(No Model.)

6 Sheets—Sheet 1.

J. H. CROWLEY.

MACHINE FOR WINDING BOBBINS FOR LOOM SHUTTLES.

No. 263,287. Patented Aug. 22, 1882.

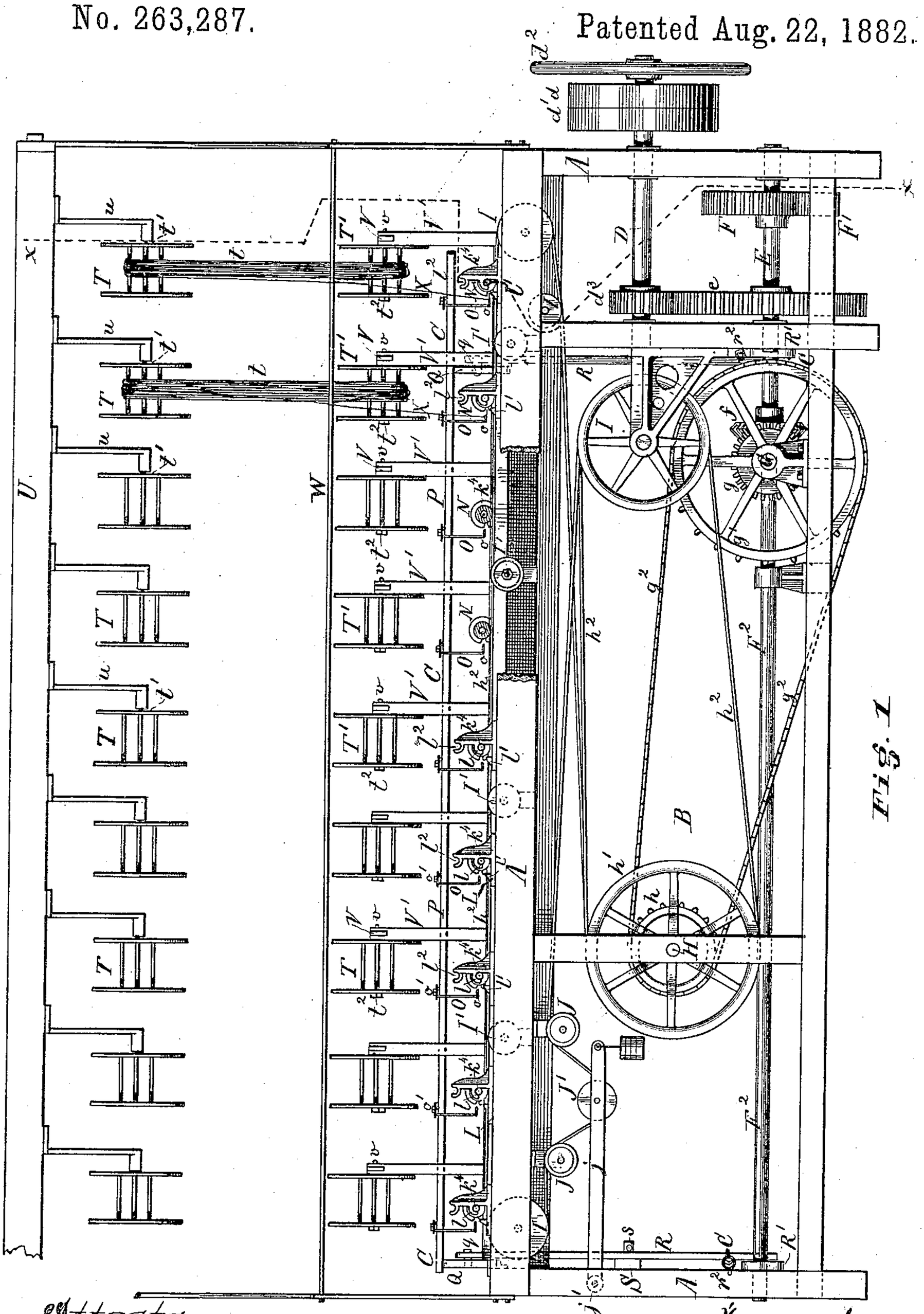

Fig. 1.

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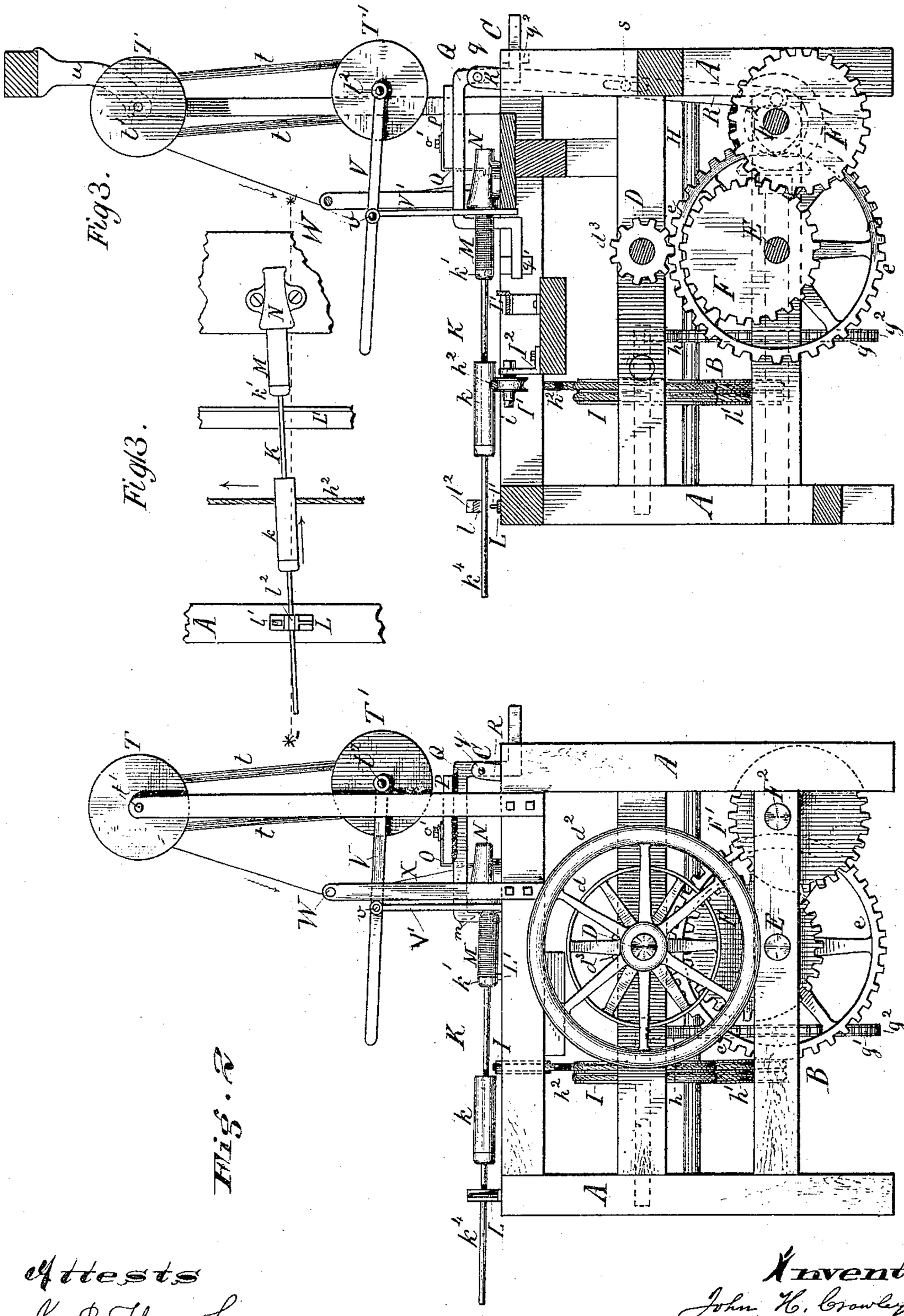

Fig. 3.

Fig. 2.

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J. H. CROWLEY.

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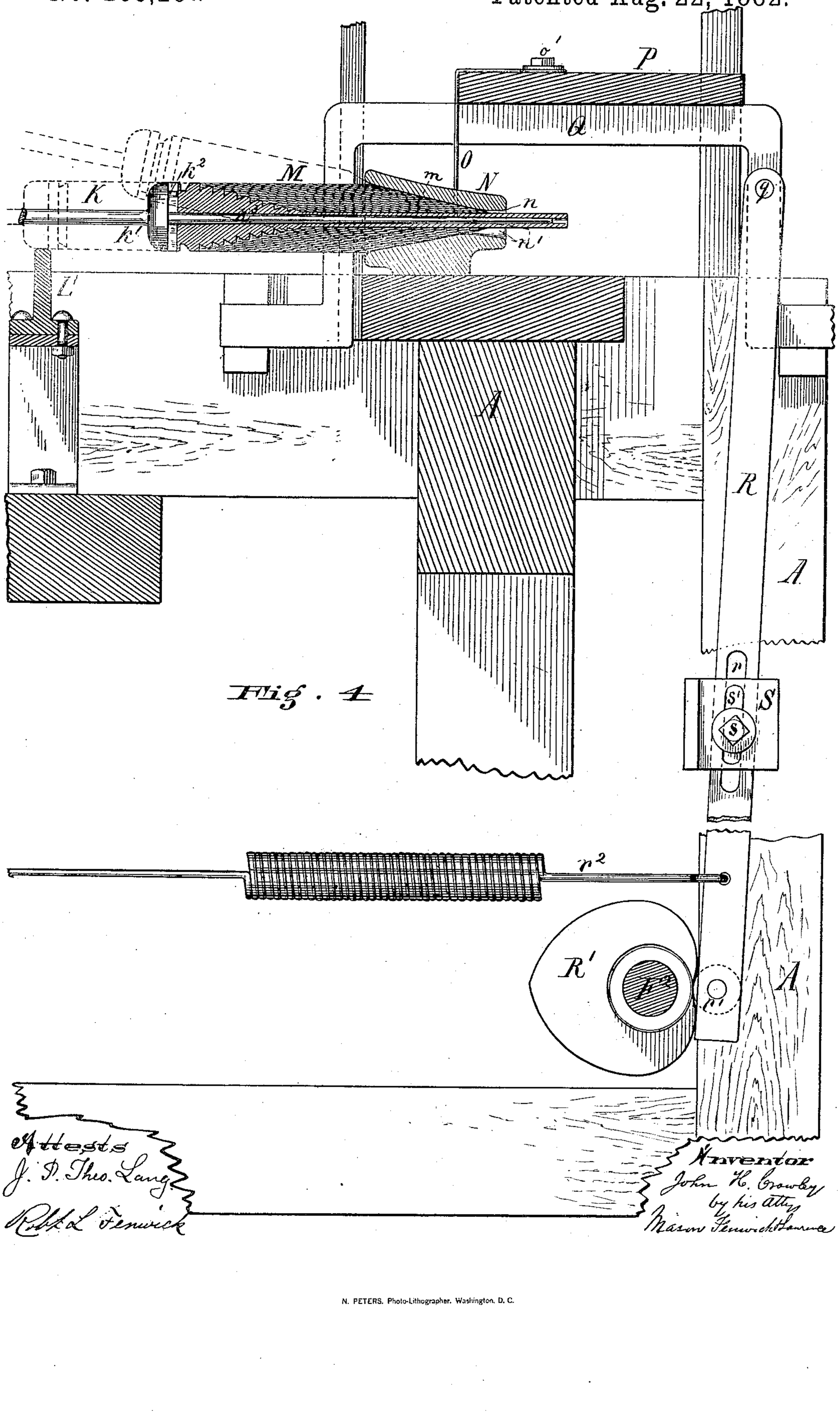

Fig. 4

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Fig. 5

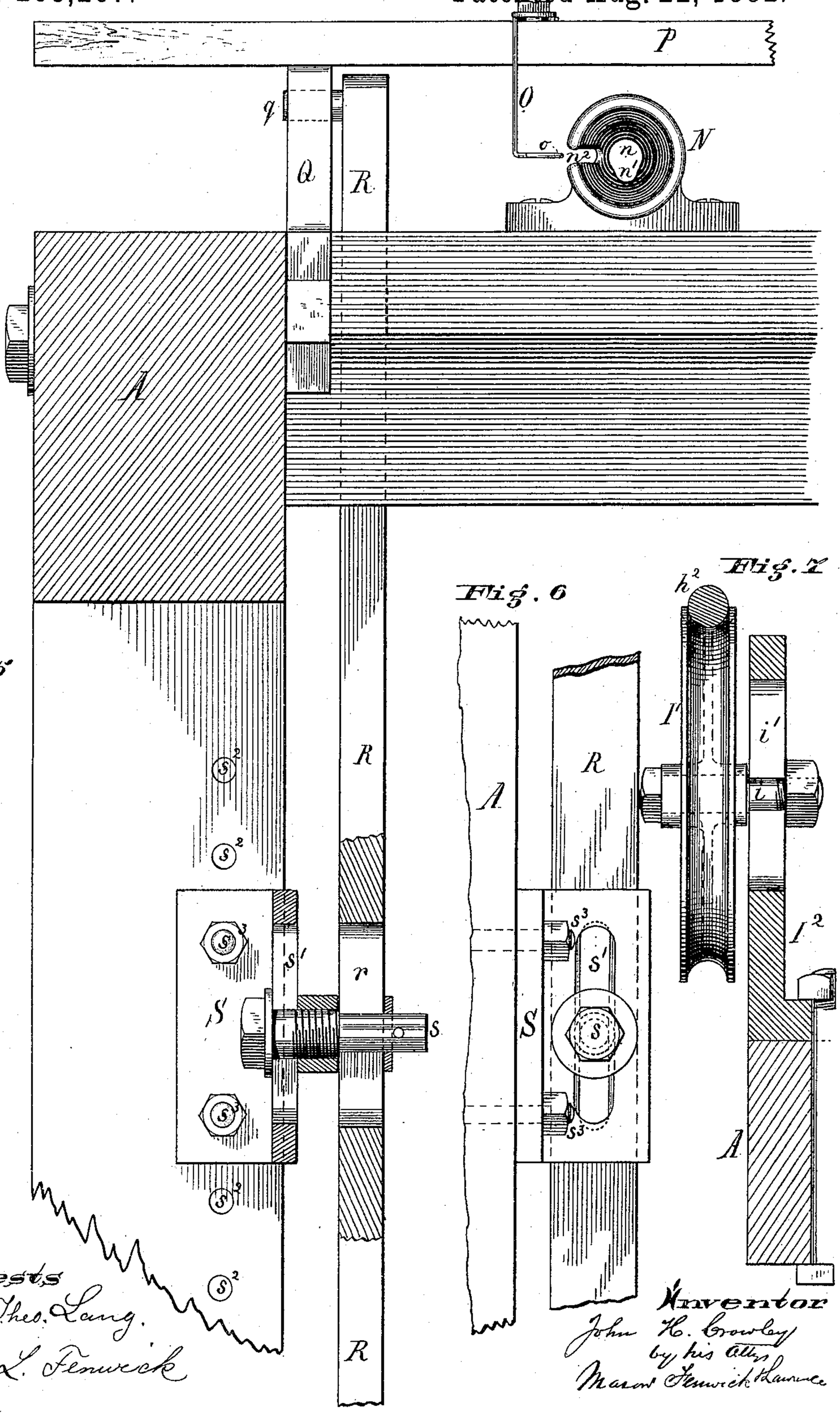

Fig. 6

Fig. 7

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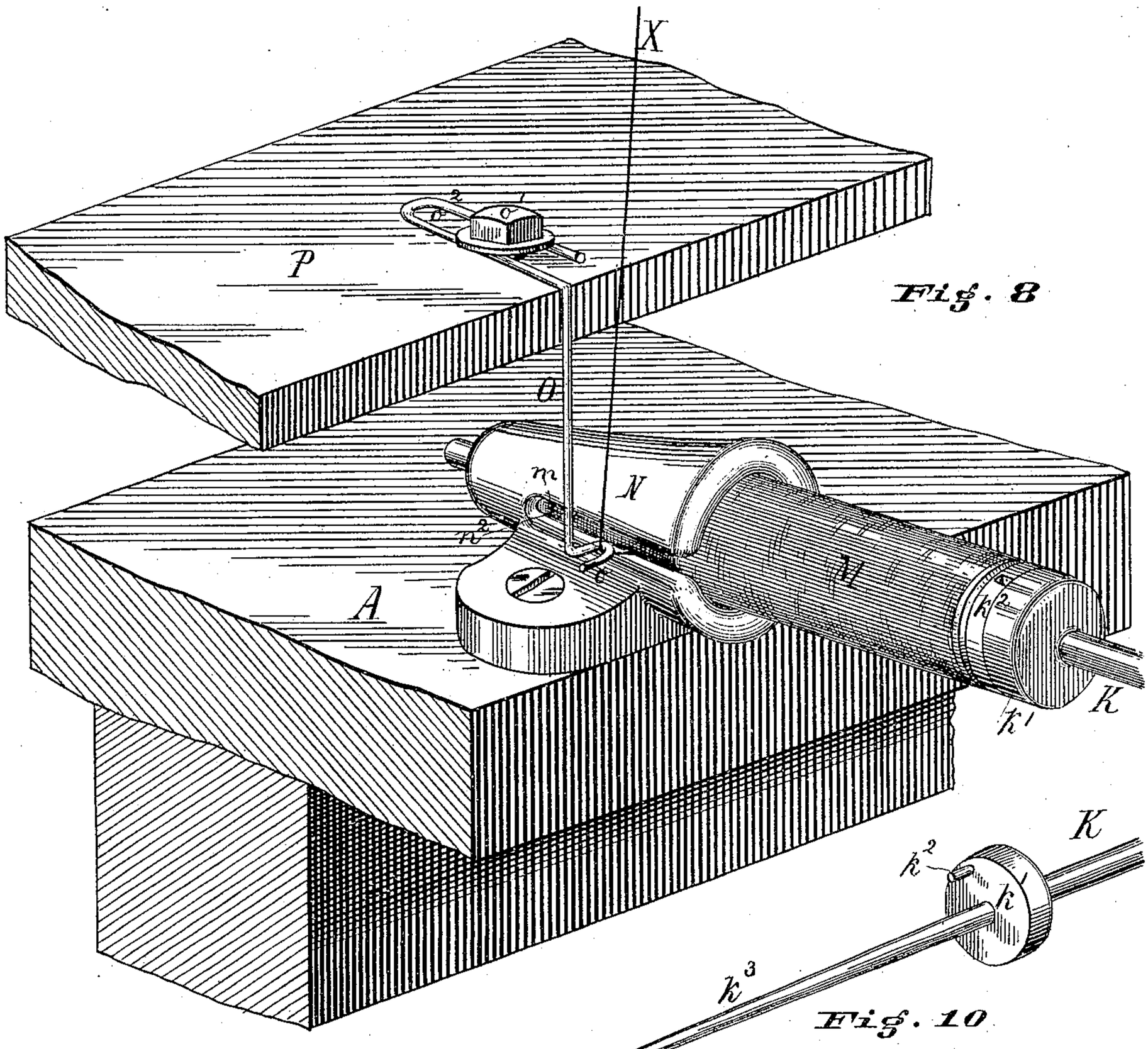

Fig. 8

Fig. 10

Fig. 9

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MACHINE FOR WINDING BOBBINS FOR LOOM SHUTTLES.

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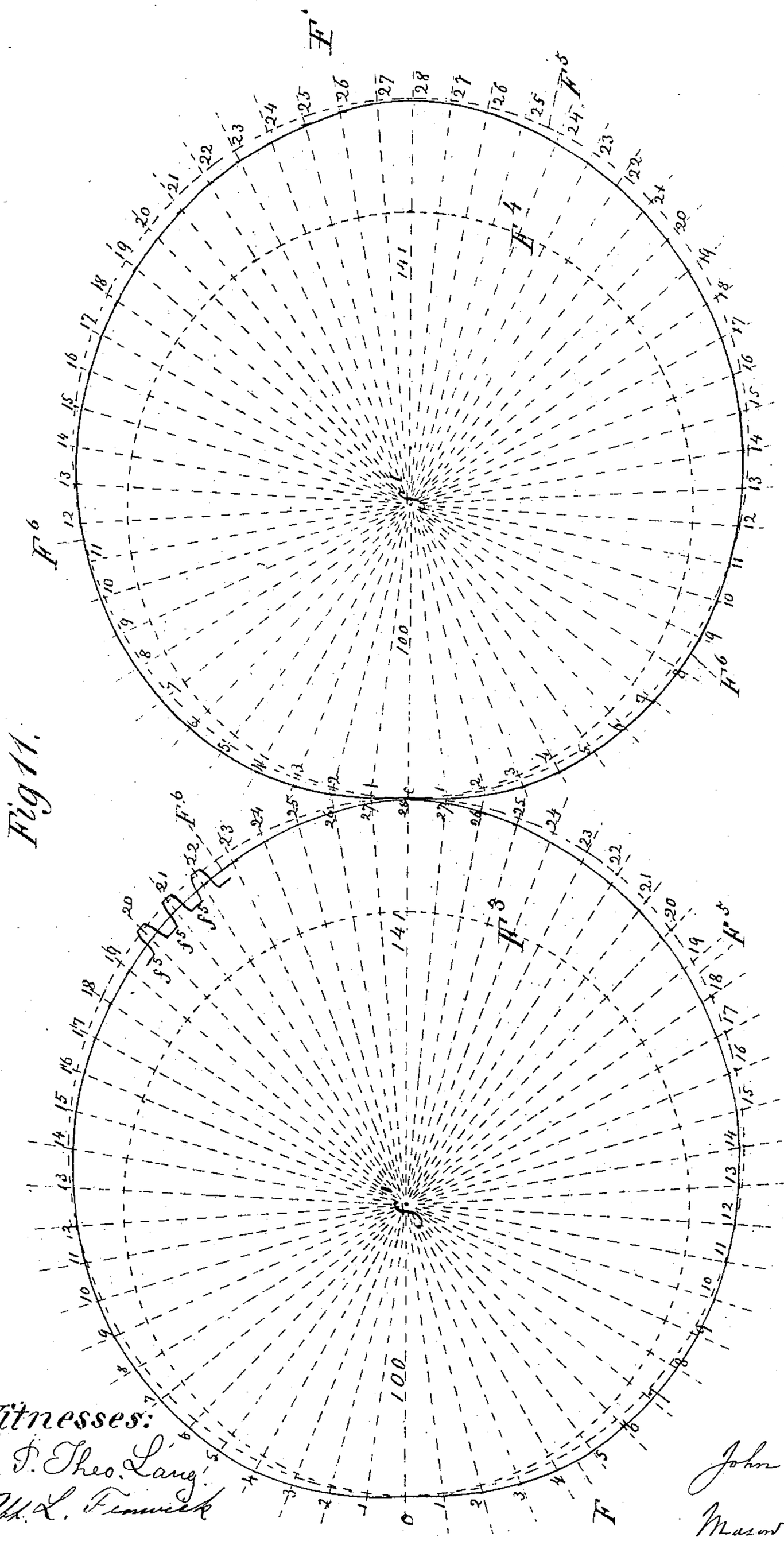
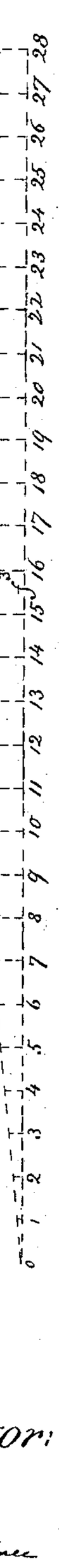
Fig 11.



Witnesses:
J. T. Theo. Lang.
Robt. L. Fennick

Fig 12.



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UNITED STATES PATENT OFFICE.

JOHN H. CROWLEY, OF PHILADELPHIA, PENNSYLVANIA.

MACHINE FOR WINDING BOBBINS FOR LOOM-SHUTTLES.

SPECIFICATION forming part of Letters Patent No. 263,287, dated August 22, 1882.

Application filed July 26, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. CROWLEY, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Machines for Winding Bobbins for Loom-Shuttles, of which the following is a specification.

The nature of my invention consists in certain novel combinations, which will be fully understood from the specification, accompanying drawings, and claims; and the objects of the improvements are, mainly, to make a bobbin-winding machine which will turn out in a given time the greatest number of bobbins in the best condition for service in loom-shuttles, and for producing better kinds of goods than have heretofore been produced with the same quality of cotton, silk, or other material; and these objects I attain by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a front view of my bobbin-winding machine, having a part of its front bar broken away and the broken ends section-lined, the bar being broken out in order to expose to view the parts in rear of it. Fig. 2 is an end view of the same. Fig. 3 is a cross-section in the line *x x* of Fig. 1, showing the parts beyond the line of section in elevation. Fig. 4 is an enlarged detail side view, partially in section, showing the thread or yarn feed motion in elevation, the feed-bar, bobbin, and its supports and parts of the frame being shown in section. In this view the feed-lever is shown broken in two, in order to afford room upon the sheet of drawings for the parts below the fulcrum of the lever. Fig. 5 is also an enlarged front view of Fig. 4. The frame, feed-lever, and its fulcrum-adjusting plate are shown in section, while the other parts are in elevation. Fig. 6 is an enlarged detail view of the adjustable fulcrum-adjusting plate and lever and a portion of the frame. Fig. 7 is a detail view of one of the adjustable tension-pulleys used with the bobbin-revolving mechanism, the pulley being in elevation and its adjusting and supporting plate and a portion of the frame being in section. Fig. 8 is a detail perspective view of the bobbin holding and forming cup, the adjustable thread or yarn feed arm and feed bar and portions of the frame being shown broken and section-lined where broken. Fig. 9 is a detail diagram, showing the driving rope or band, the tension-adjusting pulleys, the barrels of the spindles, and the main pulleys being shown in dotted lines. Fig. 10 is a detail view of that part of the spindle to which the bobbin is attached, part of the spindle being broken off. Fig. 11 is a diagram illustrating the construction of the two main toothed gear-wheels, which produce the variable speed of the bobbins necessary to cause the yarn or thread from the skein-reels to be supplied at a uniform speed to the bobbins. Fig. 12 is a diagram showing the arrangement and construction of the ordinates used in determining the radii of the wheels. Fig. 13 is a detail top view of the bobbin-spindle, its bearings, and the cup, also showing a portion of the driving-band and of the frame with bobbin-supporting bar. This view shows the spindle placed slightly out of a right angle with the driving-band or out of parallel with a line at right angles to the front of the frame, which line is indicated by dots between **' *'*.

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

A designates the frame of the bobbin-winding machine, B the bobbin-revolving mechanism, and C the feed mechanism. By the letter B, I have generally designated a bobbin-revolving mechanism, and by the letter C a feed mechanism, and the various parts comprising these respective mechanisms will be presently described. The frame A is made of suitable shape and material to support all the parts of the machine.

The main shaft D is suitably hung at one end of the frame, and is provided with a loose pulley, *d*, driving-pulley, *d'*, fly-wheel d^2, and pinion d^3.

The pinion d^3 gears into a wheel, *e*, upon a shaft, E, which shaft is provided with a cam gear-wheel, F, which gears into another cam gear-wheel, F', on a shaft, F^2, extending from end to end of the frame.

A bevel-gear wheel, *f*, fastened to the shaft F^2, drives another bevel-gear wheel, *g*, which is on a transverse shaft, G, as seen in Fig. 1.

A chain-sprocket wheel, *g'*, fastened to the shaft G, drives a smaller sprocket-wheel, *h*, upon a transverse shaft, H, by means of a chain, g^2.

On the shaft H a cord or band pulley, *h'*, is

provided, and this pulley operates an endless cord or band, h^2, running longitudinally of the frame. The cord h^2 operates the train of spindles and bobbins of the winding-machine at regular periods, with gradually decreasing and increasing speed, according to the gradual increase and decrease of the diameter of the nose or end of the conical bobbins upon which the layers of thread or yarn are wound, and this variable speed is caused by the cam gear-wheels F F′, which are preferably constructed as follows: Having obtained the diametrical proportion of a given full and an empty bobbin, determine the eccentricity of the wheels thus: Construct the dividing-curve or pitch-line of the wheels F F′ by the aid of two equal circles, F^3 F^4, Fig. 11, the radii of which circles represent the shortest radii of the cam-wheels F F′. The pitch-line above mentioned is of such shape, as illustrated, that the wheels F F′ produce a variable revolving speed of the bobbins in the proportion of 1 : 2. This proportion is adopted because it is the diametrical proportion of the empty and full bobbins in nearly all cases. In accordance with this variation of speed the length of the radii of the wheels F F′ is gradually increased and decreased, so that the angular speed of the wheel F′ is the quickest when its shortest radius is in line with the longest radius of the wheel F, and it is the slowest when its longest radius is in line with the shortest radius of said wheel F, as illustrated in the drawings.

In order to construct the dividing-line for the wheels F F′, a circle, F^5, of the approximate diameter, 100+141 or 241, is drawn so as to touch the circles F^3 and F^4 at *o*, and is divided into a suitable number of equal parts—say fifty-six or twenty-eight to each semicircle. The difference between the shortest and longest radius, which is forty-one, is measured and transferred upon an upright line, f^2, Fig. 12, at the end of a horizontal line, f^3, which horizontal line is divided into twenty-eight equal parts, corresponding with the divisions of one of the semicircles F^3 F^4. From the end *o* of the line f^3 to the upper end of the line f^2 an inclined line, f^4, is drawn, and from the divisions 1, 2, 3 to 28 of the line f^3 lines are drawn up toward line f^4 and parallel with line f^2, as seen in Fig. 12. The lines thus obtained will be the true ordinates for the graduation of the radii between the longest and the shortest radius of the dividing-line of the cam gear-wheel, and these ordinates are added in regular order, according to their numbers, 1, 2, 3 to 28, to the lengths of the radii drawn through the divisions of the circles F^3 and F^4, and their ends are united by a continuous cam-curve, F^5, which is the correct pitch-line for the teeth of the cam gear-wheels, and upon this pitch-line the teeth f^5 are constructed, according to well-known rules. The wheels F F′, produced as above described, and illustrated in the drawings, will have the required eccentricity, while their teeth will be on termini of radii of true circles, to which radii have been added gradually-increased lengths, and which lengths are those formed between the straight inclined line f^4 and the horizontal line f^3, said inclined line corresponding to the straight inclined surface of the desired frustum of the conical bobbin which is to be wound by the machine.

While I have particularly described the construction of wheels F F′ and the method of laying out the same, I do not claim the same as my invention.

Instead of using two equal cam-wheels F F′, three equal cam-wheels might be employed in which the proportion of the shortest and longest radius would be 10 : 12 approximately, and so on; but in all cases the construction should produce (if the best results are sought) a cone on the bobbin having a straight-line surface, and this will be the case if the ordinates are constructed between the two straight lines f^3 and f^4. In fact, any other desired diametrical proportion of the empty and full bobbin than 1 : 2 by well-known rules could be secured in the construction of the cam-wheels F F′.

The cord h^2 passes over a number of guide-pulleys, I I′, pulleys I being stationary, while pulleys I′ are made vertically adjustable by having their center pins, *i*, fastened in vertical slots *i′* of supporting-plates I^2, which plates are suitably fastened to the frame A, as shown in Fig. 7. The pulleys I′, as shown, are grooved to retain the cord or band h^2 in position, and they are made adjustable, as illustrated in said Fig. 7, in order to give the proper tension to the cord h^2, and thus have it act uniformly upon all the spindles.

In Fig. 1 I have shown the means whereby the tension of the cord h^2 is preserved. It consists of two stationary guide-pulleys, J, suitably fastened to the frame A and having between them a tension-pulley, J′, fastened to a weighted lever, *j*, which has its fulcrum at *j′* on the frame A. Thus, by bearing upon the cord h^2 the tension-pulley J′ prevents the rope from becoming slack.

A number of spindles, K, provided with cylindrical barrels *k*, are driven by the cord h^2, the spindles being arranged parallel with the axes of the guide-pulleys I′, one pulley for every pair of spindles, the barrels *k* resting upon the cord h^2 during the winding of the bobbins. The spindles K are also provided with ordinary collars, *k′*, and tenon-pins k^2 for the purpose of holding the bobbins M in place upon the portions k^3 of the spindles. The ends k^4 of the spindles revolve in open-hooked overhanging bearings *l* of bearing-plates L, and the ends of the bobbins M rest in cup or conical bearings N. The barrels *k* of the spindles are made exactly of the length of the finished bobbins, so that when a bobbin is finished the end edge of the barrel *k* next the bobbin stands above the cord h^2, and thus is in condition to be suddenly thrown longitudinally out of gear

with it. The ungearing of the spindle is effected by the lateral pressure and thrust of the rounded surface of the cord or band against the rear end edge of the barrel, and this occurs when the barrel and lower circumference of the finished bobbin descend below the plane of the cord by their weight, as illustrated in Fig. 2. A stop or pin, l', is provided on the bearing-plate L, whereby the spindle is prevented from rolling around laterally and falling through the frame into the machinery below when disengaged from the cord h^2.

A supporting-bar, L′, is provided for each bobbin on the frame A, whereby the filled bobbin is supported at a proper height to keep the spindle out of contact with the cord h^2 after its disengagement from the same, as illustrated in Figs. 2 and 4.

An upper hook, l^2, is provided on the plate L for the purpose of supporting the front end of the spindle after it has been removed out of the bearing l and before the bobbin with it is removed entirely from the machine.

The inner formation of the cup-bearings N is, as usual, conical, corresponding to the ends of the bobbins, and the rear parts of the said cup-bearings have openings n large enough to secure in them a loose fit of the empty bobbins. These openings n are flared downwardly, as at n', in order to facilitate the insertion into their bearings of the spindles and empty bobbins, as illustrated by dotted lines in Fig. 4.

Each cup N is, as usual, provided with a horizontal slot, n^2, through which the thread or yarn is conducted to the bobbin by means of an eye, o, in the lower end of the reciprocating arm O on the feed-bar P.

The upper portion of the arm O is bent at an angle and provided with a slot, o^2, through which a set-screw, o', passes, whereby the arm O is fastened to the bar P, and whereby also it can be adjusted to any desired position with reference to the slot n^2, in order to suit the requirements in winding bobbins of different sizes and shapes.

The bar P, to which all the arms O are fastened, is located above and in the rear of the cups N, so as not to be in the way of the operator during the act of changing the bobbins, and it is supported at or near its ends by slides Q, suitably shaped and fitted to the frame A by means of guides q' q^2 and fastened to the bar P. These two slides Q are, by means of pins q, connected to the upper ends of two levers, R, which are provided with longitudinal slots r at their centers, and with friction-rollers r' and tension-springs r^2 at their lower ends. The levers R are thus suspended from the pins q, and they swing around fulcrum-pins s, which are adjustably fastened in vertical slots s' of angle-plates S, the latter being suitably fastened to the frame A.

As the upper ends of the levers R invariably move in the same plane with the slides Q, it is evident that an adjustment of the fulcrum-pins s to a higher or lower altitude will make the stroke of the slides Q of less or greater length for a given stroke of the friction-rollers r'. This stroke of the friction-rollers r' is effected by two revolving heart-shaped cams, R′, fastened to the shaft F^2, and the tension-springs r^2, which keep the friction-rollers continually in contact with the cams. When the length of the slots s' is not sufficient for the desired change in the length of the feed the plates S are moved up or down on the frame A, which for that purpose is provided with a number of holes, s^2, into which the fastening-bolts s^3 of the plate S are inserted.

The thread or yarn X with which the bobbins are supplied is taken from skeins t, loosely stretched over reels T T′, of which the upper ones, T, have rigid center shafts, t', fastened to arms u on a bar, U, suitably attached to the frame A. The lower reels, T′, have their center shafts, t^2, fastened to levers V, which have their fulcra v in stands V′, suitably fastened to the frame A.

A deflecting-bar, W, suitably attached to the frame A, serves as an intermediate guide between the skeins and the eyes o in the reciprocating guide-arms O.

Operation: The machine is set in motion in the usual manner by shipping an ordinary driving-belt from the loose pulley d upon the fixed pulley d', whereupon the cord h^2 begins to move with the variable speed above described. At the same time the guide-arms O move back and forward in harmony with the variations of the speed of the cord h^2, whether from fast to slow or slow to fast. The skeins being put over the reels, as usual, the yarn-threads are pulled through the eyes o and attached to the empty bobbins M upon the spindles K in the usual manner, the forward ends of the bobbins M are inserted into the openings n of the cups N, and the rear end portions of the spindles are inserted into the hooked bearings l, whereby the barrels k are brought into contact with the cord h^2 and instantly revolved, taking the yarn from the skeins at a uniform speed and winding it upon the bobbins spirally, forming a succession of conical layers of yarn, which give the bobbin the appearance of a cylinder ending in a cone-frustum. This frustum of the bobbin bears continually against the inner surface of the cups N by reason of its spindle lying slightly oblique with respect to the dotted lines $*'$ $*'$, shown in Fig. 13 upon the cord h^2, which set tends to keep it properly within the cup. By degrees the wound portions of the bobbins grow longer and the spindles are pushed gradually toward the front of the machine until the wound bobbins have attained their full length, when the rear edges of the barrels k stand over the cord h^2 and the spindles are instantly thrown out of gear with the same. The front ends of the barrels limit the forward movement of the spindles by coming in contact with the plates L, and the spindles finally rest upon the plates L near the stop l', while the bob-

bins fall upon the bars L′. The hook l^2 will support the front end of the spindle with either an empty, a half-filled, or a filled bobbin upon it whenever necessary—as, for instance, when by accident the yarn becomes wound upon that portion of the spindle which is between the barrel and bobbin, and owing to being thus wound upon the spindle will cause by its contact with the band the bobbin and spindle to revolve, even after the barrel and band are out of gear. The spindle, with either an empty, half-filled, or a filled bobbin upon it, is lifted by hand or in any proper manner into or out of the hook l^2.

This machine is not stopped when the bobbins and spindles are removed or replaced; nor is it necessary that a whole row or set of bobbins should be finished at the same time.

The speed of the revolving bobbin-spindles being variable, in accordance with the varying diameter of the cone-frustum being formed on the bobbin, the discharge-speed of the yarn from the skeins does not vary, but is uniform at all times. The inertia of the skeins and reels does not offer undue resistance to the unwinding of the yarn from an increase of speed, nor an insufficient tension from a decrease of speed; and hence the yarn will not be discharged too sluggishly or too freely, and in consequence thereof the bobbins are wound with an equal tension, and no such defects experienced as a series of loops or wavy lines, or sometimes upper layers of yarn cutting into the lower layers of yarn in a manner to cause frequent breakage of the yarn and necessitate mending by means of knots. Bobbins wound in accordance with my invention enhance greatly the performance of a loom and the appearance of the goods turned out from it; and while these results are secured it is not necessary to run the looms at a slow speed.

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

1. The combination of the endless cord, band, or rope h^2, arranged to drive all the bobbin-spindles by contact from below, with the spindles, hooked overhanging bearings, and mechanism for supporting and controlling the band and for driving the band and spindles, substantially as and for the purpose described.

2. The plate L, provided with the hooked overhanging bearing l, in combination with the spindle and means for keeping it up in its bearing and for driving it, substantially as and for the purpose described.

3. The plate L, formed with the top rest, l^2, for supporting the bobbin-spindle while idle, in combination with the said spindle and the stop-bar L′, substantially as and for the purpose described.

4. The combination, with the spindles, of the endless band, cord, or rope h^2, arranged below the spindles, means for driving said band, means for keeping the band at a proper tension and in contact with the barrels of the spindles, and the plate L, provided with overhanging hooked bearings l, substantially as and for the purpose described.

5. The combination of the slides Q with the levers R, provided respectively with the slot r, pivot q, and bearing r', the plates S, provided respectively with slot s', adjustable fulcra-pins s, feed-bar P, arranged above and in rear of the bobbin-holding cups and provided with arm O and eye o, cams R′, springs r^2, shaft F^2, means for operating this shaft, cups N, bobbin-spindles, and means for operating these spindles, substantially as and for the purpose described.

6. The combination of the endless cord h^2, adjustable guide-pulleys I′, means for operating the endless cord, spindles, and cups N, or other similar support with the plate L, provided with overhanging hooked bearings l, substantially as and for the purpose described.

7. The combination of the endless cord or band h^2 with the stationary guide-pulleys J, weighted tension-pulleys J′, spindles, plate L, provided with overhanging bearings l, and means for driving the endless cord or band, substantially as and for the purpose described.

8. The bar L′, in combination with the endless cord or band h^2, spindles provided with barrels, bobbin-holding cups, plates L, provided with the bearings l, and means for driving the band or cord, substantially as described.

9. The plate L, provided with the stop l' and the bearing l, in combination with the stop-bar L′ and the spindle, whereby the spindle is prevented from getting out of its bearing l and rolling down into the machine, substantially as set forth.

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