J. F. GORDON.

WINDING MACHINE.

APPLICATION FILED FEB. 6, 1905.

898,459.

Patented Sept. 15, 1908.

5 SHEETS—SHEET 1.

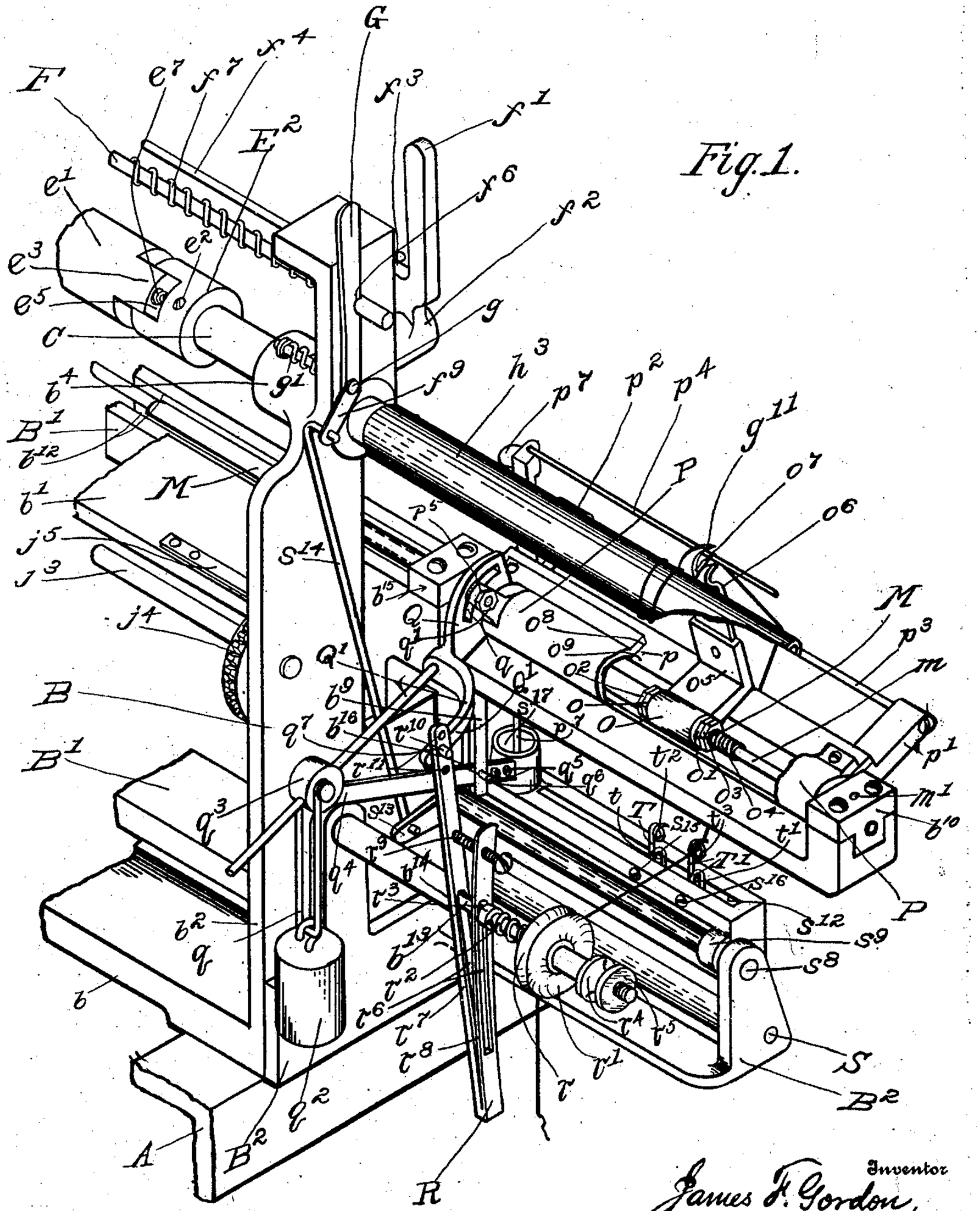

Fig. 1.

Witnesses:
Frank L. Wasley
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By Albert M. Moore,
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5 SHEETS—SHEET 2.

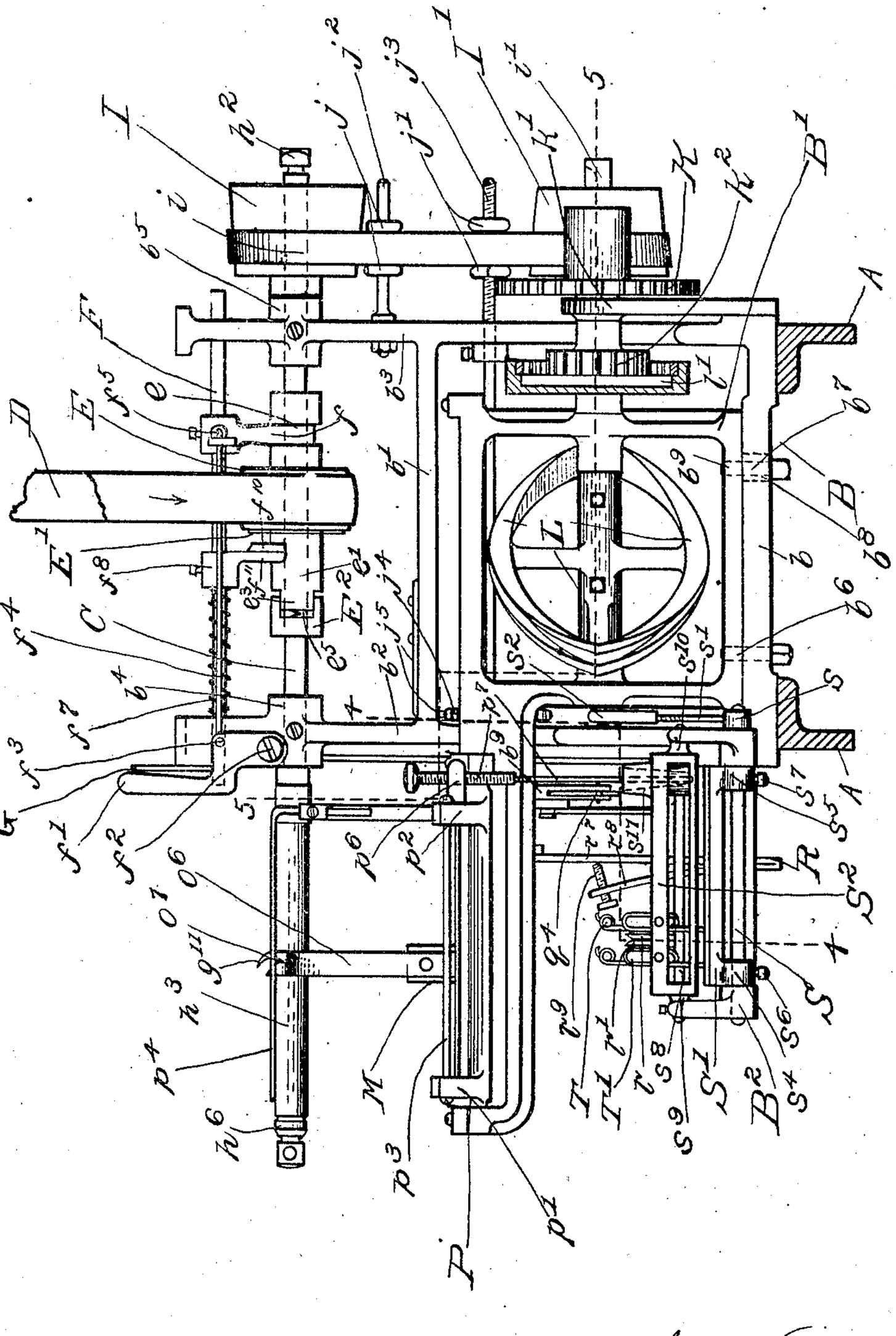

Fig. 2.

Witnesses:
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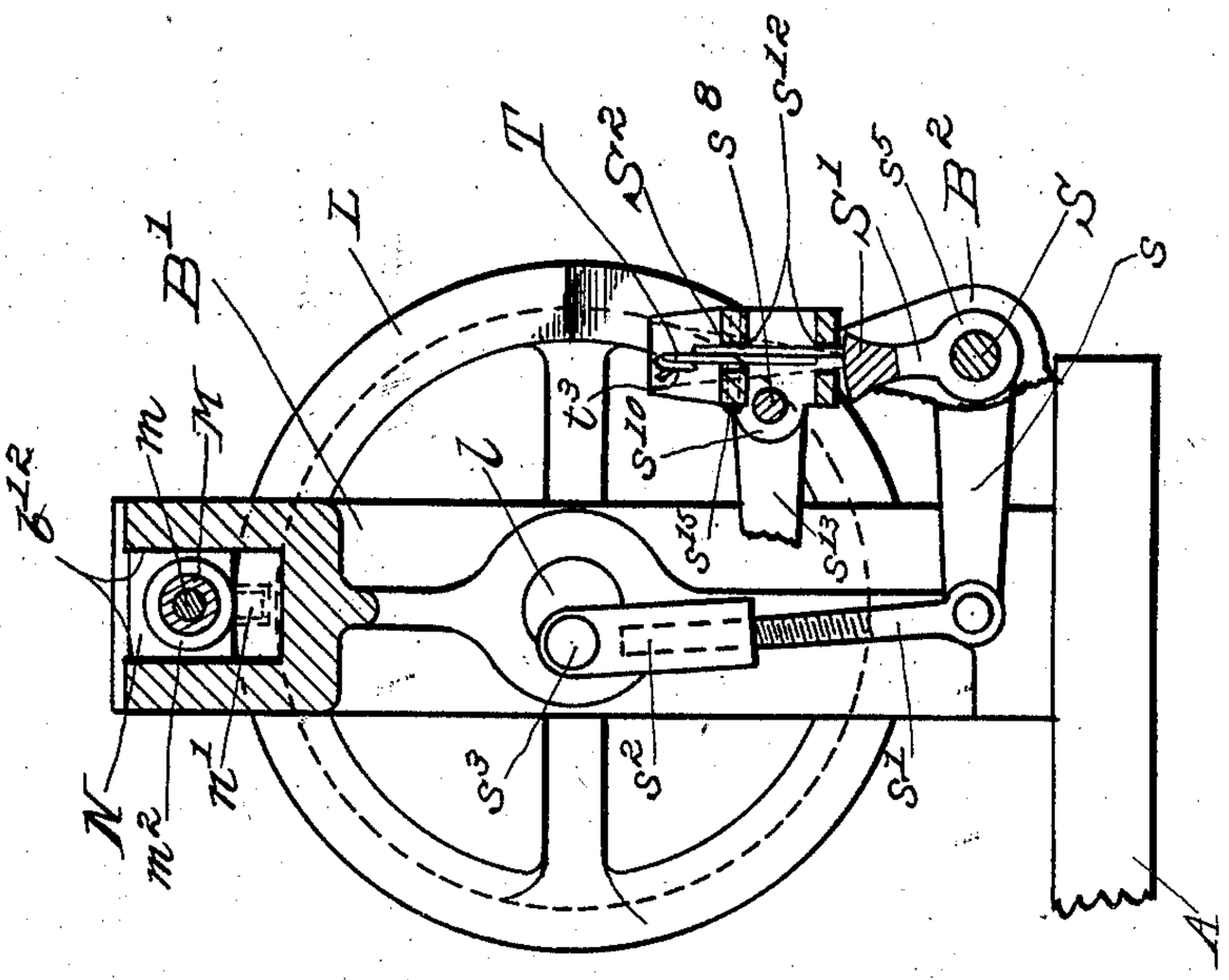

Fig. 4.

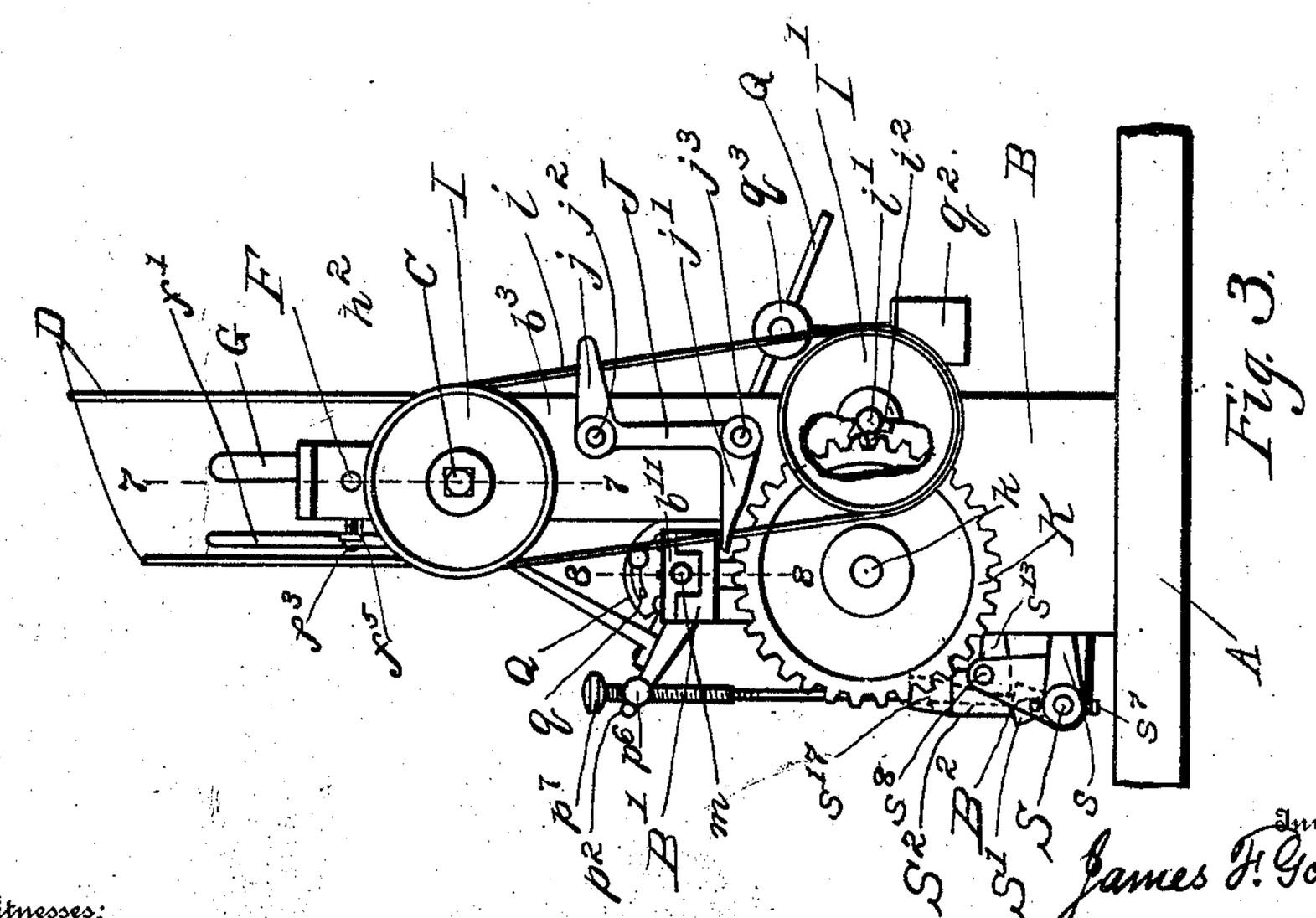

Fig. 3.

Witnesses:
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5 SHEETS—SHEET 4.

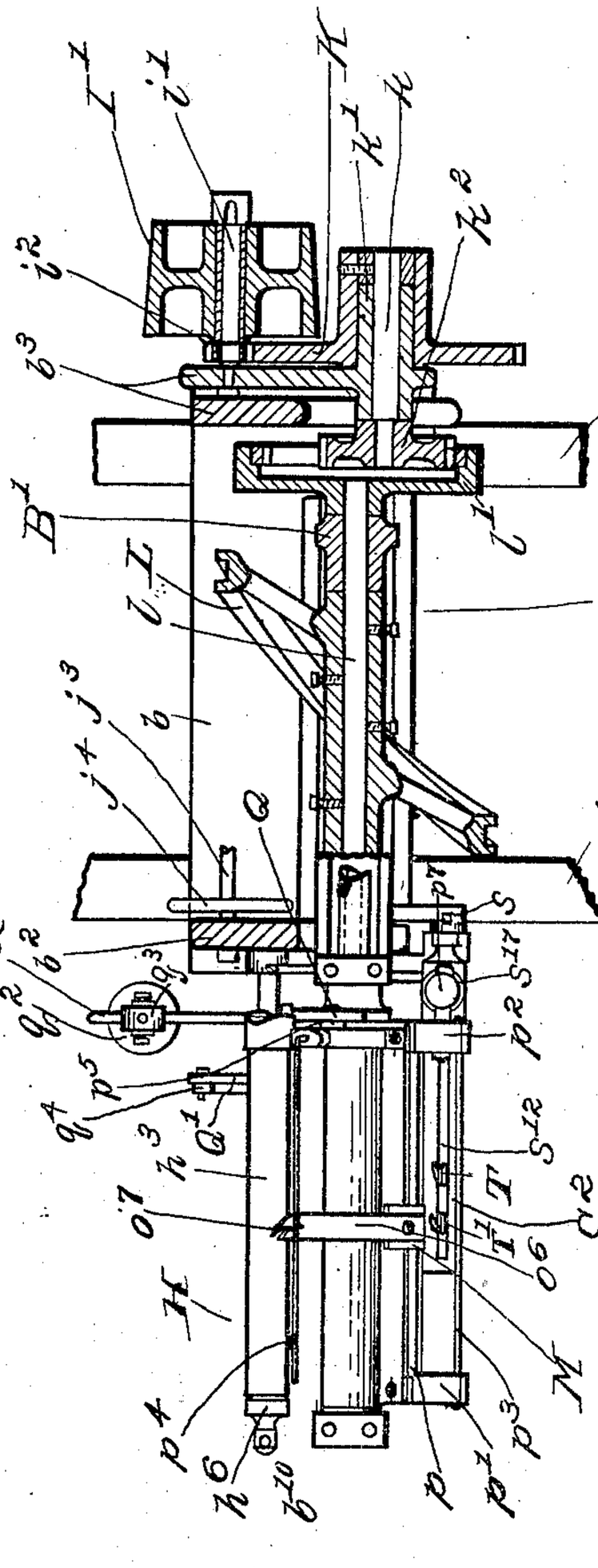

Fig. 5.

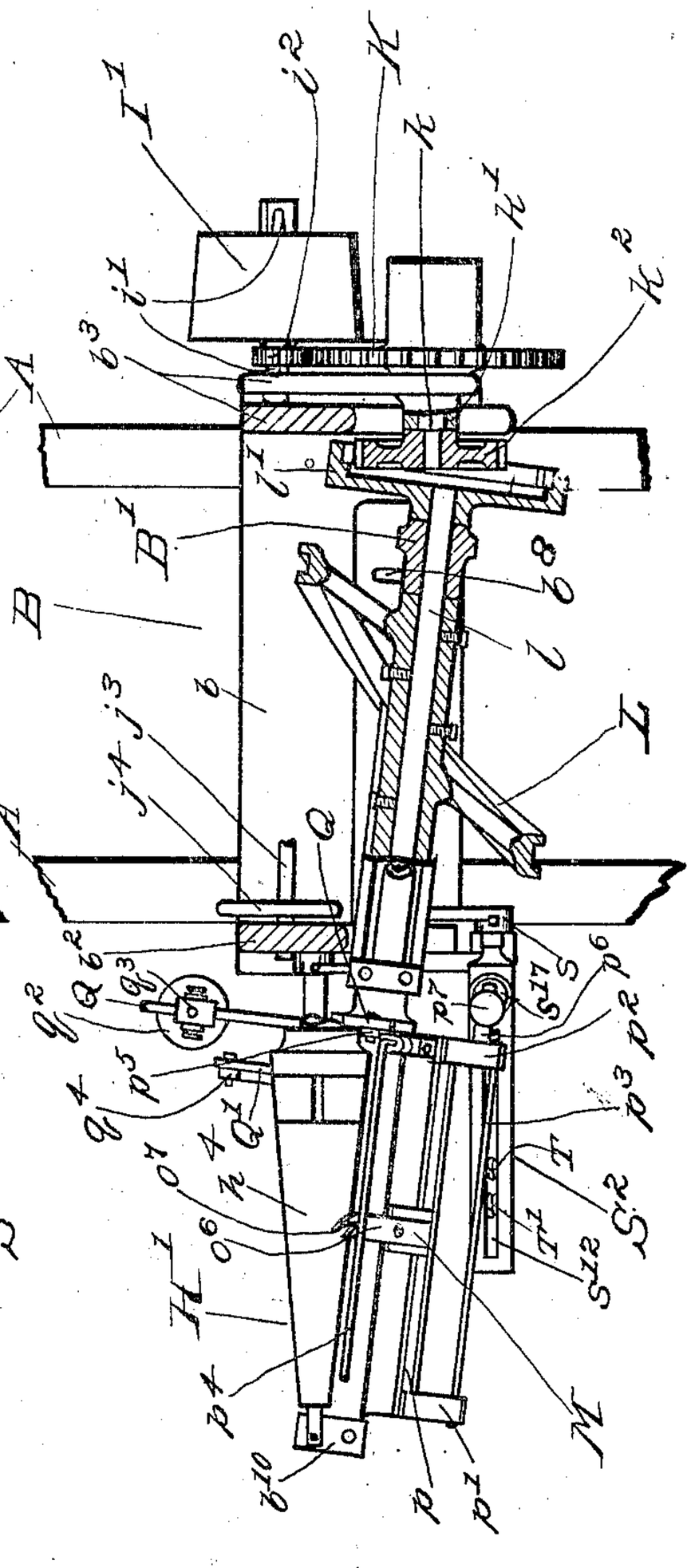

Fig. 6.

Witnesses:

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J. F. GORDON.

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5 SHEETS—SHEET 5.

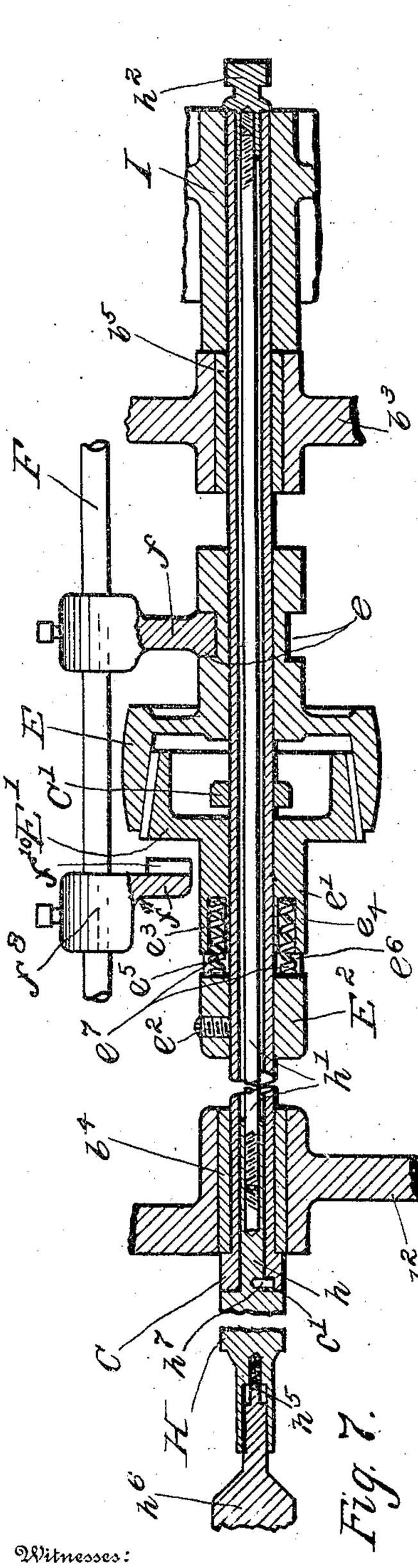

Fig. 7.

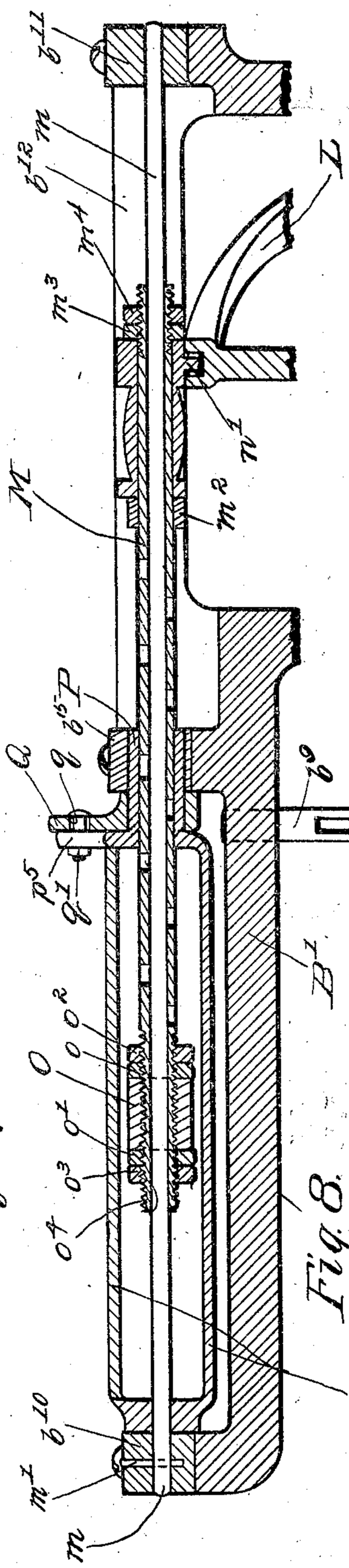

Fig. 8.

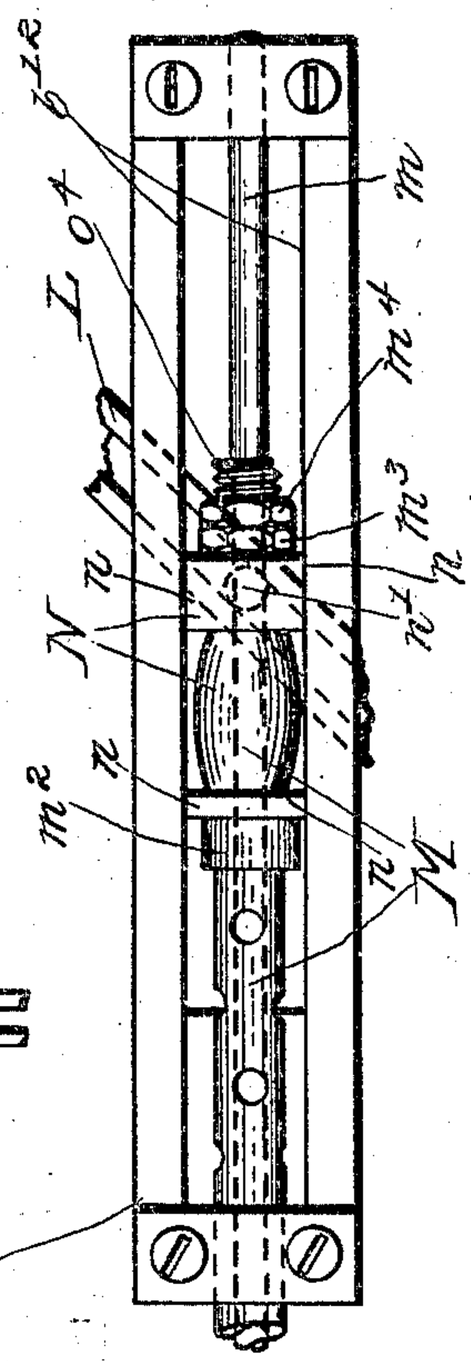

Fig. 9.

Witnesses:

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Grace Crowley.

Inventor

James F. Gordon,

By Albert M. Moore,

His Attorney.

UNITED STATES PATENT OFFICE.

JAMES F. GORDON, OF LOWELL, MASSACHUSETTS.

WINDING-MACHINE.

No. 898,459. Specification of Letters Patent. Patented Sept. 15, 1908.

Application filed February 6, 1905. Serial No. 244,396.

To all whom it may concern:

Be it known that I, JAMES F. GORDON, a citizen of the United States, residing in Lowell, in the county of Middlesex and Commonwealth of Massachusetts, have invented a certain new and useful Improvement in Winding-Machines, of which the following is a specification.

This invention relates to winding machines such as are adapted to wind yarn, threads, wire and the like on cylindrical tubes or hollow mandrels or on hollow cones.

The principal object of this invention is to adapt the same machine to the winding at separate times of both cylindrical and conical packages or cops without removal or addition of parts other than the spindle or tube carrier.

In changing from one form of cop to the other it is necessary to substitute for the spindle previously used a spindle of the form of the cop to be wound. This requires a change of direction of the traverse of the guide which in such machines rests against the material already wound upon the spindle and in winding a cylindrical package, moves in a line parallel with the axis of the cylindrical spindle, but in winding a "cone", or more properly a frustum of a cone, moves in a line at an angle with the axis of a conical or tapering spindle.

This invention comprises means for instantly adjusting the direction of the traverse of the guide into parallelism with the side of the package to be wound.

Said invention also comprises means of diminishing the pressure of the guide upon the cop as the latter increases in size; means of varying the initial pressure of the guide on the cop; stop-motion devices operated by the attainment of the cop to a predetermined size; and other stop-motion devices operated by the breaking of the material being wound.

Said invention consists in the combination and devices hereinafter described and claimed.

In the accompanying drawings, on five sheets, Figure 1, is an isometric perspective view of a part of the left side and front of a winding machine embodying my invention; Fig. 2, a right side elevation of said machine; Fig. 3, a rear elevation of the same, with a part of the lower cone broken off to show the gearing which connects the cam-shaft and the shaft of said cone; Fig. 4, a transverse section, mainly vertical, on the line 4 4 in Fig. 2, of the swing-frame and vibrator and a front elevation of the cam; Fig. 5, a plan, partly in horizontal section on the line 5 5 in Fig. 2 of the machine arranged to wind a cylindrical cop; Fig. 6, similar to Fig. 5, except that the cone and adjacent gearing is in plan instead of in section and except also that the machine is arranged to wind a conical cop; Fig. 7, a vertical longitudinal section of the driving shaft, its clutch, and the shipping rod on the line 7 7 in Fig. 3; Fig. 8, a vertical longitudinal section of the upper part of the swing-frame and the parts movable therewith on the line 8 8 in Fig. 3; Fig. 9, a plan of a part of the means for causing the guide to traverse.

A indicates a table or stand on which a number of winding machines may be supported and B a suitable frame represented as comprising a horizontal bed b and rail b^1, which connect uprights b^2 b^3, all of any usual construction.

The spindle-shaft or main shaft C (Figs. 1, 2, 3 and 7), is represented as hollow and mounted in suitable bearings b^4 b^5 in the frame. The spindle-shaft C is driven by a belt D from a suitable motor or overhead shaft, said belt running on a loose pulley E which constitutes the hollow counterpart of a cone-clutch, the other counterpart being a cone E^1 which may be prevented from turning on said shaft by any usual means, and is represented in Fig. 7 as prevented from turning on said shaft by a collar E^2, secured as by a set-screw e^2, on said shaft C, said collar and the hub e^1 of said counterpart E^1 each having alternate projections e^4 e^3 and recesses e^6 e^5 which fit each other, the collar E^2 and counterpart E^1 being shaped like a positive clutch and the cone part E^1 being crowded towards the part E by springs e^7. The actual disengagement of the part E^1 from the collar E^2 is prevented by an annular shoulder C^1 on the shaft C. The springs allow the part E^1 to yield when the hollow cone E is drawn suddenly into engagement with it and to avoid shocks which might break the material being wound or injure parts driven from said shaft C.

The friction clutch E E^1 is closed by the longitudinal movement of a shipping rod F which slides in the uprights b^2 b^3 and carries a fork f which engages an annular groove e in the hub of the part E, said rod F being drawn by a lever f^1 fulcrumed at f^2 on the upright b^2 and pivoted at f^3 to one end of a link f^4, the

other end of which is pivoted at f^5 to the fork f. (Figs. 1, 2 and 3). When the friction-clutch is closed, the rod F is prevented from its clutch-opening movement by a latch-lever G which turns on the upright b^2 and engages a notch f^6 in said rod (Fig. 1), the pivot g of said latch-lever extending through said upright b^2 and being surrounded by a coiled spring g^1, connected to said pivot g and said upright in an obvious manner, which normally swings said latch-lever against said rod F. When the latch-lever is drawn out of the notch f^6, a spring f^7, represented as a spiral spring surrounding the rod F and compressed between the upright b^2 and a collar f^8, fast on said rod, moves said rod in the opposite direction and opens the friction-clutch and allows the shaft C to come to rest.

The spindle proper or tube-carrier may be cylindrical as at H in Figs. 1, 2, 5 and 7, or tapering, as at H^1 in Fig. 6, and in either case may be attached to the shaft C by the means shown in Fig. 7, where the spindle H is provided with a shank h which enters the end of said shaft and is prevented from turning therein by a lateral projection h^7 which enters and fits a groove c^1 on the inside of said shaft. The shank h is retained in the shaft C by a long screw h^1 which extends through the shaft and enters a threaded hole in said shank when turned by the head h^2, rigidly secured to said screw as by being screwed on tight and brazed.

The cop-tube, whether cylindrical, as h^3 in Figs. 1, 2 and 5 or tapering as h^4 in Fig. 6, may be held on the spindle by a screw h^5 which enters the free end of the spindle and has a head h^6 which bears against the outer end of such tube, in the usual manner.

The end of the spindle shaft C farthest from the spindle carries a fast cone-pulley I, connected by a belt i to another cone-pulley I^1, running loose on a fixed stud i^1 which projects from the upright b^3 parallel with the shaft C, said cone pulleys being of the same dimensions, but reversed with respect to each other.

The belt-shifter J is provided with two forks j j^1 to engage opposite members of the belt i and is supported on a stud j^2 (bolted to the upright b^3) and on a screw j^3 which turns without advancing in the uprights b^2 b^3 and enters a threaded hole in said shifter, so that when said screw j^3 is turned by its toothed head j^4 the belt is moved laterally to vary the relative speed of the cones I I^1, a spring catch j^5 engaging the toothed head j^4 and preventing accidental turning of said screw j^3 (Figs. 1, 2, 3 and 6). A pinion i^2 is secured to the cone I^1, concentrically therewith, and engages a gear K, fast on a short shaft k which turns in a sleeve-bearing k^1, secured to the upright b^3. A spur-pinion k^2 is fast on the inner end of said shaft k.

The cam-shaft l instead of being journaled in the stationary frame B in the usual manner is represented in Figs. 2, 5, 6 and 8 as journaled in the auxiliary frame B^1, the body of which is a hollow rectangle resting on and pivoted to the bed b of the frame B by a bolt b^6, and normally prevented from turning on said bolt b^6 by another bolt b^7 which passes up through an arc-shaped slot b^8 in said bed b, concentric with the pivot-bolt b^6 and enters a hole b^9 in the bottom of said auxiliary frame. When the bolts b^6 b^7 are loosened, the auxiliary frame may be swung about the bolt b^6 until the bolt b^7 strikes an end of the slot b^8.

To the rear end of the cam-shaft l at the rear of the auxiliary frame is secured the internal gear l^1 which surrounds the spur-pinion k^2 and engages one or the other side of said pinion, according as the bolt b^7 is at one end or the other of the slot b^8, causing said internal gear and cam-shaft to be rotated always in the same direction with said pinion k^2.

The externally-grooved cam L is of common form and is fast on the shaft l and serves to reciprocate the yarn-guide carrier M. Said carrier M is a tube arranged to slide on a rod m supported in the auxiliary frame B^1 and in a horizontal extension which, instead of being rigidly secured to the main frame B, is cast or otherwise secured on the auxiliary frame B^1 in a line parallel with the cam-shaft l and moves with said cam-shaft into or out of parallelism with the spindle-shaft, the traversing motion of the guide being always parallel with the side of the spindle whether the spindle be cylindrical or tapering. The rod m is held in suitable blocks b^{10} b^{11} secured to the auxiliary frame and is normally prevented from longitudinal movement by a pin m^1 which passes down into the block b^{10} through said rod. A slide N receives the rear end of the carrier M and is retained on said carrier between a collar m^2 on said carrier and by a nut m^3 and check-nut m^4 (Figs. 8 and 9) turning on said carrier back of said slide, said slide N moving in a slot b^{12} in the top of the auxiliary frame B^1 and having one or more flattened sides n which bear against the walls of said slot and prevent said slide from turning, to keep a projection n^1, with which said slide is provided, in engagement with the cam L.

The lower end of the yarn-guide O surrounds and is retained on the carrier M by nuts o o^1 and check-nuts o^2 o^3, in an obvious manner, and is also represented as screwed thereon at o^4. The guide O and carrier M turn together on the rod m, the carrier being free to turn in the slide N. The body of the yarn-guide O extends radially from the carrier M and is then turned upward at o^5 at about right angles (Fig. 1), the upturned part having secured to it a bit o^6 provided in its upper end with a notch o^7 which receives the

yarn in the usual manner. The front end of the carrier and the attached part of the yarn-guide slide in a hollow cylindrical case P which is provided on one side with a longitudinal slit p, through which the radial part of said guide projects and in which said radial part slides, the sides of said slit having parallel external lips o^8 o^9 which afford suitable surfaces for the direction of said guide.

The case or guide-way P is journaled at the front end on the rod m and at the rear end in a bearing b^{15} which surrounds the tubular carrier M, concentrically with said rod and carrier, and is caused by means hereinafter described to turn sufficiently to hold the yarn-guide bit o^6 always in contact with the cop-tube or with the cop being wound thereon. Arms p^1 p^2 (Fig. 2) projecting from said case support a carrier-rod p^3 parallel with the axis of the case P and at a uniform distance from the yarn-notch o^7 and over this rod, the material being wound is drawn. Upon the arm p^2 is adjustably supported another wire or rod p^4 by its rear end. The rod p^4 does not extend to the front limit of the traverse of the yarn-guide and its upper surface is arranged so that when a yarn is pieced up and laid on the wire p^4 the longer rear side g^{11} of the yarn-notch o^7 will catch said yarn on the next forward movement and carry it beyond the front end of said wire p^4 from which said yarn will then fall into said notch o^7 and be carried backward under said wire, said longer side g^{11} being so inclined on the back as to lift and pass under the yarn in the backward movement of the yarn-guide. This arrangement enables the yarn to be pieced up more quickly than if the yarn had to be placed in the guide-notch o^7 by hand.

A tension-lever Q is journaled on the rear end of the case concentrically with the case P and is provided with an arc-shaped slot q concentric with said case, by means of which and of a bolt q^1, carried in an arm p^5 which projects radially from said case, the relative angular positions of said lever Q and arm p^5 may be varied and fixed at will.

A weight q^2 is suspended from a slide q^3 which is movable on said lever Q, said slide being adjustably connected by a link q^4 to a part of the auxiliary frame represented as a fork b^9 which is carried by the auxiliary frame B', said link having holes q^5, at different distances from said slide q^3 through one or another of which holes q^5 and a hole b^{16} in said fork b^9, pin q^6 is pushed to regulate the distance of the weight from the fulcrum or center of the tension-lever before the commencement of the cop-winding and by changing the position of said pin q^6 from one to another of the holes q^5, the initial pressure of the guide on the cop may be varied. As the cop enlarges, the yarn-guide is crowded away from the spindle, turning the case P and raising the tension-lever Q and thus drawing the weight q^2 near the fulcrum of said tension-lever and diminishing the pressure of said yarn-guide on said cop, in order that the pressure of the outer layers of the cop upon the inner layers may not cause bulging of the ends of said cop, such as is likely to occur when a uniform pressure on the cop is maintained. As a further means of preventing the bulging of the end of the cop, I provide means for diminishing the tension on the yarn as the cop increases in size.

Tension on the yarn is produced by two dished tension-washers r r^1 which are supported on a horizontal stud b^{13} on the bracket B^2, with their convex faces towards each other, the yarn passing between said washers, which are crowded outward by the expansion of a spring r^2 against a collar r^3 loose on said stud b^{13}, which washers are retained on said stud by a nut r^4. A check-nut r^5 prevents the accidental turning of the nut r^4.

A tension cam-slide R is slotted vertically at r^6 to receive the stud b^{13} and is arranged between a shoulder b^{14} and a collar r^3, said cam-slide being a skeleton-wedge, the sides r^7 r^8 of which are held apart by a screw r^9 which turns in one side r^8 of said slide and thrusts against the other side r^7 thereof (Fig. 1), so that by turning said screw the angle between said sides may be varied. The tension devices and their supporting stud are very similar to corresponding parts shown in Patent No. 664,474, granted to me December 25, 1900, except as herein stated. In said previous patent the sides of the cam-slide are represented as hinged to each other at the thin edge of the wedge, but I have shown herein the side r^8 as a spring rigidly attached at its lower end to the side r^7. It is obvious that raising the cam-slide R or loosening the nut r^4 will lessen the pressure of the washers on the yarn which passes between them and that depressing said cam-slide or tightening said nut will have an opposite effect.

In this invention, the cam-slide R is connected by a pin r^{10} to an arm Q^1 of the tension lever Q, said pin passing through a hole q^7 in said arm and through any one of the holes r^{11}, formed one above another in the upper part of said cam-slide, the higher the hole r^{11} selected, the greater the initial tension of the material being wound. As the cop enlarges and the lever Q is raised, the pressure of the tension-washers on the yarn is diminished, to equalize the tension of said yarn which, would otherwise be unduly increased by the increased speed of said yarn due to the enlargement of the cop.

A rock-shaft S is journaled in a bracket B^3 secured on the main frame B (Figs. 1—6), and is provided with a radial arm s, the outer end of which is connected by a rod, formed in two parts s^1 s^2, to a wrist-pin s^3, secured eccentrically in the end of the cam-shaft l, so

that said shaft S rocks in each direction once in every revolution of said cam-shaft. The two parts s^1 s^2 of the rod or link which connects the arms of the rock-shaft S to the cam-shaft l are adapted to turn axially on each other as the auxiliary frame is swung from one of its positions to the other.

I have shown in Fig. 4, without intending to limit myself to the particular device represented, the upper end portion of the part s^1 as screw-threaded to engage a corresponding internal thread in the sleeve or upper part s^2 of said rod or link. This construction allows a very slight turning of said parts s^1 s^2 on each other at every revolution of the cam-shaft l when said cam-shaft and rock-shaft are not parallel with each other and also permits of an adjustment of the length of said rod or link. Parallel with the rock-shaft S is arranged a vibrator or bar S^1 provided with ears s^4 s^5 which surround said rock-shaft and are prevented from moving thereon as by set-screws s^6 s^7 so that said bar S^1 swings as the shaft S is rocked.

Above the rock-shaft S and parallel therewith is supported in the bracket B^2 a rod s^8, on which is hung by means of ears s^9 s^{10}, which loosely surround said rod, a bar S^2 slotted longitudinally from top to bottom at s^{13}.

As many drop-wires T T^1, of common form, as there are yarns (or other things to be wound on the spindle), are retained in the slot s^{12} by screws s^{15} s^{16} which pass through loops t t^1 in said wires and are free to rise and fall therein, being normally supported by the tension of the yarns which pass through "pigtails" or eyes t^2 t^3 in the upper ends of said drop-wires. When a yarn breaks, the corresponding drop-wire falls into the path of the vibrator S^1 causing the bar S^2 to be swung in the opposite direction. The drop-wires are so arranged that they can fall only on one side of the vibrator.

The bar S^2 is provided with an arm s^{13}, the free end of which is moved downward by the movement of said bar, said free end being connected by a rod s^{14} to the lower arm f^9 of the latch lever G which lower arm is bent as shown in Fig. 1, so that when the arm s^{13} is drawn down, said latch-lever G is disengaged from the notch f^8 and the clutch is opened, as above described, and the machine stops.

A rod p^7 is adjustably secured to the arm p^2, said rod being screw-threaded and turning in a sleeve p^6, pivoted on said arm, and the lower end of said rod is guided by a funnel s^{17} supported on the bar S^2 into the slot s^{12} as the case is turned by the enlargement of the cop, as above described, so that when the cop reaches a predetermined size the lower end of said rod will be struck by the vibrator, the bar S^2 will be turned and the latch-lever G will be thereby disengaged from the notch f^8 and the machine will be stopped by the opening of the clutch E E^1 above described.

To limit the clutch-opening movement of the rod F and to stop the spindle as quickly as possible, the collar f^8 (Fig. 7), on said rod is provided with a brake projection f^{11} which strikes against the front of the clutch-part E^1, said projection f^{11} having a cushion f^{10}, preferably of leather, which by friction on the part E^1 brings the spindle-shaft to rest at once.

I claim as my invention:—

1. The combination of a stationary main frame, a spindle-shaft journaled therein, an auxiliary frame, a cam-shaft journaled in said auxiliary frame, a cam fast on said cam-shaft, a guide and connecting means between said guide and cam for causing said guide to traverse in a path parallel with the axisof said cam-shaft, said auxiliary frame being movable with resepct to said main frame, to enable said guide-path and the axis of said cam and cam-shaft to be changed into or out of parallelism with the axis of said spindle-shaft.

2. The combination of a spindle-shaft, an externally-toothed pinion having an axis in a fixed position relatively to the axis of said shaft, a cam-shaft, an annular internally-toothed gear surrounding said pinion and fast on said cam-shaft, journal-boxes supporting said cam-shaft and movable to allow said internally-toothed gear to engage either side of said pinion and to vary the relative direction of the axes of said shafts, and a guide driven from said cam-shaft in a line parallel with the axis of said cam-shaft and parallel with or at will at an angle with the axis of said spindle-shaft.

3. A rotary spindle, a guide having a notch, means for causing said guide to traverse, and a rod, fixed at one end and arranged parallel with the path of said guide, to support a yarn in the path of said guide, said guide being adapted to pass freely under said yarn in moving towards the fixed end of said rod and to engage said yarn by the following side of said notch in moving towards the free end of said rod and to carry said yarn off from said free end.

4. The combination of a rotary spindle, a yarn-guide adapted to press upon a cop carried by said spindle, a rocking guide-way, an arm extending from said way, a weight movable on said arm, said guide and guide-way being operated by the enlargement of said cop to raise said arm, a frame having a fixed support relatively to said guide-way and a rod connecting said weight and said frame.

5. The combination of a stationary main frame, a spindle journaled therein, an auxiliary frame movable with respect to said main frame, a yarn-guide, a guide-way there-

for supported on said movable frame and capable of rocking thereon, an arm extending from said way, a weight movable on said arm, and means operated by the enlargement of a cop on said spindle for moving said weight or said arm to diminish the distance between said weight and said guide-way.

6. The combination of a spindle, means for driving said spindle, a shipping-rod, means for moving said rod when released to disconnect said driving means and said spindle, means for holding said rod from such movement, a bar normally at rest, connections between said bar and shipping rod, to release said rod by the movement of said bar, a vibrator and means operated by the enlargement of a cop on said spindle to a predetermined size, to connect said vibrator and said bar.

7. The combination of a main frame, a spindle journaled in said main frame, an auxiliary frame movable on said main frame, into or out of parallelism with said spindle, a cam-shaft journaled in and movable with said auxiliary frame, a vibrator supported on said main frame, and means connecting said vibrator and said cam-shaft for driving said vibrator from said shaft in either position of said auxiliary frame.

8. The combination of a main frame, a spindle journaled in said main frame, an auxiliary frame, movable on said main frame, into or out of parallelism with said spindle, a cam-shaft journaled in and movable with said auxiliary frame, a vibrator supported on said main frame, and having an arm and a rod formed in two parts, one of which parts is adapted to turn axially on the other, said rod connecting said vibrator and said cam-shaft, to drive said vibrator from said shaft in either position of said auxiliary frame.

In testimony whereof, I have affixed my signature, in presence of two witnesses.

JAMES F. GORDON.

Witnesses:

ALBERT M. MOORE,

GRACE CROWLEY.