(No Model.) 4 Sheets—Sheet 1.

T. HANSEN.

THREAD WINDING MACHINE.

No. 594,530. Patented Nov. 30, 1897.

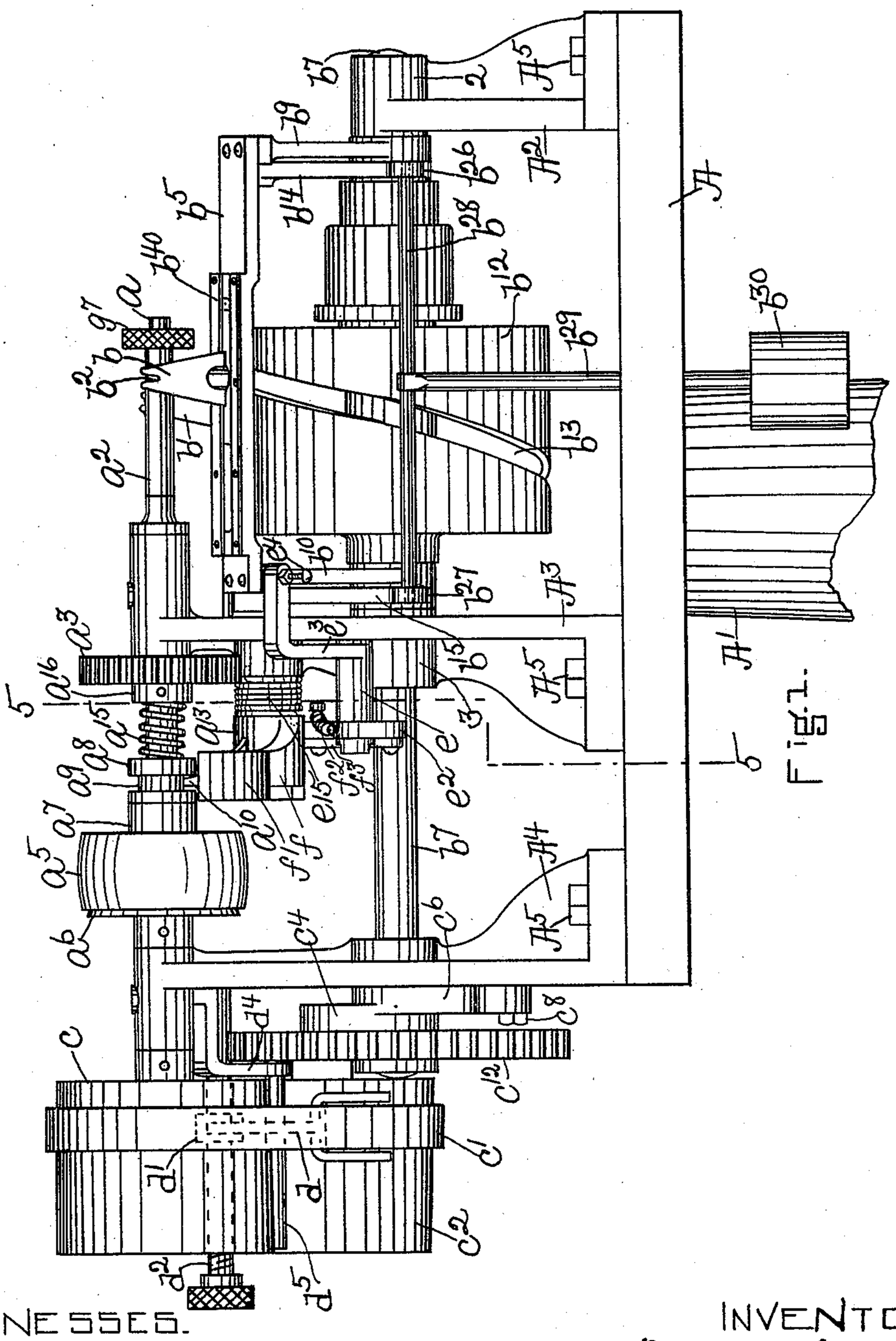

Fig. 1.

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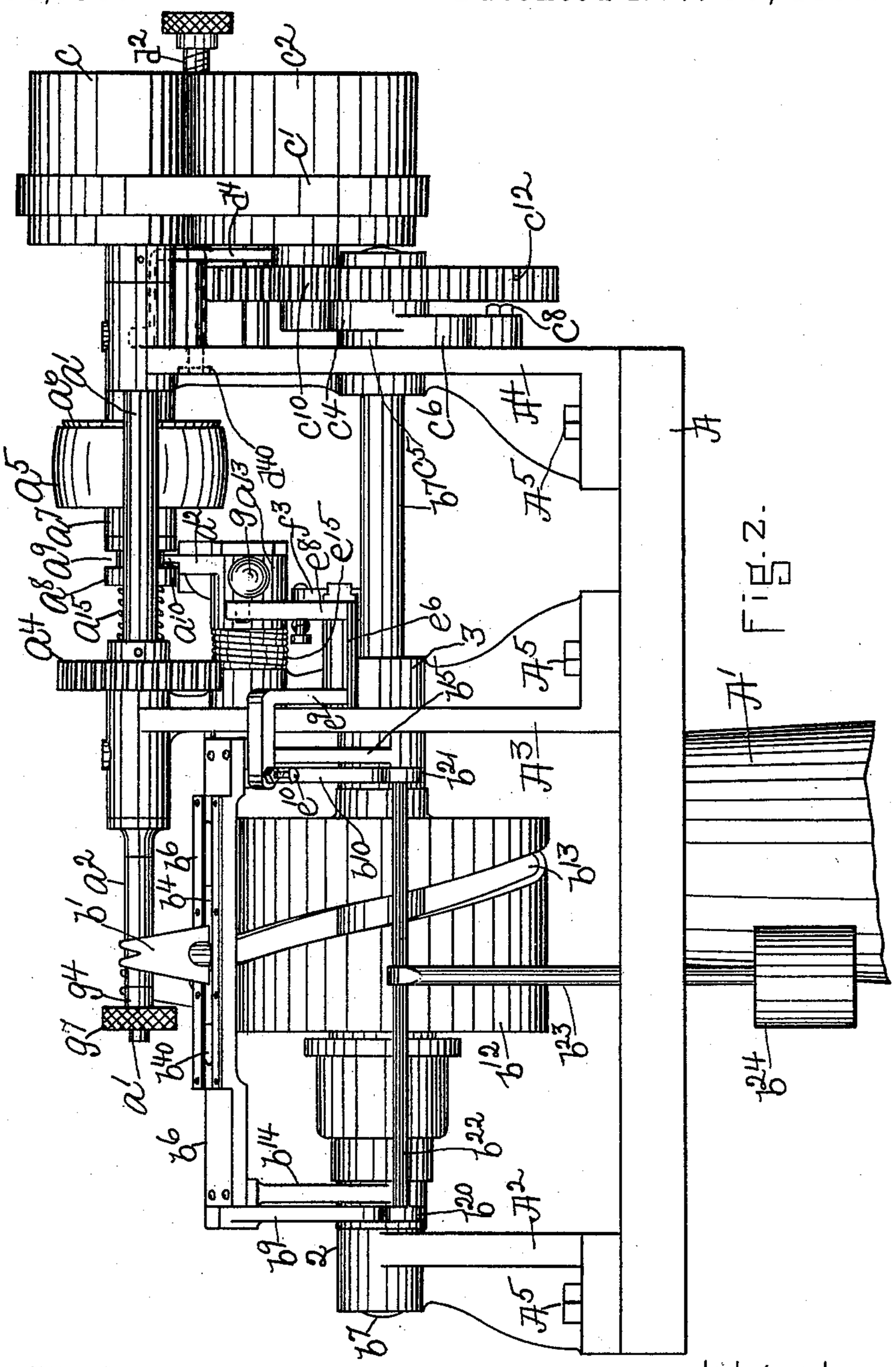

Fig. 2.

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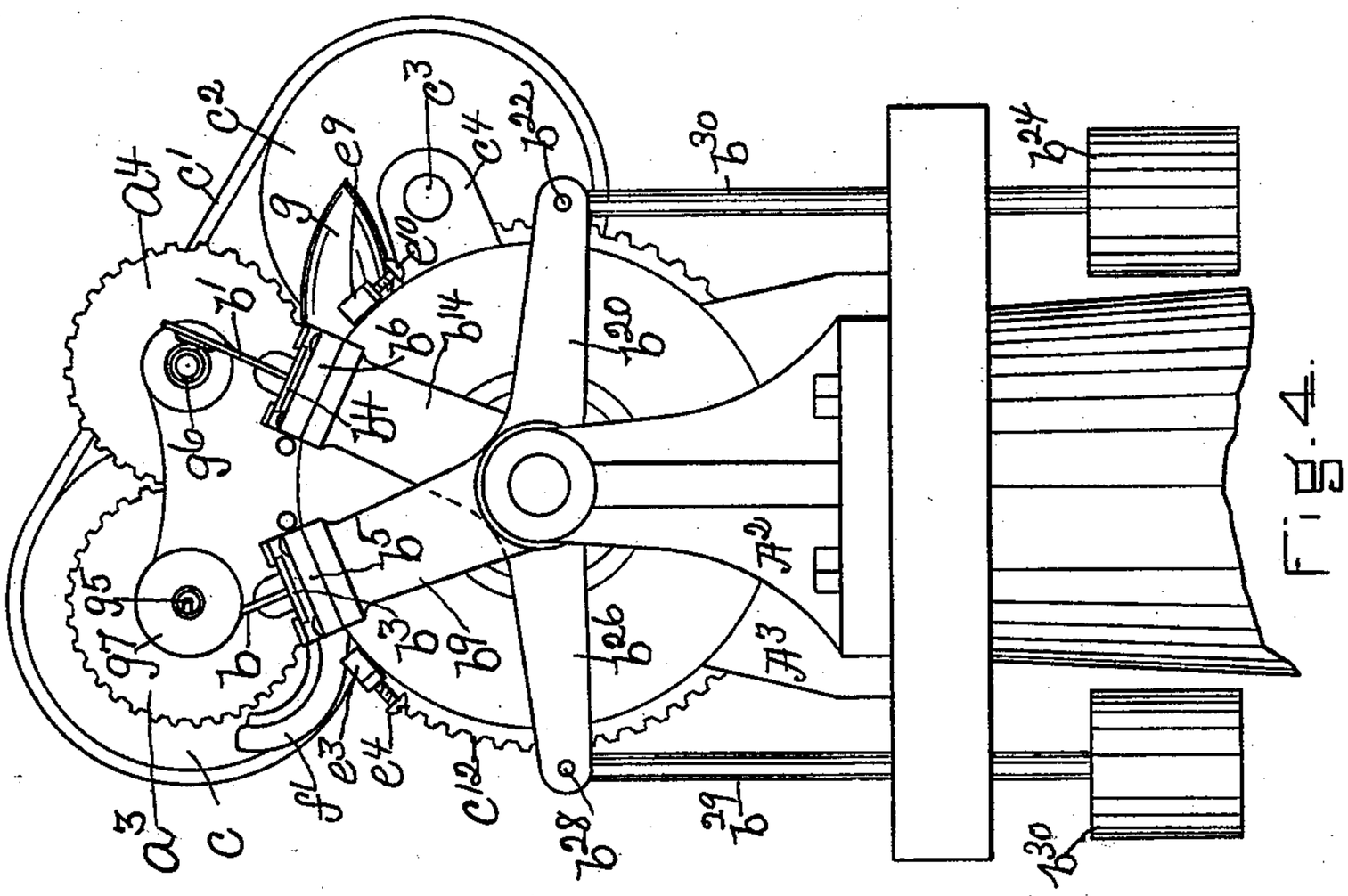

Fig. 4.

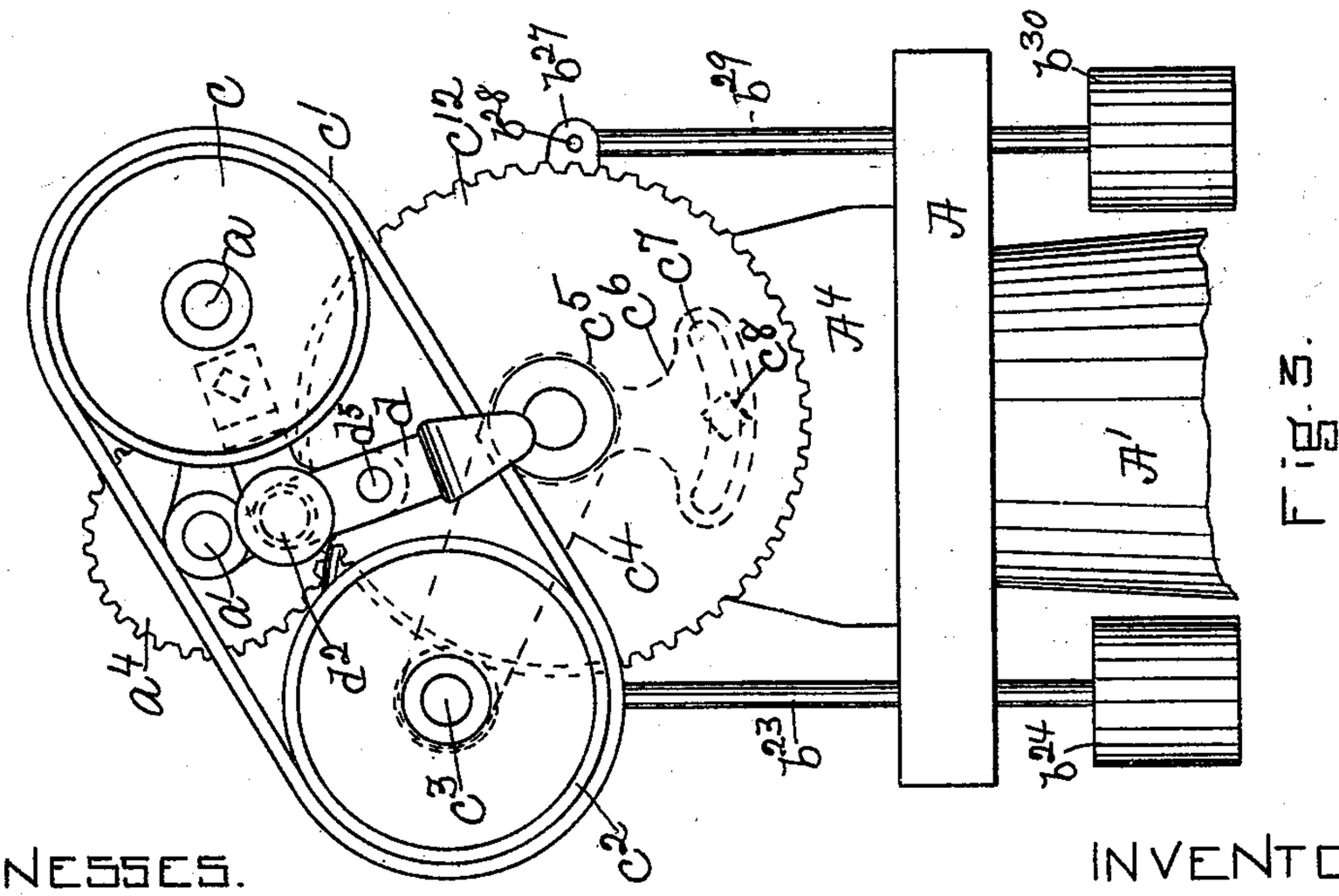

Fig. 5.

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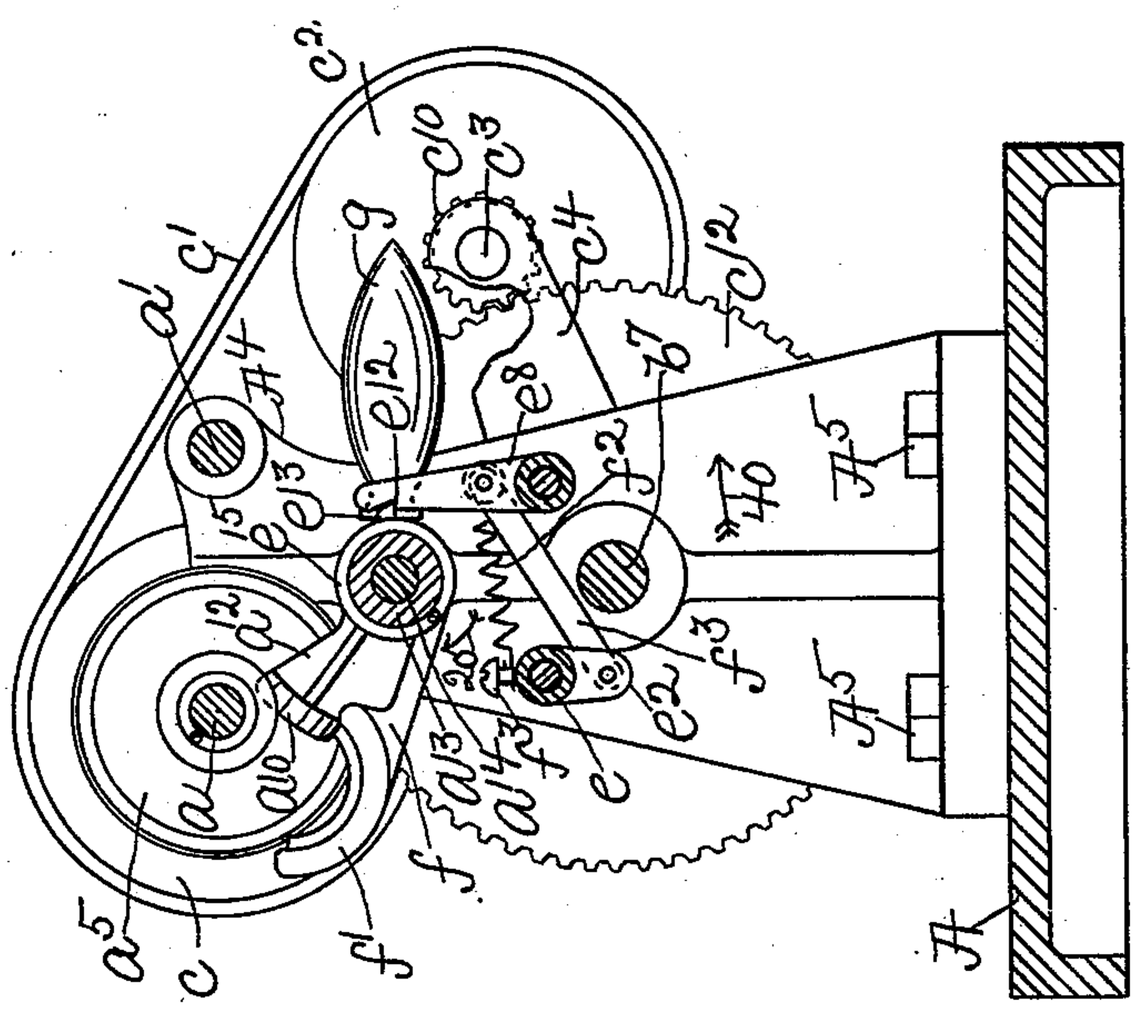

Fig 6.

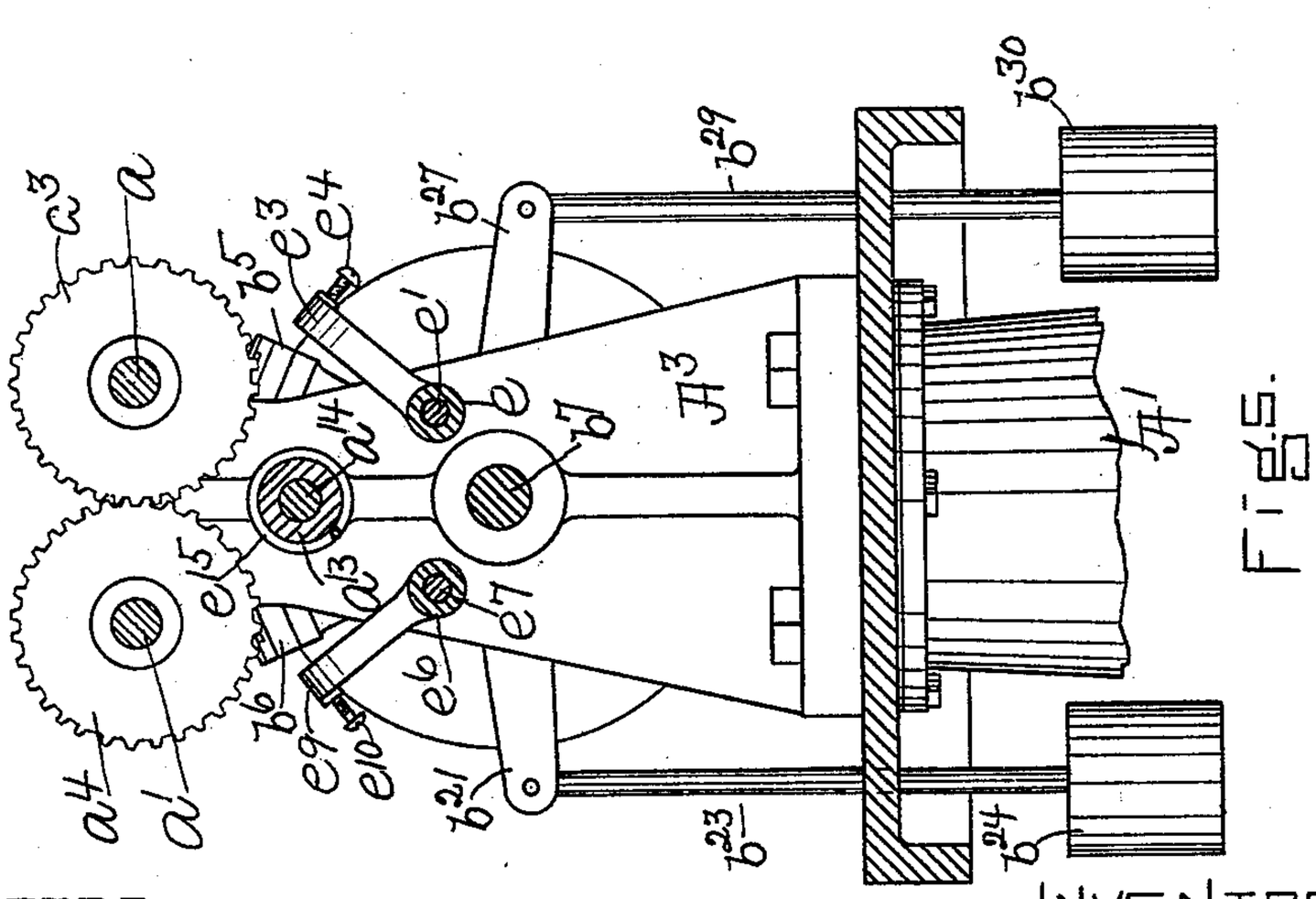

Fig 5.

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UNITED STATES PATENT OFFICE.

THORVALD HANSEN, OF EVERETT, MASSACHUSETTS.

THREAD-WINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 594,530, dated November 30, 1897.

Application filed November 23, 1896. Serial No. 613,085. (No model.)

To all whom it may concern:

Be it known that I, THORVALD HANSEN, residing in Everett, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Thread-Winding Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention relates to a winding machine or apparatus especially designed and adapted for winding thread, yarn, or like material upon a cop tube or cylinder, and has for its object to provide a simple and efficient machine capable of running at a substantially high speed and of producing a maximum number of balls of thread or yarn in a minimum time.

In accordance with this invention the machine, as herein shown, is provided with two cop-shafts, which are positively driven at a substantially high speed, as will be described, independent reciprocating thread-guides cooperating with the cop-shafts and a single cam actuating the said thread-guides. The reciprocating thread-guides are mounted in rotatable carriers, as will be described, which cooperate with an automatic stopping mechanism, to be hereinafter described, and the said cam-shaft is driven from the main shaft, as herein shown, by means of a belt encircling a preferably tapering pulley on the main shaft and a tapering pulley on a counter-shaft, which latter shaft is geared to the cam-shaft, as will be described. The belt referred to is adapted to be moved longitudinally or axially on the tapering pulleys, so as to vary the speed of reciprocation of the thread-guides according to the size of the thread being wound. These and other features of this invention will be pointed out in the claims at the end of this specification.

Figure 1 is a side elevation of a winding machine or apparatus embodying this invention, the pedestal or support for the machine being represented as broken away. Fig. 2 is an opposite side elevation of the machine shown in Fig. 1; Fig. 3, an end elevation of the machine shown in Fig. 1, looking toward the right; Fig. 4, an end elevation of the machine shown in Fig. 1, looking toward the left, with one of the cop-retaining devices removed; Fig. 5, a transverse section of the machine shown in Fig. 1 on the line 5 5, looking toward the right; and Fig. 6, a section of the machine shown in Fig. 1 on the line 5 5, looking toward the left.

Referring to the drawings, A represents a suitable table, foundation, or base to support the operative parts of the machine, the said table being represented as mounted upon a supporting stand or pedestal A′, which may be of any suitable or desired construction. The table or base A in the present instance is shown as having erected upon it three transversely-arranged uprights A^2 A^3 A^4, secured to the base, as by screws or bolts A^5. The uprights A^3 A^4 support in suitable bearings at their upper end two cop-shafts a a', (see Figs. 1, 2, and 5,) the said shafts at their front ends being made of reduced diameter to receive upon them cop tubes or cylinders a^2, upon which the thread or other flexible cord is wound. The cop-shaft a, as herein shown, has fast upon it between the uprights A^3 A^4 a gear a^3, which meshes with a like gear a^4 on the shaft a', and the cop-shaft a has mounted upon it a normally loose pulley a^5, constituting in the present instance the movable member of a clutch mechanism which coöperates with a disk or stationary member a^6, fast on the said shaft.

The normally loose pulley a^5 is provided, as herein shown, with a hub a^7, which is loosely fitted upon the reduced portion of a sleeve a^8, keyed on the cop-shaft a, and provided with an annular groove a^9, into which extends the end of a cam-shaped portion a^{10} of an arm a^{12}, (see Fig. 6,) forming part of a sleeve or hub a^{13}, loose on a stud or pin a^{14}, extended from the upright A^3. The sleeve a^8 is movable in one direction to engage the normally loose pulley a^5 with its coöperating disk a^6 by a spring a^{15}, encircling the cop-shaft a between the sleeve a^8 and a collar a^{16}, fast on the shaft a. The normally loose pulley a^5 is adapted to be driven from a main shaft (not herein shown) by means of a belt, (not shown,) but which passes about the pulley a^5, and the rotation of the cop-shaft a produces rotation of the cop-shaft a', but in an opposite direction. The cop-shafts a and a' are adapted to have fitted upon their reduced end portions the cop tubes or cylinders a^2, upon which the thread is

wound, and the said shafts have coöperating with them two thread-guides b b', herein shown as two uprights or arms, provided at their upper end with notches b^2 and erected from plates b^3 b^4, movable in guideways in rotatable carriers, represented as plates or bars b^5 b^6, (see Figs. 1, 2, and 4,) arranged substantially parallel with the axis of the shafts a a' and secured to suitable frames revolubly mounted upon the bearings 2 3 for a cam-shaft b^7, the said bearings projecting from the uprights A^2 A^3. The thread-guide carrier b^5 is fastened at its opposite ends, as herein shown, to two cranks or arms b^9 b^{10}, loosely mounted upon the bearings 2 3 on opposite sides of a cam-hub b^{12}, provided with a suitable cam-groove b^{13} for producing the desired reciprocation or traverse of the thread-guides b b'. The thread-guide carrier b^6 is also secured at its opposite ends, as herein shown, to two like cranks or arms b^{14} b^{15}, loosely mounted on the bearings 2 3, and the cranks or arms b^9 b^{10} of the thread-guide carrier b^5 have extended from them, substantially at right angles thereto, arms b^{20} b^{21}, (see Figs. 2 and 4,) connected together, as herein shown, by a tie bar or rod b^{22}, upon which is loosely mounted a depending rod b^{23}, extended down through the table or base A, as herein shown, and provided at its lower end with a weight b^{24}, which serves to keep the thread-guide b up in contact with the ball of thread as it is being formed.

The cranks or arms b^{14} b^{15}, supporting the thread-guide carrier b^6, have extended from them substantially at right angles thereto like arms b^{26} b^{27}, joined by a tie bar or rod b^{28}, upon which is loosely hung a rod b^{29}, carrying a weight b^{30}. The weights b^{24} b^{30} serve to keep the thread-guides b b' in proper position with relation to the thread being wound upon the cop-tubes on the shafts a a', the thread-guides being gradually forced back away from the cop-shaft as the ball is formed, thereby lifting the said weights. The carriers b^5 b^6 for the thread-guides are provided with suitable slots b^{40} of substantially the same length as the width of the cam-hub b^{12}, and the slide-plates b^3 b^4 are provided on their under side with suitable pins or projections, which extend into the cam-groove b^{13}, the said pins or projections being not herein shown, as they are well understood. The cam-shaft is driven from the cop-shaft a in a manner as will now be described.

The cop-shaft a at its rear end has fast upon it a pulley c, which is connected by a belt c' to a pulley c^2, revolubly mounted on a stud or shaft c^3 on an arm c^4 of a hub c^5, provided with an arm c^6, extended, as shown, at an angle to the arm c^4, and provided with a slot c^7, (indicated by dotted lines in Fig. 3,) through which is extended a clamping screw or bolt c^8, which is extended into the upright A^4 and serves to secure the pulley-carrying arm c^4 in its adjusted or proper position. The hub of the pulley c^2 is provided with a pinion c^{10}, (see Figs. 2 and 6,) which meshes with a substantially large gear c^{12}, fast on the cam-shaft b^7. From this construction it will be seen that rotation of the cop-shaft a produces rotation of the cam-shaft b^7 by means of the pulley c, belt c', pulley c^2, pinion c^{10}, and gear c^{12}. The supporting-arm c^4 for the pulley-shaft c^3 is adjustable in the arc of a circle with the cam-shaft b^7 as a center, so that the pulley c^2 may be moved away from the pulley c in order to take up any slack in the belt c'. The pulleys c c^2 preferably are slightly tapering in opposite directions, as shown in Figs. 1 and 2, so that the speed of rotation of the cam-shaft b^7 may be changed to regulate the rate of travel or reciprocation of the thread-guides b b' according to the size of thread to be wound upon the cop-tubes. To effect this change of speed, the belt c' is movable over the pulleys, which is effected by means of a belt-shipping mechanism, herein shown as a forked arm d, secured to or forming part of an internally-threaded collar d', (see dotted lines, Fig. 1,) which is mounted upon a screw-rod d^2, having its inner end reduced in diameter to form a shoulder, and supported in upright A^4, and a depending bracket d^4, secured to the said upright, the shoulder on the screw-threaded rod d^2 bearing against the bracket d^4 when the screw-rod is turned to produce travel of the threaded collar d' and of the shipper d. The inner end of the rod d^2 is reduced again to form a second shoulder which bears against the upright A^4, and the said end is screw-threaded to be engaged by a lock-nut d^{40}, countersunk into the upright, as indicated by dotted lines, Fig. 2. The shipper-arm d is guided in its travel by means of a guide-rod d^5, attached to the bracket d^4 and extended through the said shipper-arm. The machine herein shown is provided with an automatic stopping mechanism consisting of two connected members, either of which is adapted to effect the stopping of the machine, as will now be described. The carrier for the thread-guide b coöperates with one member of the automatic stopping mechanism, which member consists, as herein shown, of a hub or sleeve e, (see Figs. 1, 5, and 6,) loosely mounted on a stud or pin e', extended from the upright A^3, the said hub or sleeve being provided at or near its opposite ends with two cranks or arms e^2 e^3, the crank or arm e^3 being extended upward and provided with a horizontal extension carrying an adjusting-screw e^4. The carrier for the thread-guide b' has coöperating with it the other member of the automatic stop mechanism, which consists of a hub or sleeve e^6, (see Figs. 2, 5, and 6,) mounted on a stud or pin e^7, projecting from the uprights A^3, the said sleeve having at or near its opposite ends two upright cranks or arms e^8 e^9, the crank or arm e^9 having a substantially horizontal extension carrying an adjusting-screw e^{10}. (See Fig. 2.) The cranks or arms e^2 e^3 on the sleeve e extend in substantially the same direction for a purpose

as will be described. The crank or arm e^8 is provided, as herein shown, with a notch e^{12}, (see Fig. 6,) which is adapted to be engaged by a tooth or projection e^{13} on the hub or sleeve a^{13}, and the said hub or sleeve has fast to it one end of a spring e^{15}, having its other end fastened to the upright A^3 or to a stationary part of the framework, the said spring being coiled so as to normally turn the sleeve or hub a^{13} in the direction indicated by the arrow 20 in Fig. 6, which movement on the part of the hub a^{13} would cause the cam portion a^{10} of the crank or arm a^{12} to move up into the groove a^9 in the clutch hub or sleeve a^8 and thereby move the said sleeve and the loose pulley a^5 toward the right, viewing Fig. 1, against the action of the spring a^{15}, and thus withdraw the loose pulley a^5 from the stationary disk or member a^6 of the clutch on the shaft a. The hub a^{13} of what may be termed the "starting" mechanism for the clutch is provided, as herein shown, with an arm f, having a segmental brake-shoe f', which is adapted to be engaged with the sleeve a^8 by the time the loose pulley has been disengaged from the stationary disk a^6, so as to stop rotation of the cop-shaft a^2, which is practically the main shaft for the machine herein shown. The spring e^{15} tends to move the hub or sleeve a^8 in the direction indicated by arrow 20, Fig. 6, and when the machine is in operation, with the loose pulley a^5 in engagement with the stationary disk a^6, the hub a^{13} is held from being turned by the spring e^{15} by the latch or projection e^{13}, engaging the notch e^{12} in the crank or arm e^8, (see Fig. 6,) which latter is held up in engagement with the said latch by a spring f^2, connected to the crank or arm e^8, and, as herein shown, to a screw f^3, inserted into the sleeve e.

In order that the single clutch mechanism may be automatically operated by either of the stopping devices, the crank e^2 of one member of the automatic stopping device is connected to the crank or arm e^8 of the other member by a link f^3. By this means it will be seen that when the crank or arm e^3 is moved back by the carrier for the thread-guide b the crank e^2, being extended substantially opposite to the crank or arm e^3, will move in the opposite direction to the crank or arm e^3—namely, in the direction indicated by the arrow 40, Fig. 6—and by means of the link f^3 will positively disengage the crank or arm e^8 from the locking projection or latch e^{13} on the hub a^{13}, while if the crank or arm e^9 of the other member of the automatic stopping mechanism is engaged by the carrier for the thread-guide b' both cranks e^9 e^8 will move in the same direction and the crank or arm e^8 is moved directly backward in the direction indicated by arrow 40, so as to release the hub a^{13} and permit the spring e^{15} to disengage the loose pulley and at the same time apply the brake. The machine herein shown and described is simple in construction and is especially designed for high speed, and in practice the thread has been wound with the cop-shafts run at a very high speed—namely, thousands of revolutions to the minute.

On the machine herein shown balls of varying sizes may be wound at the same time, if so desired, by changing the position of the adjusting-screws e^4 e^{10} so that one member of the automatic stopping mechanism may be operated upon when its ball has reached the desired diameter, which is less than that of the ball partially wound upon the other cop-tube, and after the finished ball has been taken off from its cop-shaft a new cop tube or cylinder may be placed on the cop-shaft and the machine again started to finish the ball partially wound and to commence winding a new ball on the shaft from which the finished ball has just been taken. I prefer to make the pulleys c c^2 slightly tapering; but it is evident that the pulleys may be made of like diameter throughout, and such a machine could be used for one diameter of thread and would be useful on account of the increased output or production. The machine may be started by means of a handle g, (see Fig. 6,) attached to the hub a^{13}.

The cop-tubes a^2 may and preferably will be held on the cop-shafts a a' by means of the devices herein shown and each consisting of a sleeve g^4, adapted to fit over the end of its cop-shaft and provided with a pin g^5 on its inner side, (see Fig. 4,) which is adapted to engage a suitable cam or locking slot or groove g^6 in the cop-shaft, the sleeve g^4 being provided with a milled collar g^7.

I claim—

1. In a thread-winding machine, the combination of the following instrumentalities, viz: a plurality of rotary cop-shafts arranged in a substantially horizontal plane, a plurality of reciprocating thread-guides located on opposite sides of the said cop-shafts and movable toward and from the said shafts independent of each other and in opposite directions, a rotatable cam located below and in line with said cop-shafts to produce reciprocation of said thread-guides, carriers for said thread-guides movable in opposite directions, a clutch mechanism to control rotation of the cop-shafts, a locking device for said clutch mechanism, and separate stop mechanisms coöperating with said carriers and connected to said locking device to permit the latter to be released by either of said carriers, substantially as described.

2. In a thread-winding machine, the combination of the following instrumentalities, viz: a plurality of rotary cop-shafts, a plurality of reciprocating thread-guides coöperating therewith, a rotatable cam to produce reciprocation of said thread-guides, carriers for said reciprocating thread-guides, a clutch mechanism controlling the rotation of the said cop-shafts, and an automatic stop mechanism coöperating with said clutch mechanism and consisting of movable members co-

operating with said carriers and connected together to permit the said clutch mechanism to be operated by either of the said carriers and thereby enable cops of different sizes to be wound on the machine at the same time, substantially as described.

3. In a thread-winding machine, the combination of the following instrumentalities, viz: a cop-shaft provided with a normally loose pulley, means to render the said pulley fast on the said cop-shaft, a cam to disengage said pulley from the cop-shaft, means to lock said cam in its inoperative position, a second cop-shaft, gearing connecting said cop-shafts, reciprocating thread-guides coöperating with said cop-shafts and located on opposite sides of the said cop-shafts, carriers for said thread-guides movable in opposite directions, a cam coöperating with both of said thread-guides to produce reciprocations of the same, a cam-shaft, mechanism connecting said cam-shaft with one of said cop-shafts, and means operated by either of said carriers to release the locking device for said cam, substantially as described.

4. In a thread-winding machine, the combination of the following instrumentalities, viz: two cop-shafts, gearing connecting them, reciprocating thread-guides located on opposite sides of the said cop-shafts and movable toward and from the said shafts in opposite directions independent of each other, a rotatable cam with which both of said thread-guides are engaged, a cam-shaft on which said cam is mounted, means to connect said cam-shaft with one of the cop-shafts, a clutch mechanism to control the rotation of the said shafts, stop mechanisms located on opposite sides of the machine and connected together and to the said clutch mechanism, whereby the machine may be automatically stopped when the cop on either of the said cop-shafts has reached a predetermined diameter without regard to the size or diameter of the cop on the other shaft, substantially as described.

5. In a thread-winding machine, the combination of the following instrumentalities, viz: a cop-shaft, a clutch mechanism to control its rotation, a cam coöperating with said clutch mechanism, a brake mechanism cooperating with the clutch mechanism and operated simultaneously with the clutch-operating cam, a reciprocating thread-guide, a rotatable carrier for said thread-guide, a cam to operate said thread-guide, a cam-shaft, mechanism to connect the said cam-shaft with the cop-shaft, and an automatic stop mechanism acting on said clutch mechanism and operated by the said rotatable thread-carrier, substantially as described.

6. In a thread-winding machine, the combination of the following instrumentalities, viz: a plurality of cop-shafts, means to rotate them, a plurality of reciprocating thread-guides coöperating with said cop-shafts, carriers for said thread-guides movable toward and from said cop-shafts independent of each other but in opposite directions, a single cam to operate the said thread-guides, a cam-shaft, mechanism connecting said cam-shaft with one of said cop-shafts, and means to control the rotation of the said plurality of cop-shafts operated by either of the said carriers, substantially as described.

7. In a thread-winding machine, the combination of the following instrumentalities, viz: a plurality of rotatable cop-shafts, gearing connecting said shafts, a clutch mechanism coöperating with one of said cop-shafts to control rotation of both, reciprocating thread-guides coöperating with the said cop-shafts, movable carriers for said thread-guides, a cam-shaft, a cam mounted thereon and operating both of said thread-guides, mechanism connecting said cam-shaft with one of said cop-shafts, a locking device for the clutch mechanism adapted to be unlocked by either of said carriers, substantially as described.

8. In a thread-winding machine, the combination of the following instrumentalities, viz: two cop-shafts arranged in a substantially horizontal plane, reciprocating guides, carriers for said guides movable toward and from the said cop-shafts independent of each other on opposite sides of the same and in opposite directions, a rotatable cam located below and between said cop-shafts and engaging both of said reciprocating guides, a brake mechanism coöperating with one of said cop-shafts and disengaged therefrom while the machine is in operation, means to lock said brake mechanism in its inoperative position and operated by either of said carriers, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THORVALD HANSEN.

Witnesses:

JAS. H. CHURCHILL,

J. MURPHY.