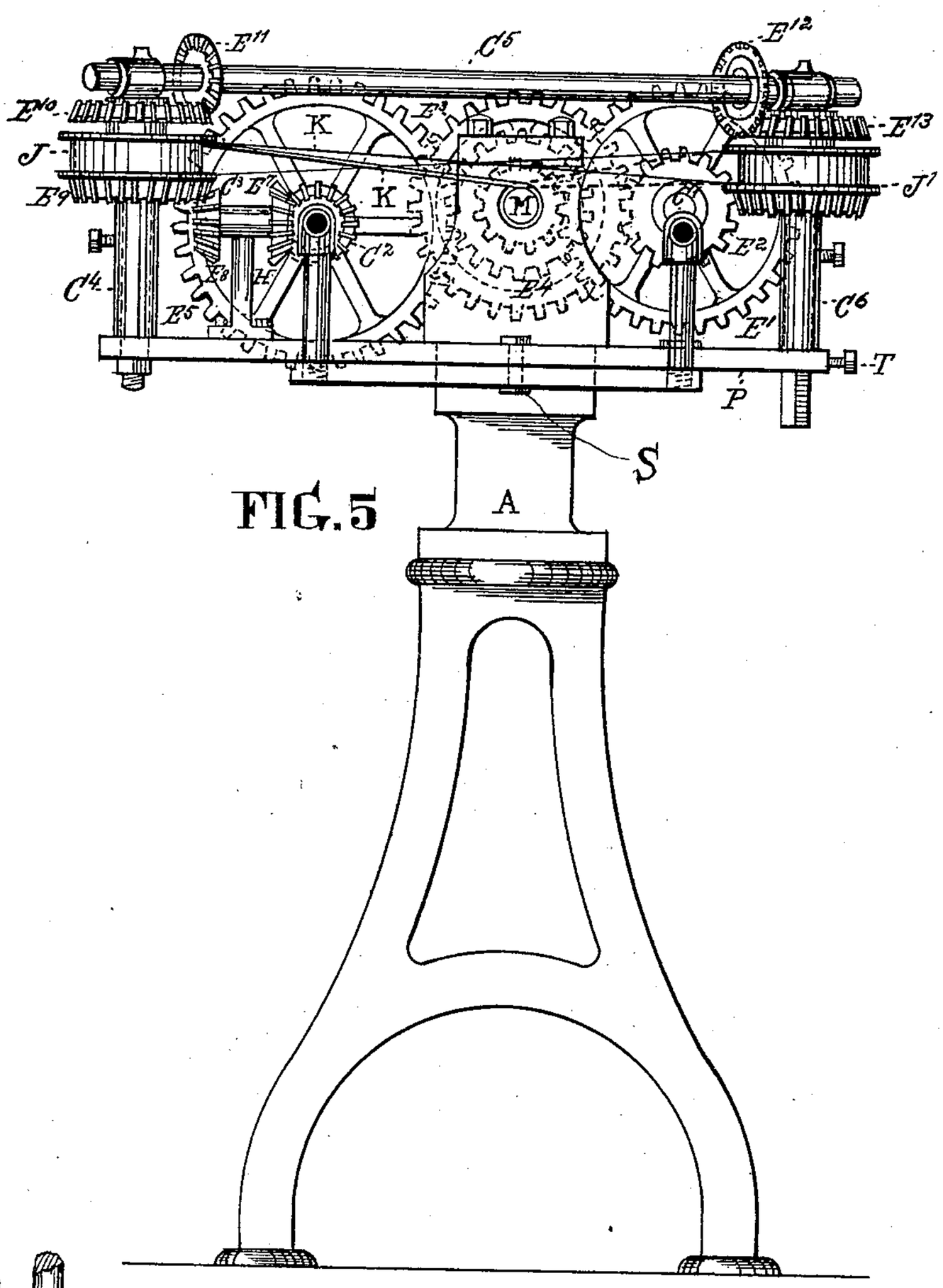


FIG. 5

FIG. 6

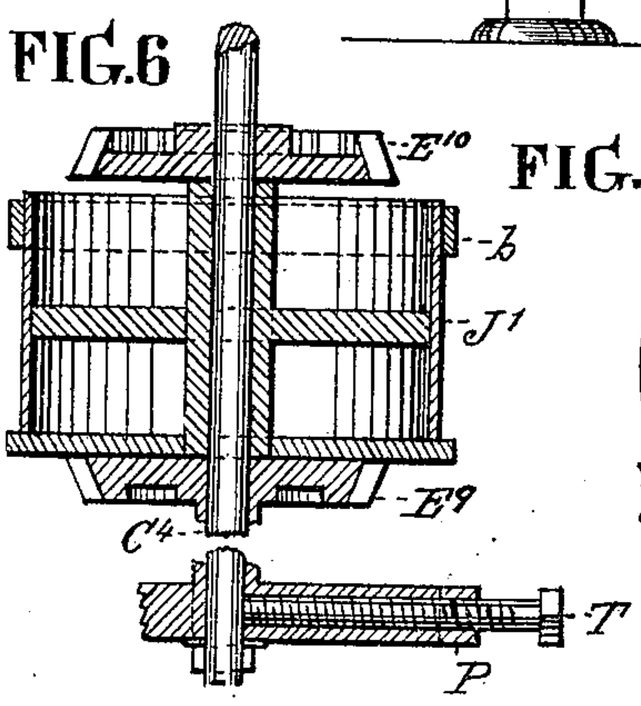
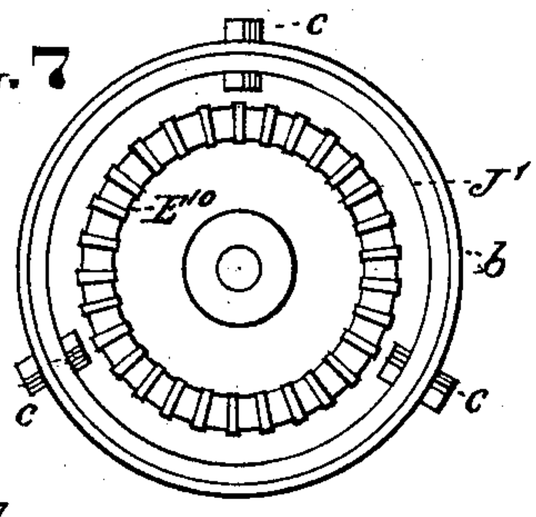


FIG. 7



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UNITED STATES PATENT OFFICE.

WYLE T. WILSON, OF PHILADELPHIA, PENNSYLVANIA, AND GERHARDT E. GRIMM, OF CAMDEN, NEW JERSEY.

MACHINE FOR MANUFACTURING CONTINUOUS SPIRAL TUBING.

SPECIFICATION forming part of Letters Patent No. 616,044, dated December 13, 1898.

Application filed February 28, 1895. Serial No. 539,995. (No model.)

To all whom it may concern:

Be it known that we, WYLE T. WILSON, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, and GERHARDT E. GRIMM, residing at Camden, in the county of Camden and State of New Jersey, citizens of the United States, have invented certain new and useful Improvements in Machines for Manufacturing Continuous Spiral Tubing, of which the following is a specification.

The object of this invention is such a construction of machine as will form a continuous spiral tubing from a roll or series of rolls of paper previously cut to a width for the formation of a tube by said strip of paper being drawn on, wound around, and delivered from either a stationary or revolving mandrel of a desired diameter continuously in one and the same operation by means of suitable mechanism arranged and adapted therefor.

The nature of the invention is such an arrangement of mechanism (supported in housings of a standing frame) adapted for operation and combined together for the formation of continuous spiral tubing from a roll or series of rolls of strips of paper which are drawn on, wound around, and delivered from a stationary or from a revolving mandrel at one and the same operation by a belt or series of two or more continuous belts operated by mechanical devices, hereinafter more fully described, which draw on, wind around, and deliver the tubing from said stationary or revolving mandrel, of any desired diameter, the said strip or strips of paper being formed by means of said continuous belt or series of continuous belts into a spiral tube of any desired length.

By the operation of the machine which constitutes the present invention the tubes are formed of long, narrow, and continuous strips of paper throughout their length, which by means of the subsequently-described mechanism are wound helically upon the mandrel, one upon and around the other concentrically, in such a manner as to break or cover the edges of the previously-wound strip or strips at the lines of jointure of their edges. The adjacent surfaces or portions of the surfaces from the edges inward are securely fastened together by a coating of glue or liquid adhesive substance during the process of winding the strips of paper upon the mandrel.

The machine further consists of either a stationary or a revolving core or mandrel of proper diameter held in a head supported in suitable housings of a standing frame, which core or mandrel fits within a bore or socket of said head, being held rigidly therein by means of a set-screw, which permits of its being removed from connection therewith for purposes of substitution of a mandrel of different diameter.

The pitch or angle of the continuous belt or series of continuous belts when a series of two or more layers of paper strips are to be wound around and upon each other helically in a continuous spiral form is proportionately arranged relatively to the width of the paper strip and to the diameter of the core or mandrel, so that as the strips are wound helically upon and around the latter and fed continuously thereon by the embracing helically-encircling coils of the belt or series of belts the pitch or angle of said coils of belt or series thereof will run helically and parallel with the pitch or angle of said strip or strips of paper, thus forming the tube.

The mechanism for rotating the belt or series of continuous belts and the strip or series of continuous strips to, upon, and around the mandrel, thereby forming a continuous tube, will be more fully understood from the following detailed and descriptive specification, and the four accompanying sheets of drawings, in which—

Figure 1, Sheet No. 1, represents a plan view of the machine. Fig. 2, Sheet No. 2, represents a side elevation of the same viewed in the direction of the arrow S. (See Fig. 1.) Fig. 3, Sheet No. 3, represents a detail view of portions of the core or mandrel M, the series of interposed strips of paper, and one of the winding-belts K, showing the coils or convolutions of the belts wound around helically and parallel with the corresponding convolutions of two concentrically-interposed paper strips upon the mandrel. Fig. 4 is an edge elevation of the same in connection with the adjustable heads on the spindles for the purpose of more clearly showing the manner in

which the winding-belts K are wound to, upon, and around the interposed strips of paper Z upon the mandrel. Fig. 5, Sheet No. 4, is an end elevation of the machine. Fig. 6 is a vertical section of one of the adjustable pulley-heads J′ (shown in detail) for carrying the winding-belt K, the spindle being broken, and the mechanism connected with the slide-plate P for tightening the belt by shifting the pulley-head. Fig. 7 is a face view of one of the heads.

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

A is the standing frame of the machine, to which the different portions of the operating mechanism are connected.

B B are a pair of cone-pulleys on the shaft C, (see Figs. 1 and 2,) by which power for rotation is given to said shaft to operate the series of intermeshing cog-gearing.

The method of operation of the machine is as follows: Power being communicated to the train of gearing by means of a belt connected with a line of shafting, which passes around the pulley B, it is communicated therefrom to the shaft C and gear-wheel E, (on same shaft,) from thence by the intermeshing wheel E′ to the shaft C′ and gear-wheel E^2 thereon intermeshing with wheel E^3, which is connected with wheel E^4. These wheels E^3 and E^4 are idlers on the shaft C, said wheel E^4 intermeshing with wheel E^5, causing rotation of the shaft C^2, carrying the miter or spur wheels E^6 E^6, fast thereon, transmitting motion and power to the corresponding bevel gear-wheels E^7 E^7, fast on the cross-shafts C^3 C^3, (on the bearings or pedestals H,) which impart motion and power to the bevel gear-wheels E^8 E^8, (see Fig. 5,) from thence to gear-wheels E^9 E^9 (see last-mentioned figure) on the vertical stud-shafts C^4 C^4, which communicate power to rotate the winding pulley-heads J J on said shafts. Upon the upper surface of the winding pulley-heads J J are the crown gear-wheels E^{10} E^{10}, which intermesh with the miter or bevel gear wheels E^{11} E^{11}, thereby transmitting motion and power to the horizontal cross-shafts C^5 C^5, which have one bearing of each on the upper end of each of the vertical stud-shafts C^4 C^4, the opposite ends of these shafts having their bearings upon the upper ends of the stud-shafts C^6 C^6, which in turn imparts motion and power to the gear or miter wheels E^{12} E^{12} on the said shafts C^5 C^5, which intermesh with the crown-wheels E^{13} E^{13}, thereby communicating power and motion to the winding pulley-heads J′ J′ on the stud-shafts C^6 C^6. The winding-heads J J and J′ J′ on the vertical stud-shafts C^4 C^4 and C^6 C^6 revolve in opposite directions, as will be seen by following the train of the lines of gearing, the heads J J revolving from left to right and the heads J′ J′ revolving from right to left, as indicated by the arrows shown in proximity to the winding-heads. (See Fig. 1.) When motion and power are communicated from the driving-belt on the pulley B by means of the train of intermediate cog-wheel gearing to the flanged winding pulley-heads J J J′ J′, which starts the mechanism in motion, the continuous winding-belts K K run upon the winding pulleys or heads J′ J′, from thence to, over, and around the mandrel, which may be stationary or revolving, forming a helical or spiral coil thereon, the angle of the edge of the winding-belt being parallel to and running with the angle of the strip or strips of paper wound helically around the mandrel. From the point of take-off of winding-belts, after encircling the mandrel M, the motion of the belts K K is to and around the winding pulley-heads J J. From points 1 on said heads (see Fig. 1) to points 2 on pulley-heads J′ J′, same figure, the winding-belts run over and above the mandrel or core M and that section of the winding-belt wound or coiled thereon, thus completing the circuit of the belts.

In the detail view, Fig. 3, (see Sheet No. 2,) is shown a portion of the mandrel M, two layers of paper wound helically thereon, with the edges of the winding-belts wound helically and parallel with the helices of the paper strips lying between them and the mandrel. The mandrel M is held in a socket of the head V by means of the set-screw *a*, whereby it becomes removable and interchangeable.

P P P′ P′ (see Fig. 1) are adjustable slide-plates on the standing frame A, carrying the vertical stud-shafts C^6 C^6 C^4 C^4, with their winding-belt pulley-heads J J and J′ J′ and gearing connected therewith.

The slide-plates P P′, carrying the vertical stud-shafts C^4 C^6 and the winding pulley-heads J J′, are held in position upon the housings or standing frame A by means of the screw-bolts S, (seen in Fig. 5,) the upper ends of said bolts passing into the body of the slide-plates P P′ and holding them rigidly upon the upper surface of the housings. By the application of a wrench or spanner upon the lower ends of said bolts S said slide-plates P P′, carrying shafts C^4 C^6 and winding pulley-heads J J′, are loosened from their rigid connection with the face of the bed-plate, whereby the heads may be shifted to vary the pitch or angle of the continuous winding-belts to conform to the pitch or angle of the interposed strip or strips of paper forming the tube, thus by permitting the adjustment of said slide-plates, carrying their respective stud-shafts C^4 C^6 and winding pulley-heads J J′, the pitch or angle of the continuous winding-belts K, passing around said winding pulley-heads, and thence to, over, and around the mandrel, may be made to conform to the pitch or angle of any strip or strips of paper wound helically around said mandrel. By the adjustment of these slide-plates P P P′ P′ the winding-belts K K are caused to conform upon the mandrel to any angle or pitch of helix or helices desired.

In Fig. 6 a detail view is given, showing one of the winding flanged pulley-heads J′ in

section, having the upper flange *b* adjustable vertically on the head for the purpose of tightening the belt on the pulley. Fig. 7 is a plan view showing the set-screws *c*, by means of which the flanges *b* of the pulley-heads J′ J′ are adjusted. In Fig. 6 is also shown a sectional view of an end of one of the slide-plates P and the manner of tightening the belt by adjusting the flanged winding pulley-head J′ by means of the screw-rod T. This screw-rod T works in a sleeve of the slide-plate P, so that the winding pulley-heads can be moved in or out laterally, by which means the winding-belts can be tightened or loosened around the strips of paper forming the tube which surrounds the mandrel.

R (see Figs. 1 and 2) is an adjustable rod carrying the guides X, which guides are for the purpose of carrying and guiding the strip or strips of paper to the mandrel.

X′ on the opposite side of the machine is an adjustable guide capable of being moved on the bed-plate.

Y are a series of loose rollers, having their journals in an adjustable frame, which carry the finished tube from the machine to an independent cut-off device, (not shown in the drawings,) by means of which the tubes are cut into desired lengths of pieces.

Z Z Z are rolls of strips of paper in process of being fed to the mandrel and from which the tubes are destined to be formed. They are capable of rotation upon spindles on which they have been previously wound, the spindles having bearings in frames independent of the machine and adjustable therewith in accommodation to the angles required by the different widths of strips and diameters of mandrels.

The process of manufacturing continuous spiral tubing starting from the head of the machine is as follows: Paper strip No. 1 is fed dry upon the mandrel back of the winding-belt. Strip No. 2 is coated with a solution of gum and is fed on and around strip No. 1 (breaking joint therewith) back of the first winding-belt, the machine then being started for operation, the first continuous winding-belt being wound helically around the mandrel and moving constantly in the same angle and direction. The paper strips Nos. 1 and 2 are fed under said winding-belt, which draws on, winds around, and delivers along and from the mandrel these strips of paper united by the gummed surface and pressed and rolled by the winding-belt into a continuous spiral tubing or core. Upon this core, consisting of two or more strips of paper, (formed back of and by the first continuous winding-belt,) after it is passed said first winding-belt one or more strips of paper having gummed surfaces are added, which are drawn on, wound around, and united thereto by belt No. 2, which passes helically around said core and its inclosed mandrel and moves constantly in the same angle and direction, drawing on, pressing down, and uniting to the core formed by belt No. 1 the strip or strips of paper on said core. In this manner a tube of any desired thickness may be formed, the obligation of each belt after the first being to wind on successive strips of paper upon the core made by the preceding belt or belts.

In the manufacture of some sizes of tubing it may be found advantageous to have both of the heads carrying a continuous winding-belt to, over, and around a mandrel located on one side of the machine instead of on both sides, as shown in the drawings, without departing from the character of the invention.

Having thus described the construction and method of operation of the machine for manufacturing continuous spiral tubing, what we claim as being new therein, and desire to secure by Letters Patent, is—

1. The combination of the continuous winding-belt passing to, over and around the mandrel or core, the adjustable slide-plates carrying vertical stud-shafts and adjustable winding pulley-heads whereby the distance between the winding pulley-heads may be varied by adjusting the slide-plates and the angle of the continuous winding-belt thereby so changed as to conform to the angle required to be given to the series of strips of paper forming the tube, substantially as specified.

2. In a machine for manufacturing continuous spiral tubing, the combination of the winding pulley-heads, the mandrel, the continuous belt passing to, over, and around said mandrel, slide-plates and screw-rods thereon adapted to adjust stud-shafts carrying the winding-heads, whereby the tension of the continuous winding-belt can be regulated, substantially as specified.

3. The combination of the continuous winding-belt, passing to, over and around the mandrel or core, the vertical stud-shafts and winding pulley-heads carried thereby, an adjustable slide-plate upon which one of said stud-shafts is mounted, whereby the distance between the winding pulley-heads may be varied by adjusting the slide-plate and the angle of the continuous winding-belt thereby, so changed as to conform to the angle required to be given to the strip of paper forming the tube, substantially as specified.

4. In a machine for manufacturing continuous spiral tubing, the combination of the stud-shafts carrying winding pulley-heads, the mandrel, the continuous belt passing to, over and around said mandrel, the slide-plate and screw-rod thereon, adapted to adjust one of the stud-shafts, whereby the tension of the continuous winding-belt can be regulated, substantially as specified.

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