No. 714,897. Patented Dec. 2, 1902.

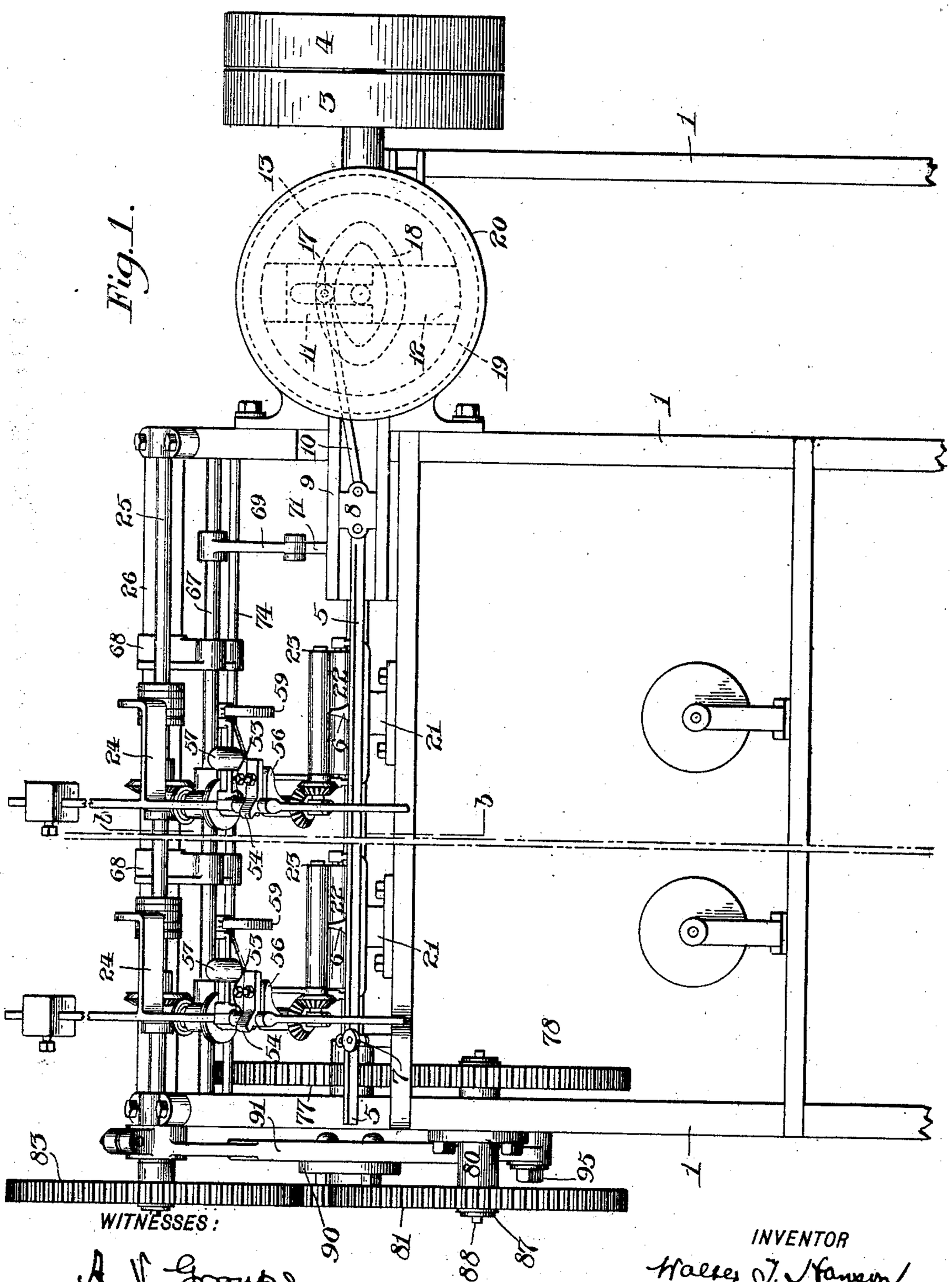
W. T. HANSON.

COP WINDING MACHINE.

(Application filed Nov. 8, 1898.)

(No Model.) 6 Sheets—Sheet 1.

Fig. 1.



WITNESSES:

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(No Model.) 6 Sheets—Sheet 2.

Fig. 2.

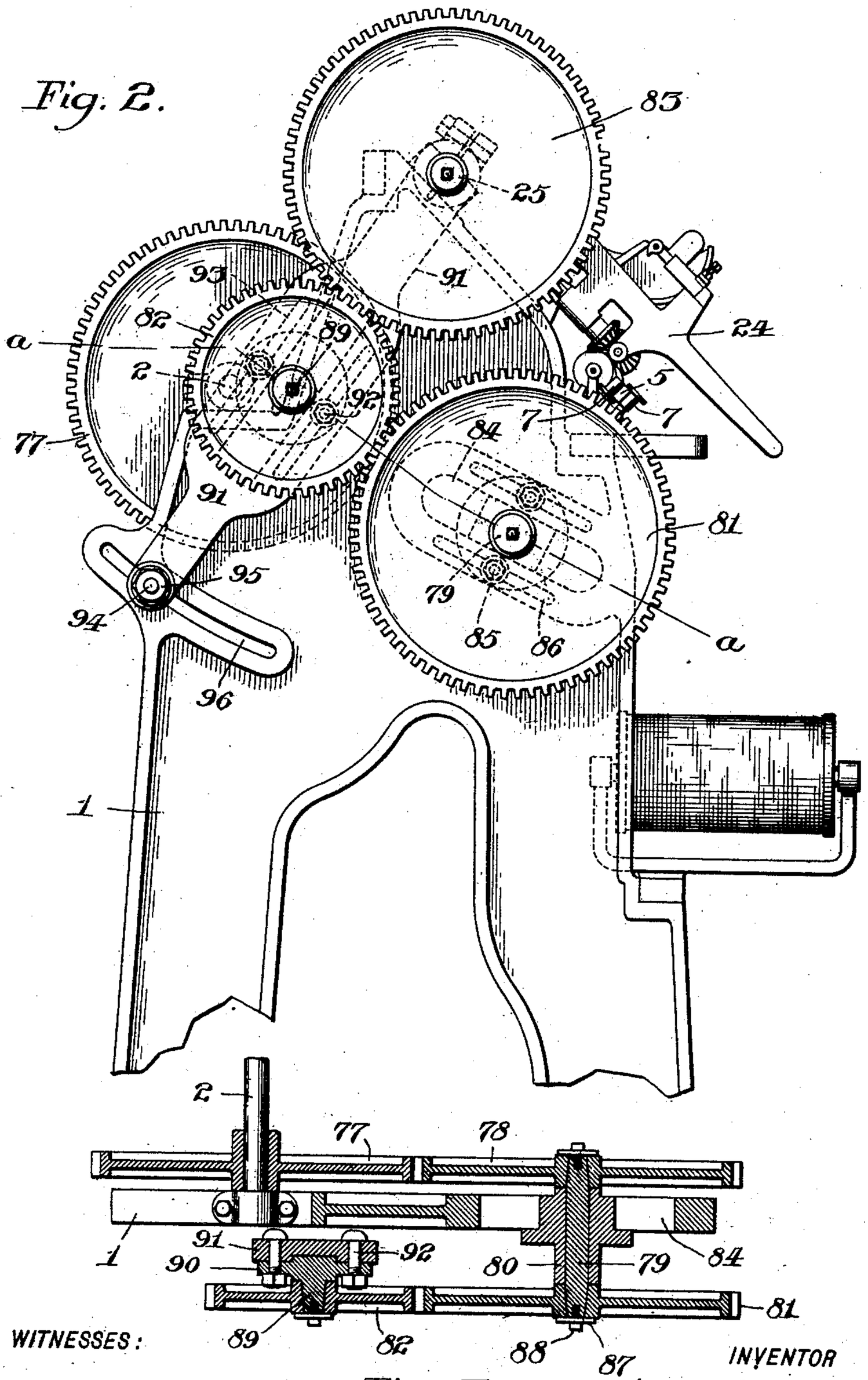

Fig. 3.

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(No Model.) 6 Sheets—Sheet 3.

Fig. 4.

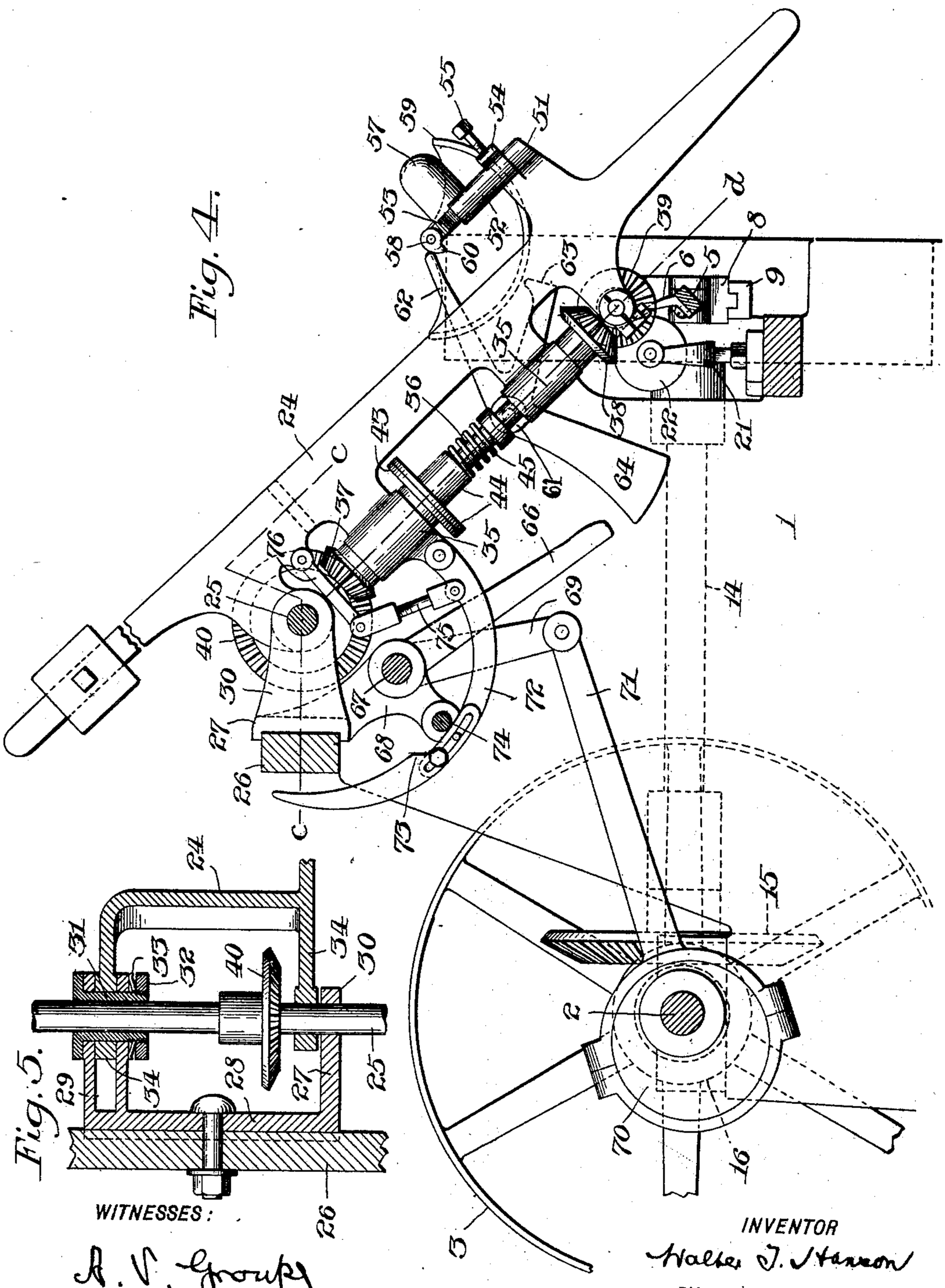

Fig. 5.

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(No Model.) 6 Sheets—Sheet 4.

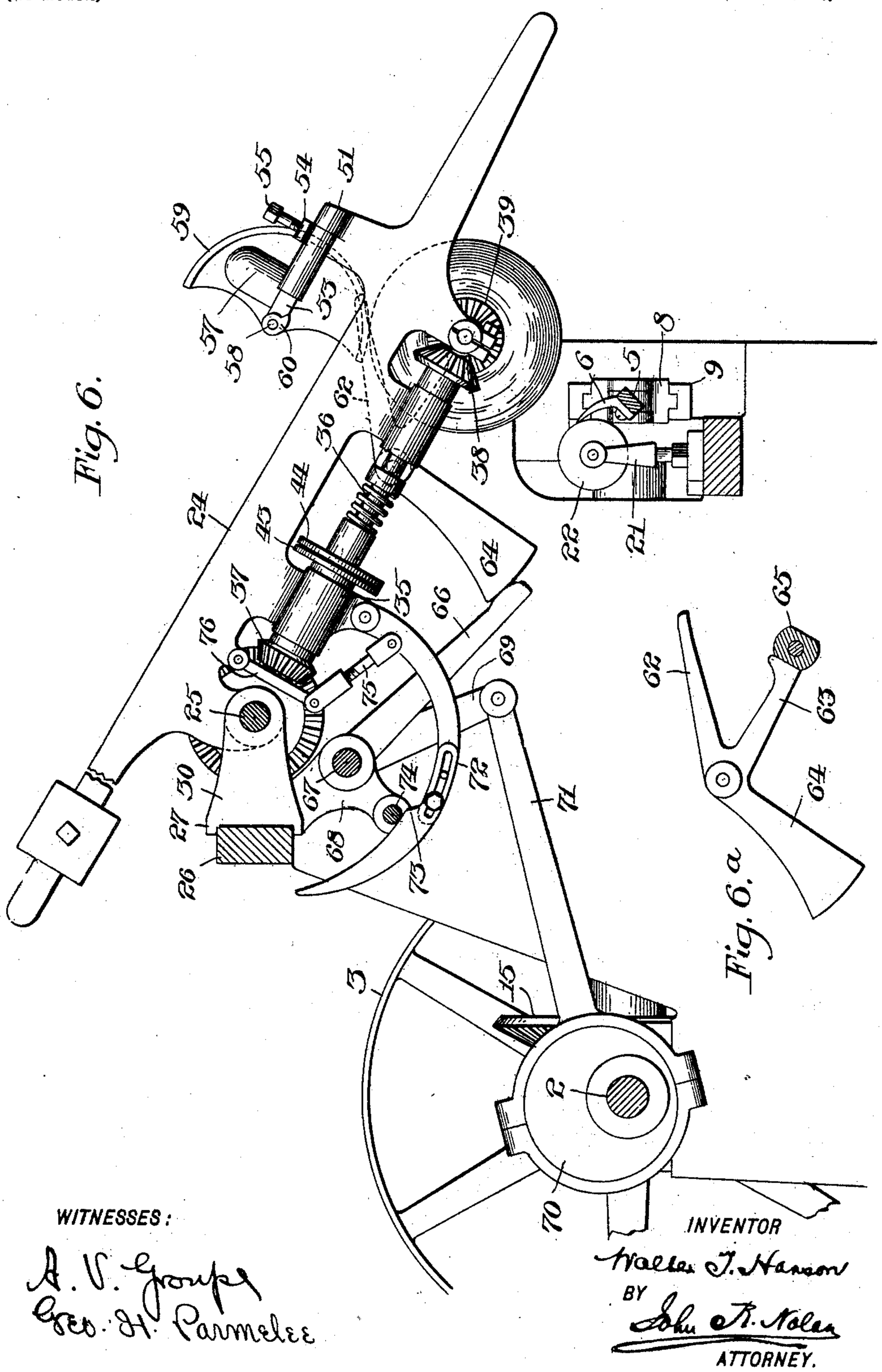

Fig. 6.

Fig. 6.a

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(Application filed Nov. 8, 1898.)

(No Model.) 6 Sheets—Sheet 5.

Fig. 7.

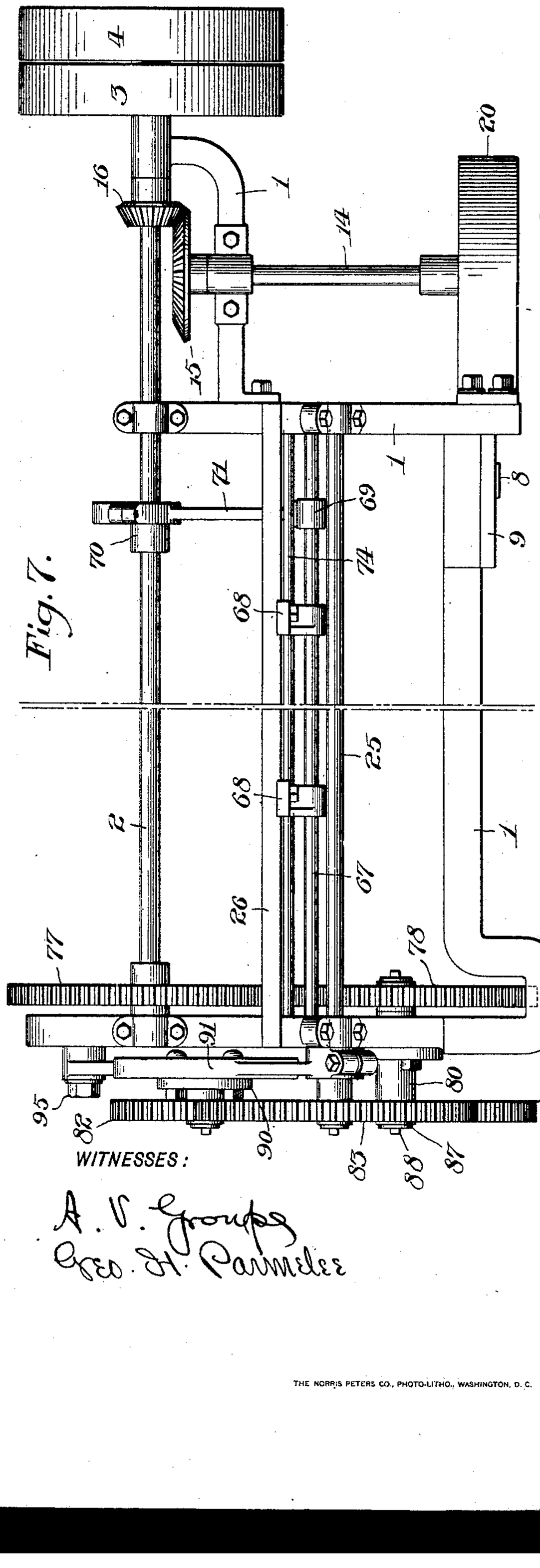
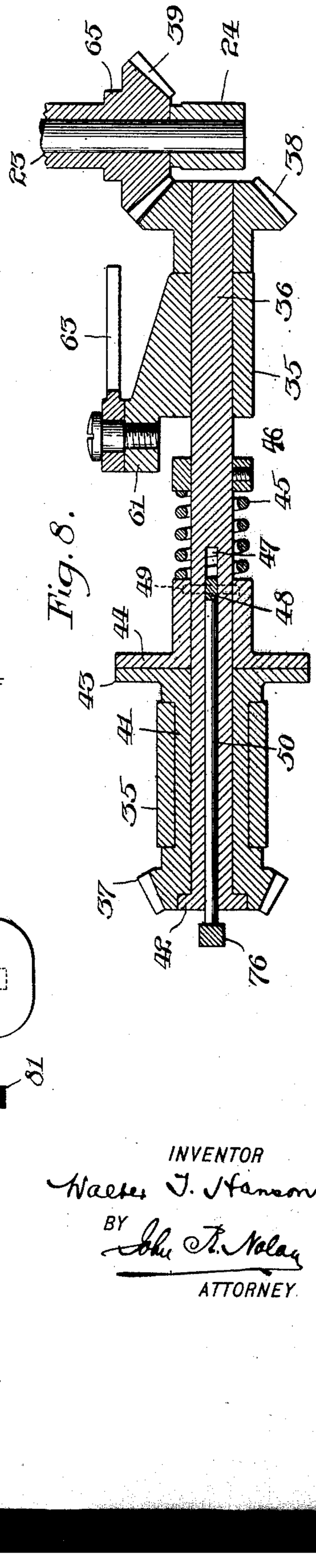


Fig. 8.



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(No Model.) 6 Sheets—Sheet 6.

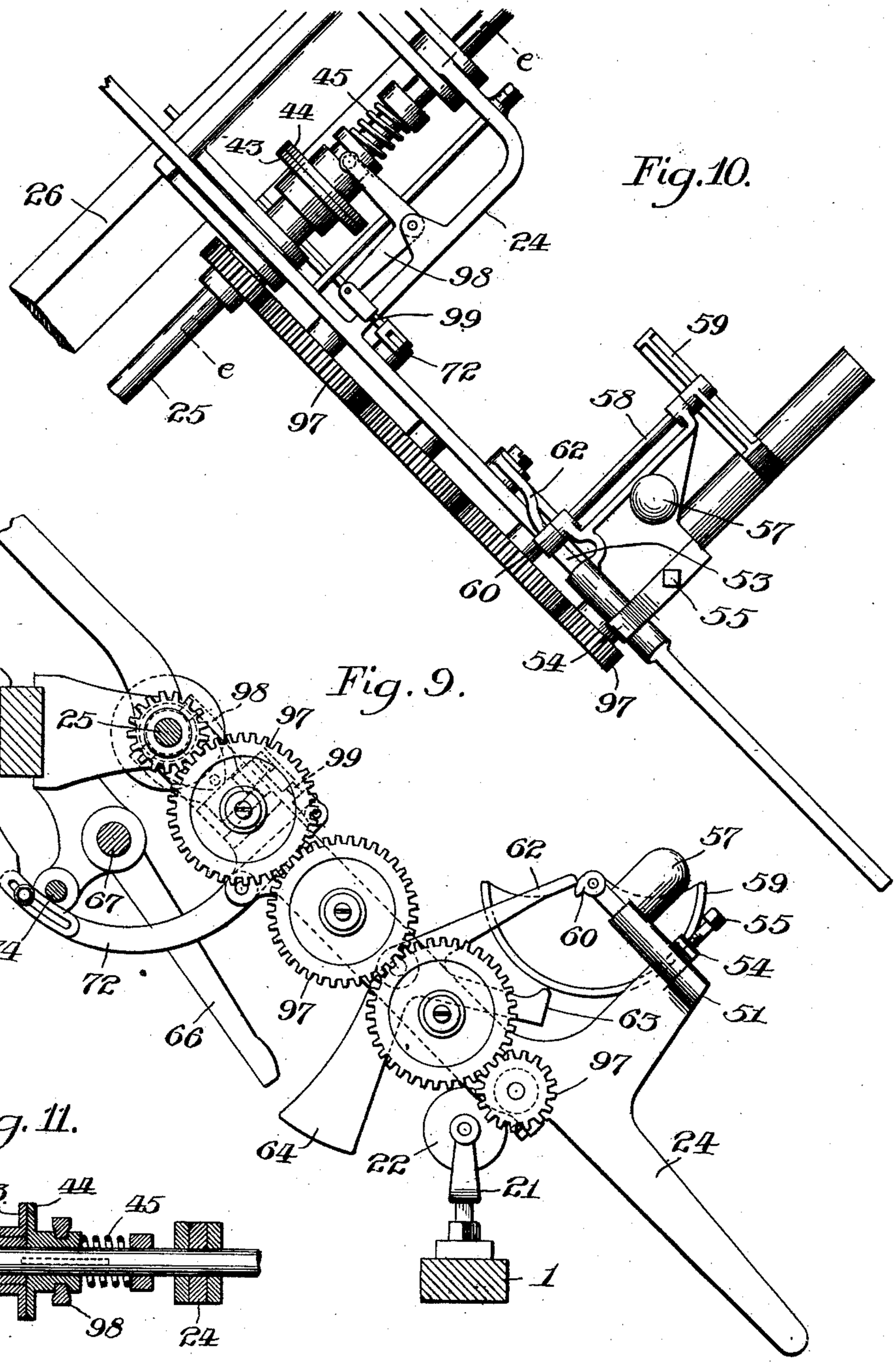

Fig. 10.

Fig. 9.

Fig. 11.

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UNITED STATES PATENT OFFICE.

WALTER T. HANSON, OF MACON, GEORGIA.

COP-WINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 714,897, dated December 2, 1902.

Application filed November 8, 1898. Serial No. 695,885. (No model.)

To all whom it may concern:

Be it known that I, WALTER T. HANSON, a citizen of the United States, residing at Macon, in the county of Bibb and State of Georgia, have invented certain new and useful Improvements in Cop-Winding Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to winding-machines of that type whereby thread or cord is wound in close-lying parallel helixes or spirals upon a central core or spindle to form a compact cylindrical cop. In such machines the core or spindle is rotated at a prescribed rate of speed in respect to that of the thread-guide and the size of the thread or cord, to the end that in each stroke of the guide the thread or cord shall be wound in the direction of a helix or spiral running from end to end of the core, each coil being deflected at the beginning of each stroke of the guide in a manner to pass across the last preceding coil and lie close to and parallel with the same.

The object of the present invention is to provide simple and efficient means whereby the relative speeds of the core or spindle and the thread-guide, as predetermined by the number of helixes per stroke required and the size of material to be wound, shall be attained and maintained with positiveness and precision and whereby the accurate winding of a plurality of cops shall be accomplished with one differential mechanism.

A further object is to provide a simple and efficient means whereby the rotation of the spindles or cores and each of them shall be automatically arrested when the cops or any of them have reached a predetermined diameter.

Accordingly my invention embodies in a machine of the class recited a novel construction and organization of gearing the relative order and combination of which may be adjusted to meet the varying requirements, a novel arrangement of clutch and clutch-actuating mechanism under the control of the cop or cops being wound, and various novel features, which will be hereinafter fully described and duly claimed.

In the drawings, Figure 1 is a front elevation of a cop-winding machine embodying my invention. Fig. 2 is an end view thereof. Fig. 3 is a transverse section through the speed-controlling gearing as on the line *a a* of Fig. 2. Fig. 4 is a transverse vertical section as on the line *b b* of Fig. 1. Fig. 5 is a sectional detail as on the line *c c* of Fig. 4. Fig. 6 is a view similar to Fig. 4, showing the parts in the respective positions they occupy after the winding of the cop has been completed. Fig. 6ª is a detail view of the three-armed lever to be described. Fig. 7 is a plan of the framework and the main driving mechanism. Fig. 8 is a sectional detail as on the line *d* of Fig. 4. Fig. 9 is a sectional elevation of the spindle-supporting arm, showing a modification of spindle-actuating gearing and the clutch mechanism therefor. Fig. 10 is a plan thereof. Fig. 11 is a sectional detail as on the line *e e* of Fig. 10.

1 is the main supporting-frame, and 2 the driving-shaft, mounted in boxes thereon and provided at one end with the fast and loose pulleys 3 4, respectively.

5 is the horizontal traverse-bar arranged on the forward side of the frame and provided at intervals with thread-guides 6, which during the reciprocations of the bar are designed to direct the thread to and longitudinally of the contiguous revolving shells or cores. The traverse-bar is supported upon suitably-arranged guide-rollers 7 on the frame and is adapted to be uniformly reciprocated by any appropriate mechanism. In the present instance the bar is connected at one end with a horizontal cross-head 8, which is fitted to a guideway 9 on the frame. This head is connected, by means of a rod or link 10, with a reciprocative block 11, that is in turn fitted to a radial guideway 12 in a wheel or disk 13, the latter being fast on the forward end of a transverse shaft 14, which is geared with and driven from the main shaft by means of the coacting bevel-wheels 15 16, respectively. On the block is a roller 17, which is fitted to a cam-groove 18 in a fixed plate 19, the contour of the groove being such that during the rotation of the disk 13 the roller is guided in a manner to effect the positive and uniform reciprocation of the cross-head and its connected traverse-bar. The cam-plate is contained in a casing 20, which is bolted to the end of

the main frame. Arranged upon the forward side of said frame, adjacent to the respective thread-guides on the traverse-bar, is a series of brackets 21, in which are journaled the usual supporting-rollers 22 for the several cops being wound. The spindles 23, upon which are held and rotated the tubes, shells, or cores for the cops, are mounted in swinging frames 24, which during the progressive enlargement of the cops in the winding thereof are gradually raised. Inasmuch as the several swinging frames are identical in construction and operation, a description of one will suffice.

Referring to Figs. 1, 4, 5, and 7 of the drawings, 25 is a shaft arranged longitudinally of the main frame and journaled in suitably-located boxes thereon. This shaft is positively driven at a prescribed rate of speed relative to the movement of the traverse-bar through the instrumentality of a novel construction and organization of gearing, which will be hereinafter set out in detail. Rearward of this shaft and parallel therewith is a bar 26, which forms, in effect, a part of the main frame and connects the standards thereof. Bolted or otherwise affixed to this bar is a series of brackets 27, to which the upper ends of the swinging arms are pivotally connected. Each of these brackets comprises a base 28, with two forwardly-extending arms 29 30, respectively, which are bored for the passage of the shaft. One, 29, of the arms is bifurcated to afford two jaws, and a bushing 31 is fitted through the same. One end of the bushing is flanged to take against the outer side of the arm, while the opposite end thereof is screw-threaded for the reception of a nut 32, between which and the opposing side of the arm is interposed a spring-washer 33. The shaft 25 extends through the bushing and the opposite perforation in the arm 30. The swinging frame is provided near its upper end with two lugs 34, one of which is fitted between the jaws and mounted on the bushing, while the other is supported on the shaft adjacent to the inner side of the arm 30. By this construction it will be seen that by manipulating the nut the pressure of the spring-washer may be nicely regulated to cause the jaws to exert more or less friction upon the interposed lug, as occasion may require. On the under side of the swinging frame are formed lugs or boxes 35, in which is journaled a shaft 36, that lies parallel with the frame, or substantially so, and carries at its upper and lower ends bevel-wheels 37 38, respectively. The wheel 38 coacts with a corresponding wheel 39 on the cop-supporting spindle 23, above referred to, which spindle is journaled at the lower end of the frame and extends laterally therefrom to lie in proximity to and parallel with the cop-bearing roller. The upper wheel coacts with and is driven by a like wheel 40 on the shaft 25, so as to effect the rotation of the spindle. The wheel 37 is so connected with its shaft that it may be thrown into and out of operative engagement therewith, as desired, provision being had to move the same out of action automatically upon the completion of the operation of winding the cop. To this end the gear 38 is keyed or otherwise affixed to the shaft, while the other gear 37 is formed on a sleeve 41, which is loosely mounted on the shaft, the upper end of such shaft being provided with a flange or collar 42, that is seated in a recess in the outer extremity of the sleeve. The inner end of the sleeve is provided with a peripheral flange 43, which constitutes a frictional clutch member, with which coacts the complementary member 44. The latter comprises a flanged sleeve mounted on the shaft and held normally in contact with the opposing member by means of a spiral spring 45, which encircling the shaft bears against the end of the sleeve and against a collar 46, fixed on the shaft, whereby the gears, clutch, and shaft will rotate as a unit. The shaft is provided adjacent to the lower end of the clutch member 44 with a transverse slot 47, to which is fitted a cross-bar 48, the ends of which are secured to said member by means of pins 49 or the like. The shaft is also centrally bored from the slot to and through its upper extremity for the reception of a stem 50, the lower end of which rests upon the cross-bar, while its upper end projects above the sleeve. Hence if the stem be depressed the cross-bar and its attached clutch member will be correspondingly moved against the compression of the spring, thus relieving the frictional engagement of the clutch and permitting the gear 37 and its sleeve to rotate independently of the shaft. The swinging frame is provided on its upper side, adjacent to the spindle, with a lug or post 51, to which is hingedly connected a bracket 52, which may be swung into parallelism, or substantially so, with the spindle or outwardly therefrom. The bracket is hung upon a pivot-pin 53, extending from the lug or post, and is provided with suitable stops to limit its throw in each position. In the present instance an ear 54, formed on the bracket at or near the pivotal point thereof, takes against the post when the bracket is swung outward, while a set-screw 55, fitted to the body of the bracket, takes against a lateral projection or abutment 56 on the lug or post when the bracket is swung inward. By adjusting the set-screw the inward position of the bracket may be nicely regulated. A weight 57, formed on or secured to the body of the bracket, tends to hold it in either position to which it may be thrown. Journaled in the bracket longitudinally thereof is a rock-shaft 58, on the outer end of which is affixed a sector 59, the periphery of which is preferably milled or otherwise roughened. On the opposite end of the shaft is secured a toe 60. Fulcrumed to a suitably-located lug 61 on the frame is a three-armed lever, one, 62, of the arms of which when the bracket is in the inward position rests upon the toe, so as to maintain the other arms, 63 64, raised, as seen in Fig.

4, yet when the rock-shaft is partially turned, as hereinafter described, the toe will escape the arm 62 and permit the lever to swing downward by gravity. In that event the arm 63 will drop upon a flattened collar 65 on the spindle and act thereon similarly to a pawl to prevent the backward movement of the spindle, while the remaining arm 64 will swing into the path of an adjacent rocking arm 66 and be acted upon thereby in a manner to raise the frame bodily. This arm 66 is affixed to a rock-shaft 67, which extends lengthwise of the machine and has its bearings in brackets 68, depending from the frame-bar 26, the rocking arms 66, adjacent to the respective spindle-carrying frames, being borne by such shaft. The rock-shaft is provided with a depending arm 69, which is connected with an eccentric 70 on the main shaft by means of a link 71, and thereby positively and continuously actuated during the operation of the machine.

Pivoted to the swinging frame is one end of a rearwardly and upwardly curved arm 72, the inner edge whereof is interrupted by a suitably-located rise or cam portion 73, which when the frame is raised, as above mentioned, bears against a fixed rod 74, extending from end to end of the machine, and thereby effects the depression of said arm. This arm is connected, by means of a link 75, with the free end of an arm 76, which is pivoted to the frame and so arranged as to overhang the upwardly-projecting extremity of the clutch-controlling pin or stem 50, to the end that when the cam-arm is depressed, as just explained, said pin or stem will be actuated to release the clutch.

Preparatory to the winding of the cops a shell or core is applied to each of the spindles and the several parts are caused to occupy the relative positions shown in Fig. 4, wherein it will be observed the clutch mechanism is in its normal or active position, the spindle-carrying frame is down, the bracket thereon lies forwardly of the spindle, and the tri-armed lever is supported by the toe on the rock-shaft in said bracket, the sector on such shaft lying above the spindle and maintaining the toe in proper position relative to the lever. Power being applied to the machine, the several spindles are simultaneously revolved and the traverse-bar is reciprocated, the thread-guides thereon directing the thread to and along the adjacent cores, the frames gradually swinging upward as the cops are wound. When the cops have reached a predetermined size, they revolve in frictional contact with the overlying sectors, and thereby partially turn the latter, thus moving the rock-shafts and disengaging the respective toes from the abutting lever-arms, whereupon the levers swing downward by gravity, as above stated. At this stage the rise 73 on each of the curved cam-arms by the upward movement of the hinged frame lies at or adjacent to the fixed rod 74. Hence when the rocking arm 66 abuts against the opposing arm 64 of the lever and effects the lifting of the frame the cam-arm is depressed and the clutch in consequence released, thus throwing the spindle out of operation. As hereinbefore explained, the arm 63 of the lever acts as a back-stop or pawl upon the flattened member on the spindle, thus permitting the cop, with its core, to be firmly grasped and withdrawn from the spindle by a reverse twisting or "unscrewing" action.

The mechanism whereby the shaft 25 is driven constitutes an important feature of the present invention, my aim in this regard being to transmit the power and motion to that shaft from the main or primary shaft with positiveness and precision, irrespective of the number of cop-winding spindles employed, and yet permit the speed of the spindles to be nicely timed in respect to that of the traverse-bar to meet the varying requirements of service incident to the use of the finest thread to the coarsest cord or yarn. By those conversant with the art to which my invention relates it will be understood that the most delicate and precise speed adjustments must be attained in order that the threads of the contiguous coils shall lie in contact with and parallel to each other, the slightest imperfection in the adjustment resulting in the production of an irregular and defective cop. Differential frictional driving mechanisms of various kinds have heretofore been employed to transmit the power from the primary shaft to the spindle-actuating devices; but they are objectionable in that owing to their very limited power of transmission a separate mechanism is required for each spindle or machine, thus necessitating their separate and independent adjustment when it is desired to change the size of the material being wound. Moreover, even in a single-spindle machine the objection obtains that the frictional transmitting mechanism is not positive and reliable, the same being very apt to slip while in operation, and thereby disconcert the speed of the spindle in respect to that of the thread-feeding devices.

In pursuance of my invention I provide a novel system of gearing intermediate the primary and the spindle-operating shafts, as follows: On one end of the main shaft, near to the inner side of the adjacent standard of the supporting-frame, is fixed a spur-wheel 77, which gears with a similar wheel 78 on the inner end of a stud-shaft 79, the box or bearing 80 for which is supported in the standard. On the outer end of this stud-shaft is fixed a corresponding wheel 81, which coacts with an idler 82, that in turn gears with a spur-wheel 83 on the end of the shaft 25, whereby motion is transmitted to the latter from the main shaft at a rate of speed determined with mathematical precision by the relative proportions of the spur-wheels. The box 80 is fitted to an appropriate guide-slot 84 in the standard, so as to be adjustable toward and from the center of the main shaft,

set-bolts 85, which extend through parallel slots 86 in the standard, being provided to secure the box in any desired position of adjustment. The wheel 83 on shaft 25 and the wheels 78 and 81 on the stud-shaft are detachably mounted by means of the caps 87 and central screws 88 or other suitable devices. The idler 82 is or may be likewise detachably mounted on a stud-shaft 89, projecting laterally from a slide-block 90, which is fitted to a longitudinal guideway in an adjustable arm 91 and secured in place by means of bolts 92, which extend through longitudinal slots 93 in the arm. The arm is pivoted at its upper end to a boss or projection on the standard centrally of the wheel 83, the lower end of the arm being connected, by means of a bolt 94 and set-nut 95, with a segmental slot 96 in the side of the standard, whereby when the arm is bodily swung on its pivot it may be secured in any desired position of adjustment.

By the foregoing-described construction it will be seen that the gears 78, 81, 82, and 83 or any of them may be readily removed and others of different diameters substituted therefor, the stud-shafts in that case being adjusted in respect to the axes of the various wheels to effect the accurate coöperation of the latter. By varying or, so to say, "changing" the combination of the gears the speed of the spindle-driving shafts may be reduced or increased to any predetermined proportion relative to the movement of the traverse-bar to insure the winding of the material with accuracy and uniformity irrespective of its size or thickness.

In the construction above described the wheel 78 will most ordinarily be changed to attain the number of helixes per stroke required, while the wheels 81 and 83, which are on the outside of the end standard, and therefore readily accessible, will be changed to meet different requirements of relative speed for respectively different sizes of material.

I remark that while the essentially minute speed variations incident to changes in the size of material wound and those of the larger proportions required when changing the number of helixes per stroke desired can be effected by the arrangement of gears above set forth, yet I do not confine my invention specifically thereto, as the same may be modified without departure from the fair spirit of the invention.

In Figs. 8, 9, and 10 of the drawings I have shown a slight modification wherein the motion is transmitted from the shaft 25 to the cop-bearing spindle through a train of gears 97 on the side of the swinging frame and wherein the clutch is mounted directly on said shaft, the spring-controlled member 44 thereof being connected with a forward extension of the curved cam-arm by means of a bell-crank 98 and link 99, whereby said member is actuated to release the clutch when the cam-arm is depressed after the winding of the cop has been completed. In this construction the movable clutch member is splined to the shaft, while the coacting member is simply sleeved on the shaft, the upper wheel of the gear-train being formed on or affixed to the sleeve, as clearly shown.

I claim as my invention—

1. In a cop-winding machine, including a revoluble cop-holder and thread-feeding means, the combination with a primary shaft, a secondary shaft, and gear-wheels on said shafts, of a stud-shaft, an adjustable support therefor, gear-wheels detachably mounted on said stud-shaft, a second stud-shaft, and a gear thereon meshing with one of the gears on the other stud-shaft, all combined substantially as described.

2. In a cop-winding machine, including a revoluble cop-holder and thread-feeding means, the combination with a primary shaft, a secondary shaft, and gear-wheels on said shafts, of a stud-shaft, an adjustable support therefor, gear-wheels detachably mounted on said stud-shaft, an adjustable pivoted arm, an adjustable bearing thereon carrying a second stud-shaft, and a gear detachably mounted on the last-named shaft.

3. In a cop-winding machine, including thread-feeding mechanism, the combination with main and secondary shafts, and intermediate gearing connecting the main and secondary shafts, of a movable frame carrying a revoluble cop-support, gearing between the secondary shaft and the cop-support, and clutch mechanism interposed between the cop-support and secondary shaft whereby the various cop-supports may be independently thrown out of operating connection with their actuating-gearing.

4. In a cop-winding machine, including thread-feeding mechanism, the combination with main and secondary shafts, and intermediate gearing therefor, of a movable frame carrying a revoluble cop-support, a shaft in said frame, a clutch therefor, gearing connecting said last-named shaft with the cop-support and with the secondary shaft, and mechanism whereby the clutch is automatically released through the medium of the cop.

5. In a cop-winding machine, the combination with the movable frame carrying a revoluble cop-support, of mechanism for rotating said support, a clutch for said mechanism, a cam member on the frame, connections between the same and the clutch, a rocking arm, actuating means therefor, and devices on said frame adapted to be released through the medium of the cop and moved into the path of the rocking arm.

6. In a cop-winding machine, the combination with the movable frame carrying a revoluble cop-support, of mechanism for rotating said support, a clutch for said mechanism, a rock-shaft mounted on the frame, a friction-head and lever-support on said shaft, a lever adapted to coact with said support, means to impinge against the lever and thereby raise

the frame when the position of the support is changed to release the lever, and means on the frame to open the clutch when said frame is raised.

7. In a cop-winding machine, the combination with a movable frame and a revoluble cop-support thereon, mechanism to rotate said support, a clutch for said mechanism, a lever adjacent to the support, a support and trip for said lever under the control of the cop, mechanism to act upon said lever to raise the frame, and operative connections between said frame and the clutch.

8. In a cop-winding machine, the combination of a primary and secondary shaft, gearing connecting said shafts, a revoluble cop-support, a swinging frame pivotally mounted on said secondary shaft and carrying said cop-support, and a frictional regulating device for varying the resistance to the swinging movement of the said swinging frame.

In testimony whereof I have hereunto affixed my signature in the presence of two subscribing witnesses.

WALTER T. HANSON.

Witnesses:

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A. P. FINDLAY.