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A. B. MORSE.

THREAD WINDING APPARATUS.

No. 582,393. Patented May 11, 1897.

Fig: 1.

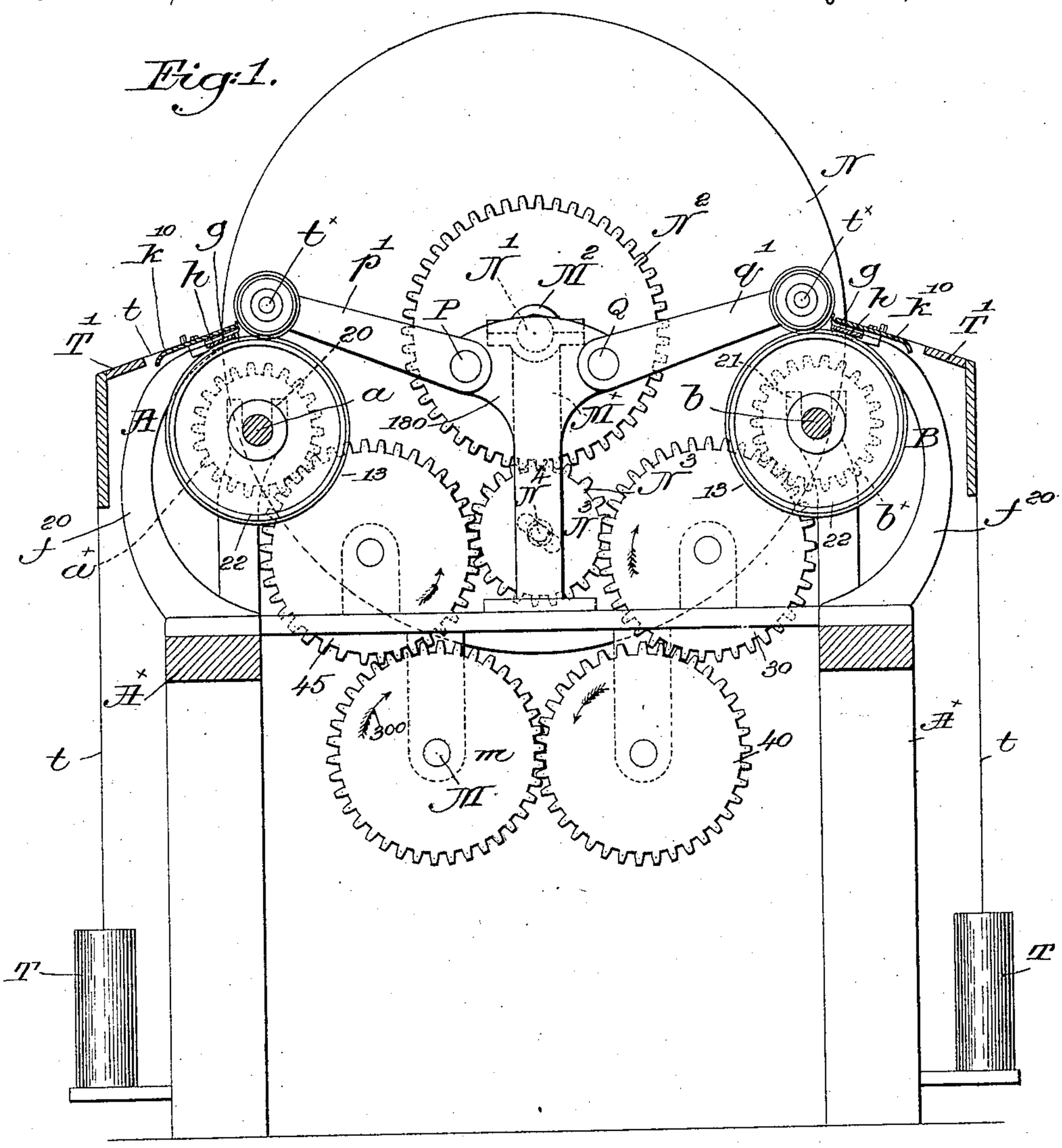

Fig: 8.

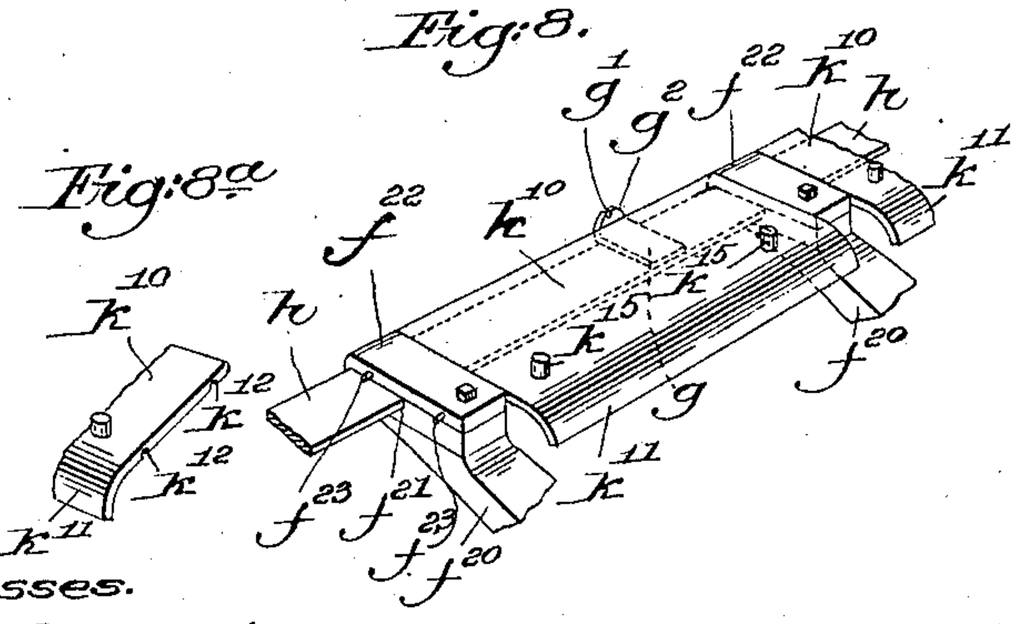

Fig: 8a.

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Inventor
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(No Model.) 4 Sheets—Sheet 2.

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THREAD WINDING APPARATUS.

No. 582,393. Patented May 11, 1897.

Fig: 2.

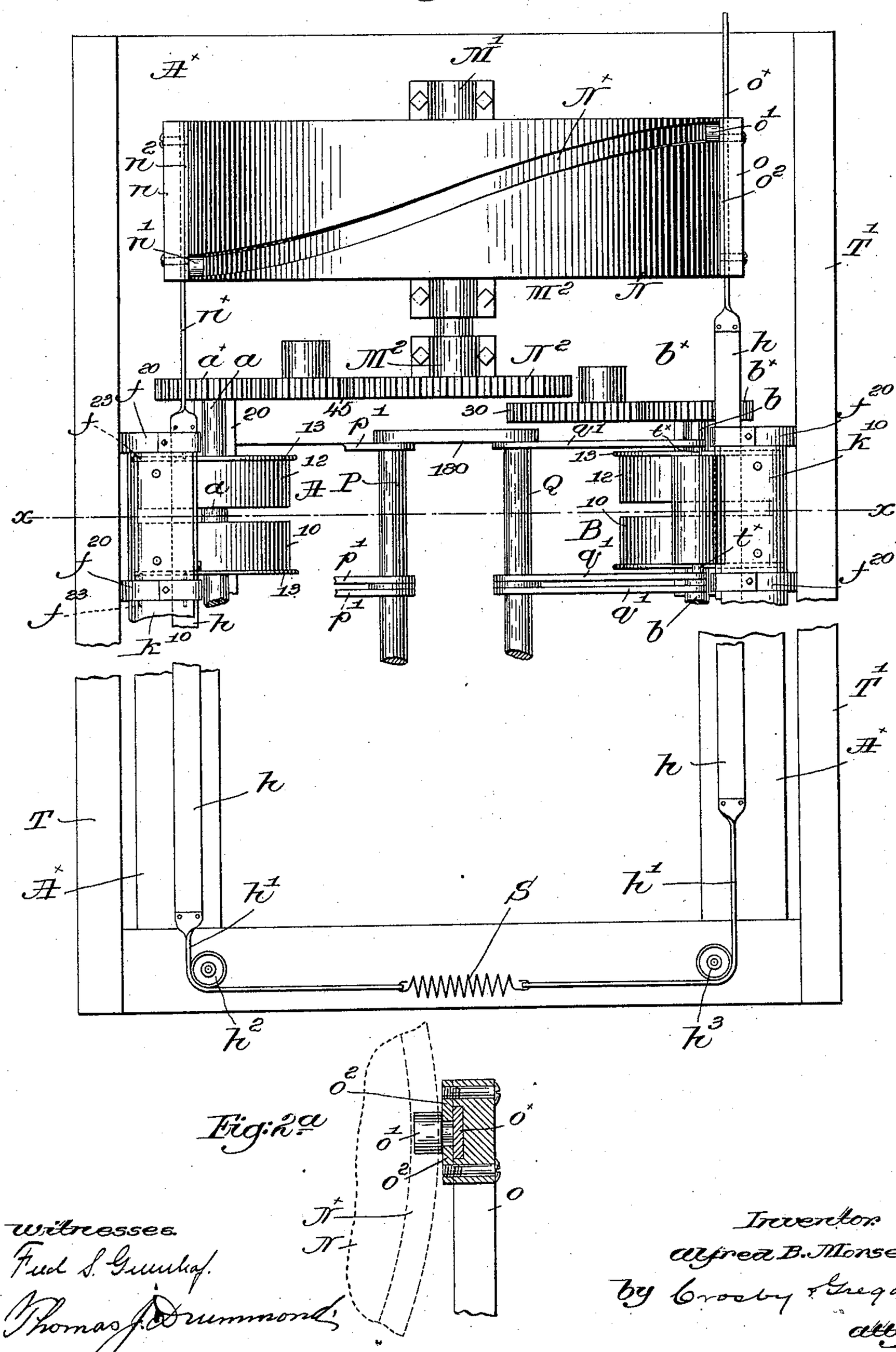

Fig: 2a

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(No Model.) 4 Sheets—Sheet 3.

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THREAD WINDING APPARATUS.

No. 582,393. Patented May 11, 1897.

Fig. 3.

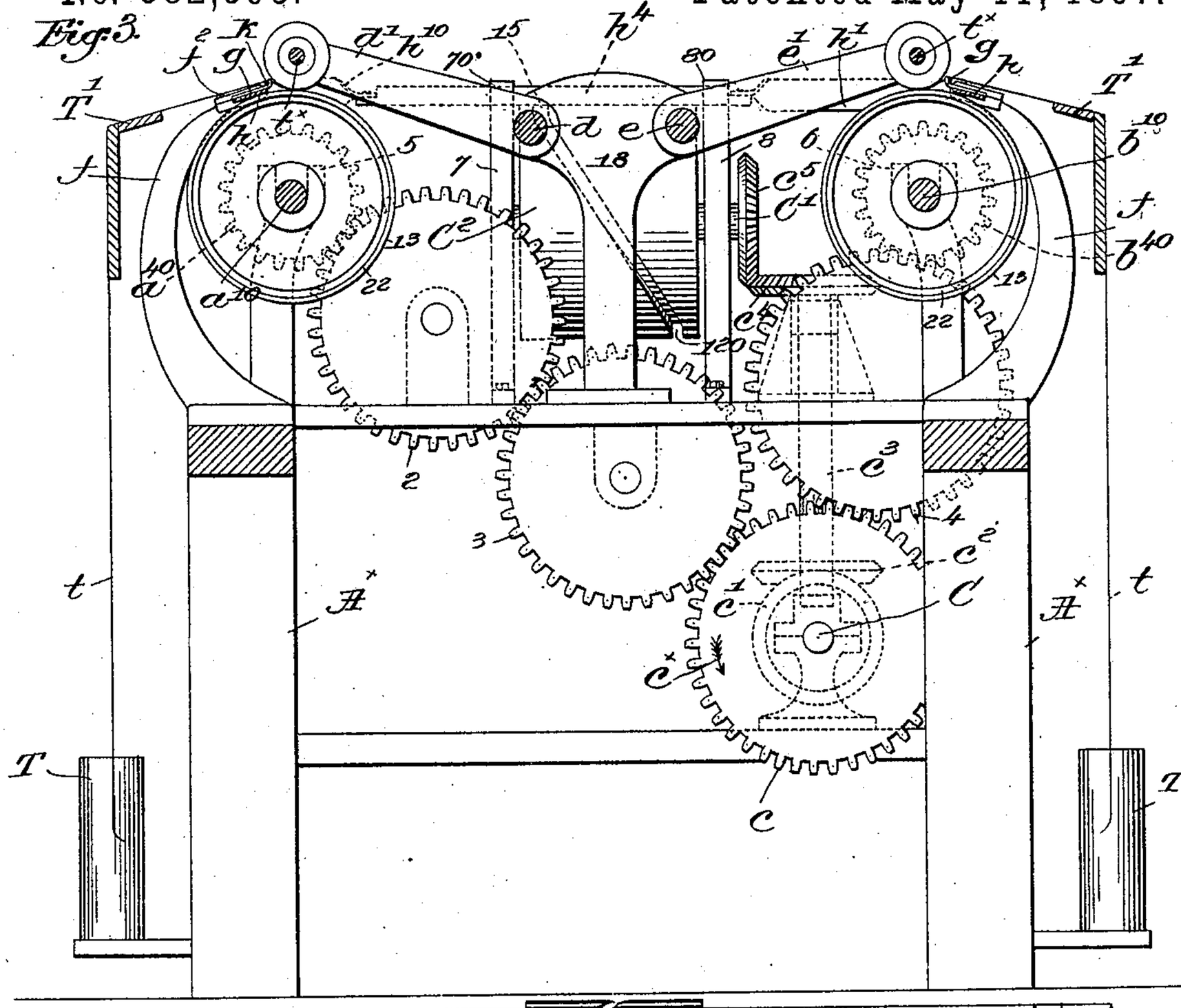
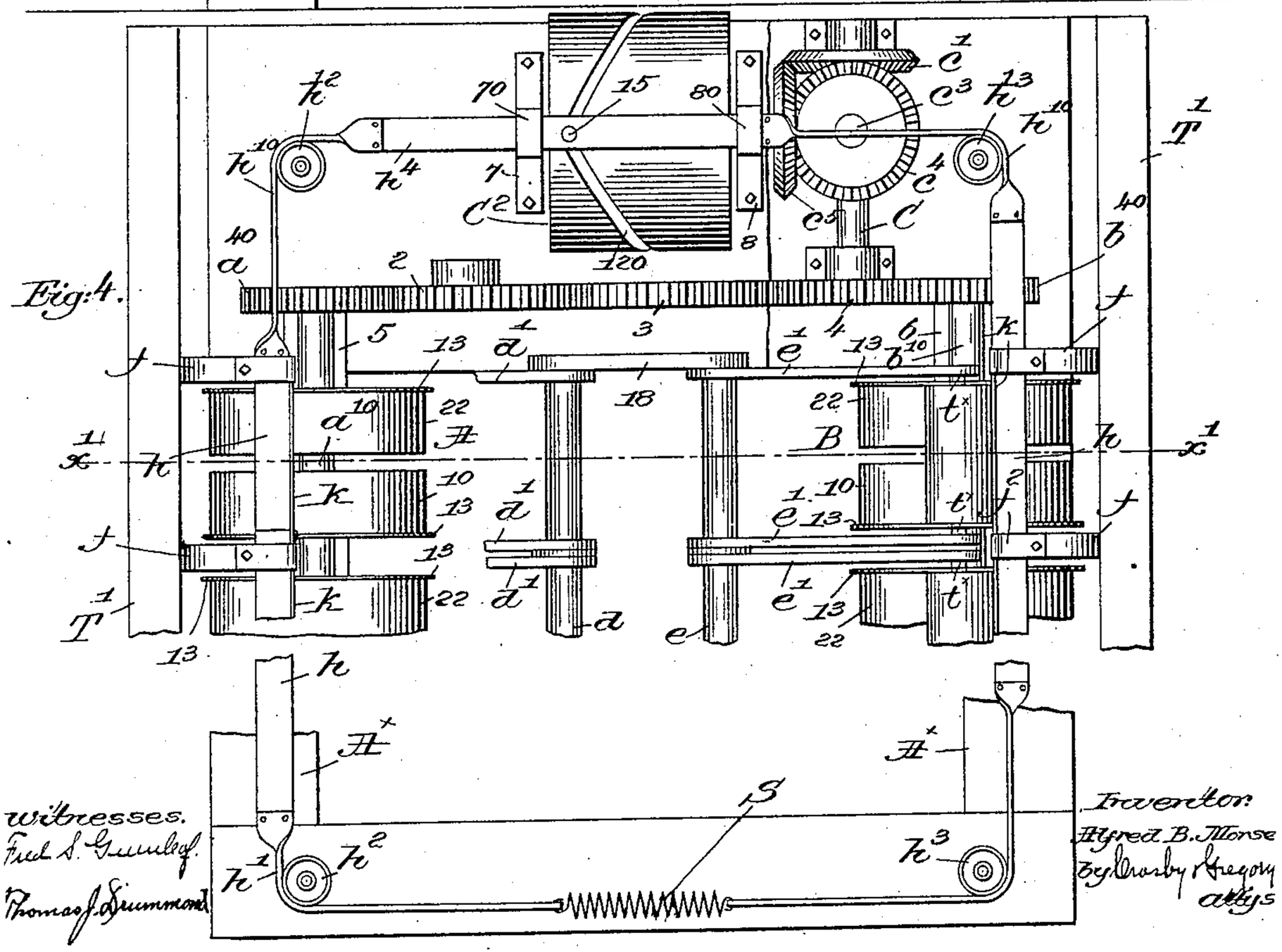


Fig. 4.



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(No Model.) 4 Sheets—Sheet 4.

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THREAD WINDING APPARATUS.

No. 582,393. Patented May 11, 1897.

Fig: 5.

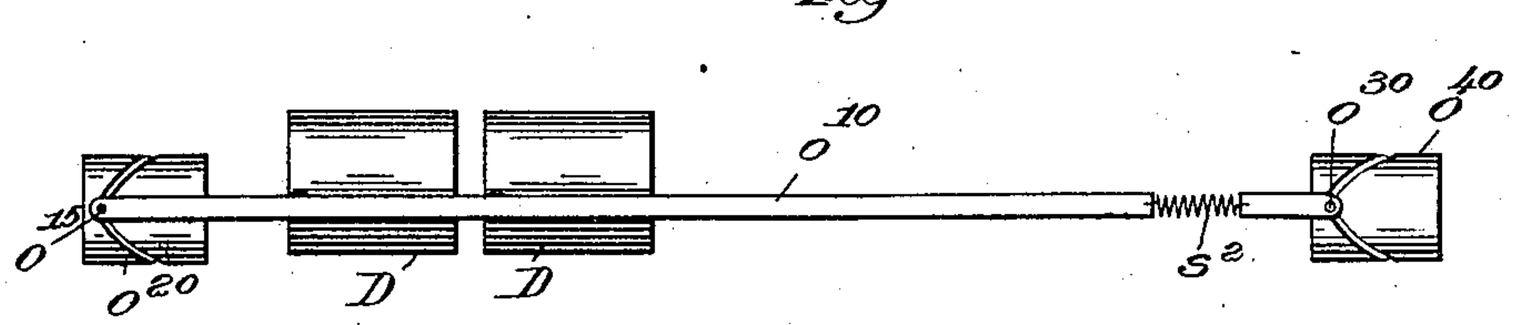


Fig: 6.

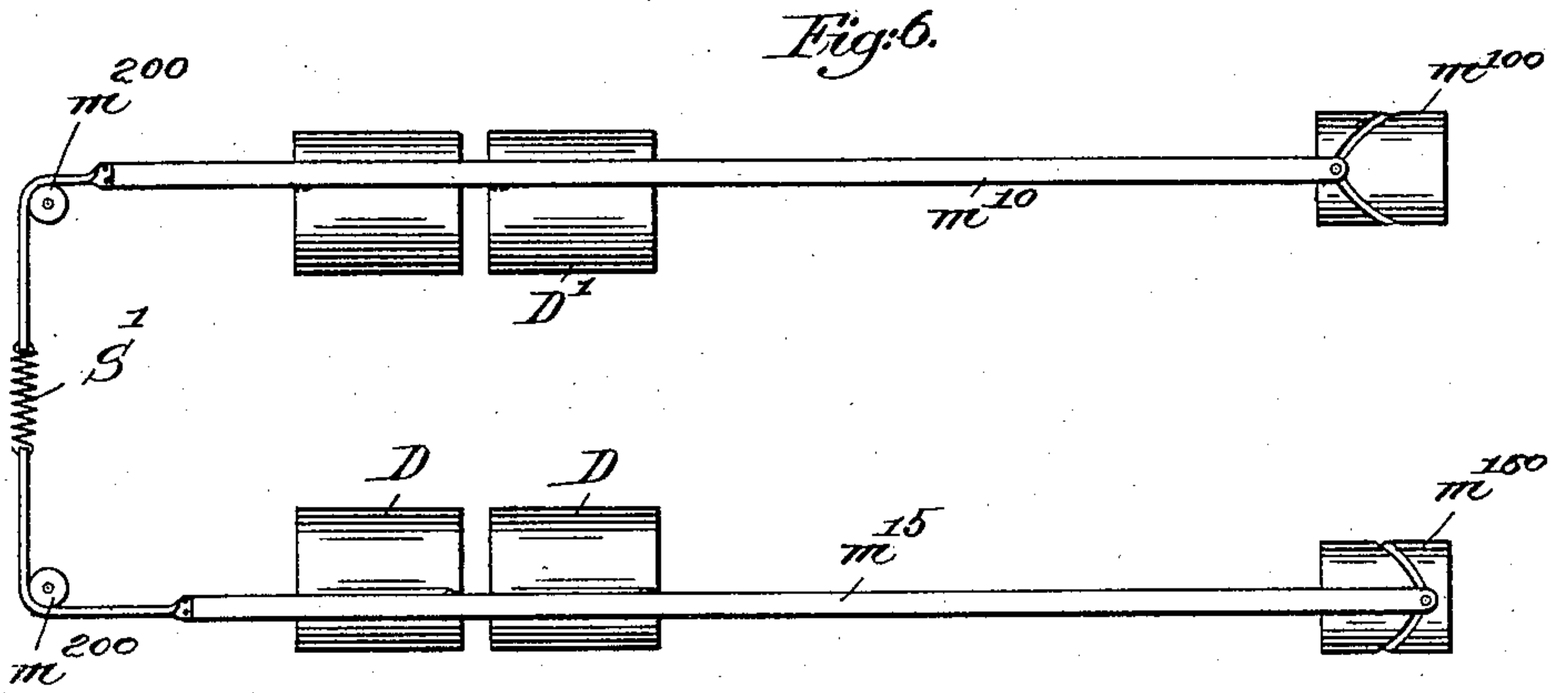


Fig: 7.

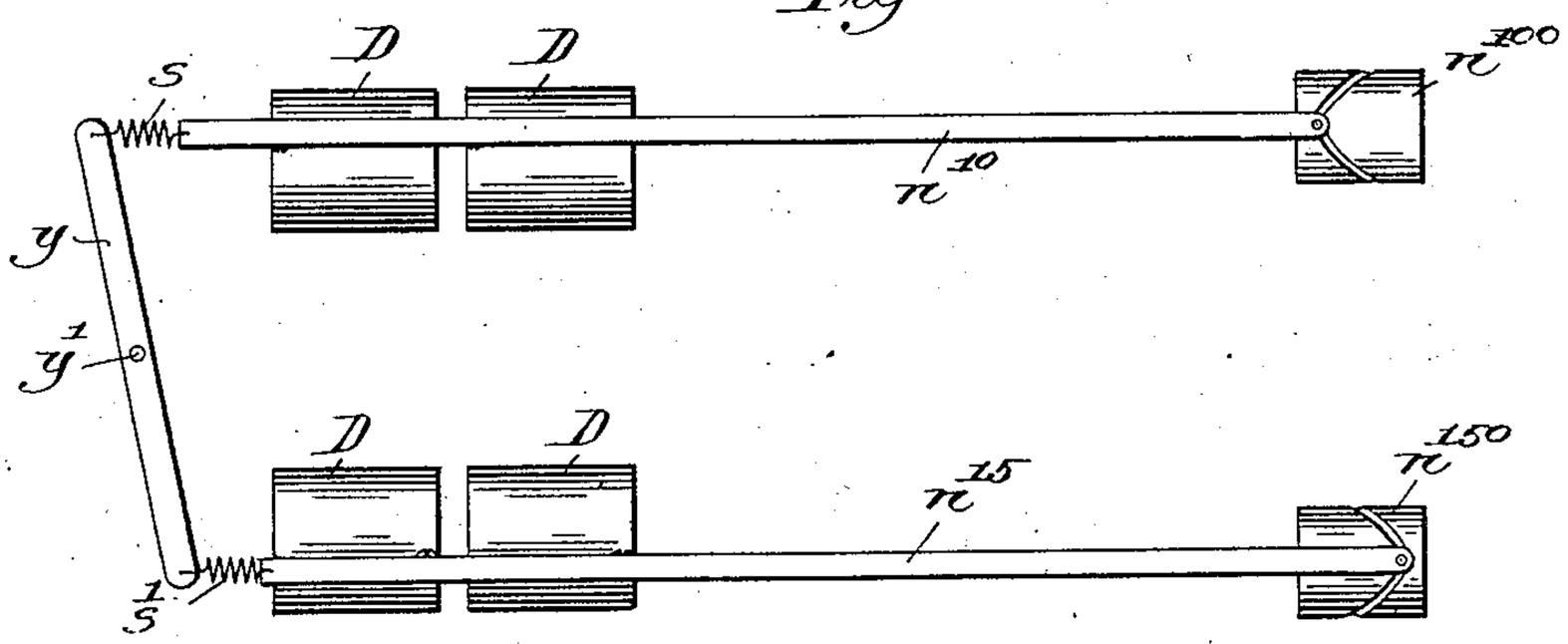


Fig: 10.

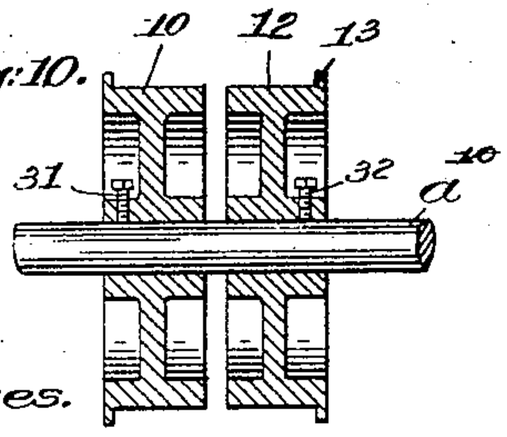
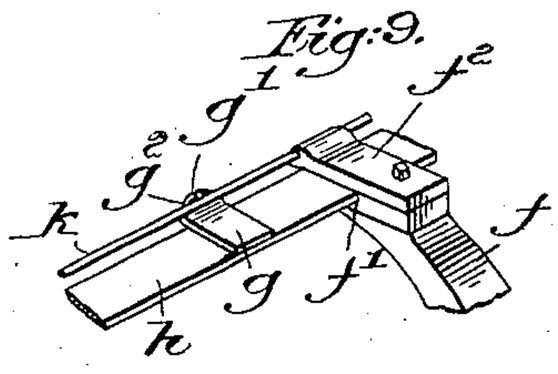


Fig: 9.



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UNITED STATES PATENT OFFICE.

ALFRED B. MORSE, OF EASTON, MASSACHUSETTS.

THREAD-WINDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 582,393, dated May 11, 1897.

Application filed April 30, 1896. Serial No. 589,670. (No model.)

To all whom it may concern:

Be it known that I, ALFRED B. MORSE, of South Easton, county of Bristol, State of Massachusetts, have invented an Improvement in Thread-Winding Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like letters and numerals on the drawings representing like parts.

In a large and important class of thread-winding apparatus the thread or yarn is wound upon rotatably-supported spindles or tubes, rotation being transmitted thereto by means of suitable drums upon which they rest. The thread or yarn led from suitable sources is delivered to the spindles by guides which are reciprocated in the direction of the length of the spindles to traverse the yarn or thread thereupon, so that the same is laid in more or less compact and even masses. The speed with which such apparatus can be run is practically limited by the speed of reciprocation of the traverse mechanism, and as such mechanism is heavy the momentum thereof prevents very high speed. In winding such thread masses the rolling over of the endmost spirals must be carefully guarded against in order to produce compact solid masses, which can afterward be unwound over one end without catching, and where the traverse of the thread-guide is not absolutely accurate and exact the thread will fall over at the ends of the mass, making poor work. Therefore when the traverse mechanism is speeded up beyond a certain point the momentum of the moving parts comes into play, and the sudden change of direction at each end of the stroke will not be uniform and the result will be uneven winding. In other words, there is an uncertainty and vibration at such points, so that the thread-guides cannot produce accurate work, and the wound masses will in consequence be rough and overrun at the ends.

This invention has for its object the production of a thread-winding apparatus which can be run at very high speed without detriment to the work to be produced, such high speed being attained by mounting the thread-guides upon a light yet strong flexible carrier, preferably maintained under tension, and positively reciprocated in the direction of the length of the spindles or tubes upon which the thread is to be wound.

Other features of my invention will be hereinafter described, and particularly pointed out in the claims.

Figure 1 is a transverse vertical section on the line $x\,x$, Fig. 2, of a thread-winding apparatus embodying one form of my invention, looking toward the driving end of the apparatus. Fig. 2 is a top or plan view of the apparatus broken out between its ends to save space. Fig. 2^a is a detail, partly in section, of the connection between the guide-carrier and its cam. Fig. 3 is a transverse sectional view of a modified construction on the line $x'\,x'$, Fig. 4; and Fig. 4 is a top or plan view thereof. Figs. 5, 6, and 7 are modifications in detail of the traverse-actuating mechanism, a pair of driving-drums being shown in Fig. 5 and oppositely-located pairs in each of Figs. 6 and 7. Fig. 8 is an enlarged perspective detail of a portion of the carrier, one of its bearings, a thread-guide on the carrier, and the fixed thread-support. Fig. 8^a is a detail showing one end of the thread-support illustrated in Fig. 8. Fig. 9 is a similar view of the thread-support shown in Figs. 3 and 4, and Fig. 10 is a sectional view of one of the adjustable driving-drums forming a part of my invention.

Referring to Figs. 1 and 2, the frame $A^\times$, of suitable shape to support the operative parts of the apparatus, has bearings 20 21 for parallel drum-shafts a and b, arranged at the back and front of the apparatus, and having secured thereto like driving-drums A and B.

Gears $a^\times\,b^\times$ are fixed on the shafts $a\,b$, respectively, the gear $b^\times$ being connected by intermediate gears 30 and 40 to a gear m on the main driving-shaft M, driven in any suitable manner in the direction of arrow 300, Fig. 1, while an intermediate gear 45 connects gear m and the drum-shaft gear $a^\times$.

Standards erected on the frame carry bearings $M'\,M^2$ for the journals N′ of a drum N, having a diameter about equal to the distance between the paths of the two thread-guide carriers, to be described, the face of the drum N having a cam-groove $N^\times$ therein having a long gradual sweep, and to impart a comparatively short throw.

As herein shown, the cam-shaft N′ has fast

thereon a gear N^2 in mesh with an intermediate gear N^3, mounted on one of the standards, as $M^\times$, (see Fig. 1,) and driven through the gear 45 from the driving-shaft M, though obviously a separate gear could be secured to the driving-shaft, if desired, to operate the cam-shaft. By substituting in usual manner change-gears of different diameter for those shown the speed of the cam may be varied relative to the speed of the driving-drums.

Stands *n* and *o*, (see Fig. 2,) erected on the main frame at opposite sides of the cam-drum N, are horizontally recessed, as shown in Fig. 2^a, to receive, respectively, preferably flat slide-bars $n^\times$ $o^\times$, on which are mounted roller or other studs n' o', which enter the cam-groove $M^\times$. (See Fig. 2.)

Cover-plates n^2 o^2 retain the slide-bars $n^\times$ $o^\times$ in their bearings, as clearly shown in section in said Fig. 2^a, the slide-bars moving in parallel vertical planes adjacent to the paths of movement of the thread-guides at the front and back of the apparatus.

Two parallel bars P Q are supported in standards 180 above the center of the apparatus and forming bearings for a series of arms p' q', respectively, said arms receiving rotatably therein at or near their free ends the journals of the spindles, tubes, or other foundations $t^\times$, upon which the thread or yarn is to be wound.

The "spindles," which term will be hereinafter used as indicating the foundations upon which the thread or yarn masses are wound, rest upon and are rotated by the drums A B, one spindle being herein shown as resting on each drum, and as the thread increases in diameter the pivotal spindle-support permits it to rise from the drum.

I prefer to make the drum, as best shown in Fig. 10, in two parts 10 12, independently secured to the drum-shaft by suitable set-screws 31 and 32, so that the drums can be adjusted to the length of the spindles or to the masses of thread to be wound thereupon, the flanges serving to guide and control the building of the thread at the ends of the mass. When several layers have been superposed one upon another, the end support is unnecessary, but it is of very great assistance in producing the best thread masses to support the ends of the few layers nearest the surface during the winding.

A series of brackets f^{20} are mounted on and along the sides of the main frame, preferably between the drums, the upper ends of said brackets extending above the drums and in front of the line of contact of the spindles therewith, the brackets being recessed or grooved at f^{21} (see Fig. 8) to form bearings for the thread-guide carrier.

I have herein shown the carrier I prefer to use as a thin flat strip or ribbon of sheet metal *h*, resting in and longitudinally movable in the bearings f^{21}, wherein they are retained by caps f^{22}, bolted to the brackets, said caps being provided with suitable devices to hold a common thread-support (shown in Fig. 8 as sheet or cast metal k^{10} and in Fig. 9 as a light rod or wire *k*) above the path of the guide-carrier. The apron or shelf k^{10} is bent or curved at k^{11} in the direction of its length at its outer edge and overhangs the carrier *h*, and at its ends is notched, as at k^{12}, Fig. 8^a, to engage pins f^{23} on the caps f^{22}.

I prefer to polish the upper surface of the thread-support k^{10} to offer little resistance to the thread *t* as it comes from the source of supply T and passes over the guide-shelf T'.

A series of thread-guides are suitably secured to the carrier *h*, each guide being shown in Figs. 1, 2, and 8 as a piece of sheet metal *g* upturned at its inner end and notched, as at *g'*, said upturned end projecting between the adjacent spindle $t^\times$ and the thread-support k^{10} and somewhat above the latter.

The thread *t* as it passes over the support k^{10} enters the notch *g'* of its guide and travels thence to the spindle to be wound thereupon, the thread-guide being reciprocated by its carrier *h* in the direction of the length of the spindle to traverse the thread thereupon, and from Fig. 1 it will be seen that the path of the thread-guide is very close to the line of contact between the driving-drum and the particular mass of thread wound thereby. To facilitate the entrance of the thread to the notch *g'*, the upper edge of the notched end of the guide is convexed, as at g^2, so that the thread can easily slide up into the notch, while the common thread-support keeps the threads from resting upon and becoming soiled or greasy by contact with the carrier *h*, whose bearings, of any suitable construction, will be maintained well lubricated.

The carrier *h* is very light, and the addition of the thread-guides *g* thereto does not increase its weight very much, so that it may be reciprocated at very high speed without any of the evil effects due to momentum with a heavy traverse mechanism. The small cross-sectional area of the carrier incidental to its thin ribbon-like character, as herein shown, renders it necessary, in order that it may be reciprocated longitudinally, that it be acted upon at each end by a pulling force, said pulling forces operating alternately in opposite directions, and as the carrier is thus flexible it is operated as a tension member.

Several means are herein shown for maintaining the tension of the carrier and for reciprocating it with its thread-guides.

In Fig. 2 I have shown the metallic straps or bands *h* at front and back of the apparatus as bent and connected to the slide-bars $n^\times$ $o^\times$, the opposite ends of the carriers being attached to preferably stout leather straps *h'*, which are passed around guide-rolls h^2 h^3, rotating on vertical axes, the straps *h'* at the end of the machine farthest from the transverse cam N being connected, preferably, by a spring S sufficiently strong to keep the carriers under tension at all times, it being obvious that practically the same result is thus

attained as would be by using two cams, one at each end of the carrier.

In Figs. 3 and 4 the mechanism at the cam end of the apparatus is different, the carriers h having attached thereto leather straps h^{10}, which pass around rolls h^{12} h^{13}, said straps being secured to a slide-bar h^4, longitudinally movable in bearings 70 and 80, and shown as carrying the roll or stud 15, which enters the cam-groove 120 of the cam C^2, so that the two carriers, located at the front and back of the apparatus, are oppositely reciprocated to traverse the thread t upon the spindles $t^\times$.

In Fig. 2 it is obvious that the guide-carriers h will be moved in opposite directions by the coöperation of the cam-groove $N^\times$ with the rolls n' o', the latter being located at substantially diametrically opposite sides of the cam-drum N.

The spring S, Figs. 1 and 4, exerts a pull upon the carriers at all times, and thereby keeps them under tension, so that the thread-guides g move in a plane just as they would were they mounted on the heavy rigid traverse-bars now in use.

The carrier-bearings may be made anti-friction in any of the well-known ways by rolls, balls, lubricant, &c., as desired, and the speed with which the thread-guides may be reciprocated is unlimited, so far as the momentum of the carriers and attached parts is concerned.

As most clearly shown in Fig. 8, the thread-supports k^{10} between the supporting-brackets f^{20} are provided with upright pins or projections k^{15}, separated by a distance less than the length of the mass of yarn to be wound, said pins acting as guards for the thread and preventing it from running over the ends of the mass on the spindles should the thread be disengaged from the notches g' of the thread-guides, said stops also preventing the thread from overrunning laterally onto the caps or brackets.

The general operation of the mechanism shown in Figs. 3 and 4, so far as the winding of the yarn or thread is concerned, is substantially such as shown in Figs. 1 and 2, but the arrangement of the actuating-gears for the drum is somewhat different. In said Figs. 3 and 4 the drum-shafts a^{10} b^{10} are supported in bearings 5 and 6 and are provided with gears a^{40} b^{40}, respectively, the gear a^{40} being connected by intermediate gears 2 and 3 to a gear c' on the main driving-shaft C and rotated in the direction of the arrow $c^\times$, Fig. 3, a single intermediate gear 4 connecting the driving-gear c and the drum-shaft gear b^{40}. A bevel-gear c' on the shaft C meshes with a similar gear c^2, (see dotted lines, Fig. 3,) fast on a short vertical shaft c^3, which has secured at its upper end a second bevel-gear c^4, meshing with a similar gear c^5 on a shaft C', supported in bearings 7 and 8 on the frame, a suitable cam C^2 for actuating the traverse mechanism being secured to the said shaft C'. In Figs. 3 and 4 said cam is shown as provided with a groove 120 of such shape as to reciprocate a roller or other stud 15 between the bearings 7 and 8. The parallel bars d and e, supported in the standards 18, form bearings for the spindle or tube supporting arms d' and e'.

In Fig. 6 I have shown one end of each carrier, as m^{10} m^{15}, provided with a roll to engage cams m^{100} m^{150}, respectively, the other ends being bent around guide-rolls m^{200} and connected by a spring S', the cams being so set that the carriers will be oppositely reciprocated. The same arrangement as to driving-cams n^{100} n^{150} is shown in Fig. 7, but the opposite ends of the carriers n^{10} n^{15} are connected by springs s s' to the ends of a yoke y, pivoted at y' to a suitable support, (not shown,) as Figs. 5 to 7, inclusive, are intended only to show, broadly, the arrangement of the traverse mechanism, the drums D being shown as ordinary cylinders.

While it is preferable, on the ground of economy and simplification of construction, to connect the two carriers at the front and back of the apparatus, as described, yet the carriers may be operated independently, as they would be in an apparatus having a single series of spindles, one such construction being shown in Fig. 5. In said Fig. 5 the carrier o^{10} is provided at one end with a roll or stud o^{15} to be engaged by a cam o^{20}, the other end being connected by a spring s^2 to a rod carrying a roll or stud o^{30} in engagement with a second cam o^{40}, the spring maintaining the tension of the carrier o^{10}.

In all cases I prefer to employ a spring or springs to maintain the carrier tension, and with the light weight of the reciprocating portions of the traverse mechanism the thread-guides will have exactly the same stroke no matter whether the speed be moderate or very high, as the evil effects due to momentum of heavy reciprocating parts have been eliminated by the construction herein described.

In Figs. 3, 4, and 9 I have shown the thread-support as a wire k, held in suitable seats in the caps f^2 above the path of the thread-guide carrier h.

My invention is not restricted to the construction and arrangement herein set forth, as alterations and modifications may be made therein without departing from the spirit and scope of my invention.

The pins k^{15} are so located that just before the thread-guide approaches the extremes of its throw the thread is brought against them, and as the guide continues its movement the thread in the notch thereof is carried against that side of the said notch which is at the rear thereof, in the direction of movement of the guide, thus putting an extra amount of tension on the thread, so that when the motion of the thread-guide is reversed the contact of the thread with the said side of the guiding-notch is maintained during the first part of the said reverse motion, thus obviating any slack winding or throwing over of

the thread due to lost motion by or through the guide.

I claim—

1. In a thread-winding apparatus, a series of rotatably-supported spindles, means to rotate them to wind the yarn or thread thereupon, a flexible carrier, maintained under tension when operative, a series of thread-guides thereon, and means to reciprocate the carrier in the direction of the length of the spindles, to traverse the thread thereupon, substantially as described.

2. In a thread-winding apparatus, a series of rotatably-supported spindles, rotatable driving-drums to rotate them to wind the thread thereupon, a flexible carrier, maintained under tension when operative, bearings in which it is reciprocated parallel to the driving-drums, a series of thread-guides on the carrier, and means to reciprocate the carrier, to traverse the thread upon the spindles, substantially as described.

3. In a thread-winding apparatus, a flexible carrier, a series of thread-guides thereon, means to maintain the carrier under tension, and devices to positively reciprocate the carrier, substantially as described.

4. In a thread-winding apparatus, a series of rotatably-supported spindles, means to rotate them to wind the yarn or thread thereupon, a flexible carrier maintained under tension adjacent the spindles, a series of thread-guides mounted on the carrier, means to reciprocate said carrier in the direction of the length of the spindles, and a fixed thread-support above the carrier, substantially as described.

5. In a thread-winding apparatus, a series of rotatably-supported spindles, means to rotate them to wind the thread thereupon, a ribbon-like flexible metallic carrier, a series of thread-guides thereon, means to maintain the carrier under tension, and devices to reciprocate the said carrier in the direction of the length of the spindles, substantially as described.

6. In a thread-winding machine, thread-guides, a carrier therefor, and a fixed thread-support above the carrier, said support having a smooth plane upper surface to receive the thread, said thread-guides having their free guiding ends projecting slightly above the upper surface of said thread-support to catch and guide the thread, substantially as described.

7. In a thread-winding apparatus, a series of rotatably-supported spindles, rotatable driving-drums therefor, a flexible metallic carrier, bearings therefor, thread-guides on the carrier to traverse the thread upon the spindles, a fixed thread-support above the carrier and in front of the thread-guides, and means to maintain the carrier under tension, substantially as described.

8. In a thread-winding machine, a rotatable drum to rotate a spindle in the process of winding yarn, a carrier having an attached thread-guide, and means to reciprocate said carrier, combined with a thread-support provided with pins or projections separated for a distance less than the length of the throw of the thread-guide, to operate, substantially as described.

9. In a thread-winding machine, an endless flexible, reciprocable carrier provided with thread-guides, and means to reciprocate the carrier, combined with a spindle and means to rotate it, substantially as described.

10. In a thread-winding machine, an endless flexible reciprocable carrier provided with thread-guides, and means to reciprocate the carrier, combined with a spindle and means to rotate it, and pins or projections to stop the traverse of the thread before the traverse of the thread-guide is stopped, substantially as described.

11. In a thread-winding apparatus, a series of spindles, means to rotate them to wind the thread or yarn thereupon, a carrier reciprocable in the direction of the length of the spindles, a series of thread-guides on the carrier, and means acting alternately upon the ends of and to pull the carrier longitudinally in opposite directions, to traverse the thread upon the spindles, substantially as described.

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

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Witnesses:

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