(No Model.) 4 Sheets—Sheet 1.

E. W. SERRELL, Jr.

SILK REELING MACHINERY.

No. 406,598. Patented July 9, 1889.

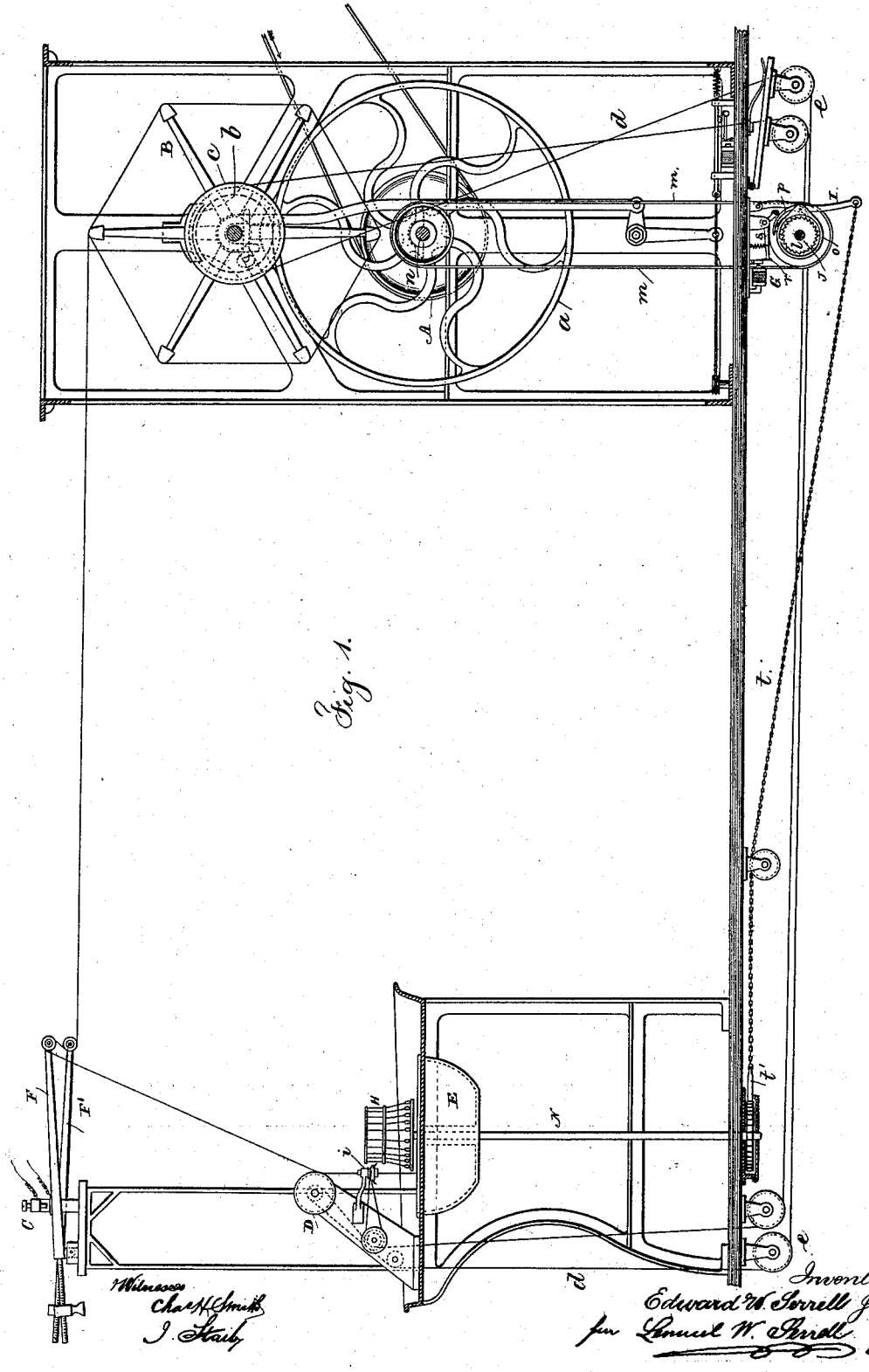

Fig. 1.

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per Samuel W. Serrell
atty.

(No Model.) 4 Sheets—Sheet 2.

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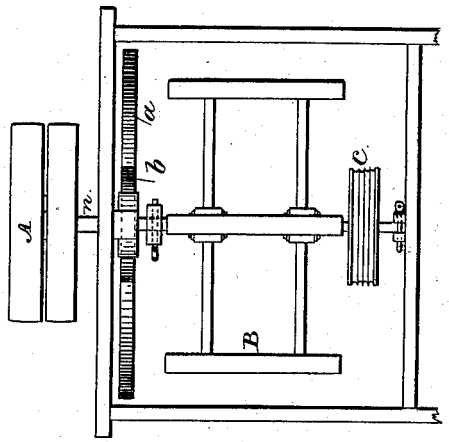
SILK REELING MACHINERY.

No. 406,598. Patented July 9, 1889.

Fig. 2.



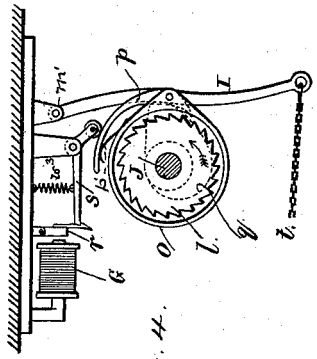
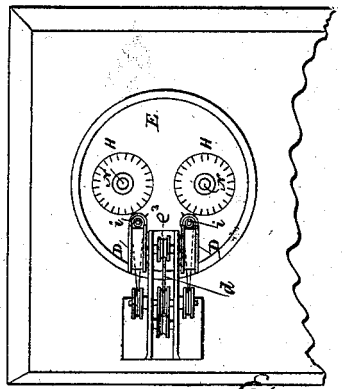


Fig. 4.

Fig. 3.



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(No Model.) 4 Sheets—Sheet 3.

E. W. SERRELL, Jr.

SILK REELING MACHINERY.

No. 406,598. Patented July 9, 1889.

Fig. 10.

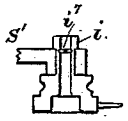
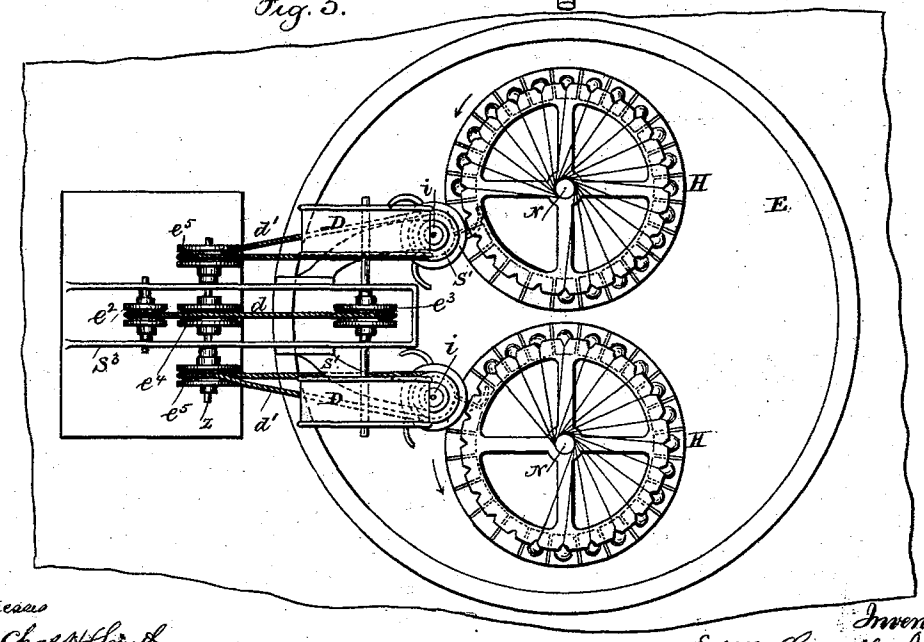


Fig. 6

Fig. 9.

Fig. 5.



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(No Model.) 4 Sheets—Sheet 4.

E. W. SERRELL, Jr.

SILK REELING MACHINERY.

No. 406,598. Patented July 9, 1889.

Fig. 8

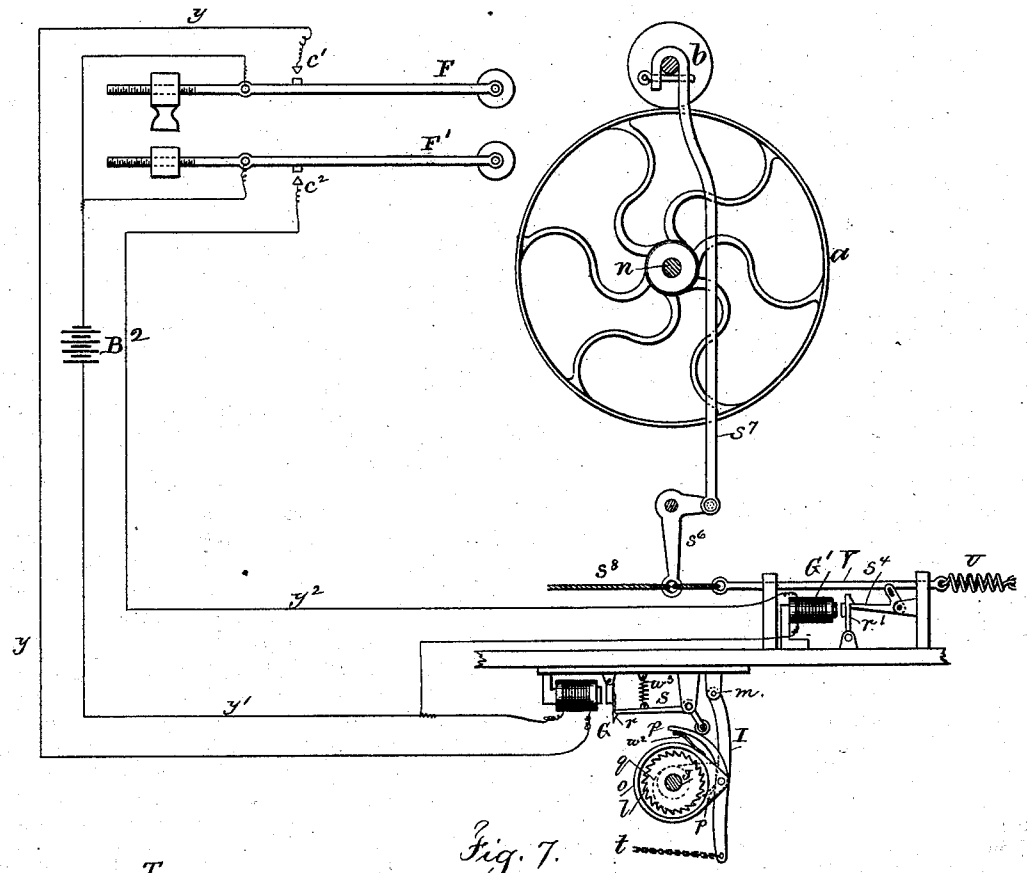
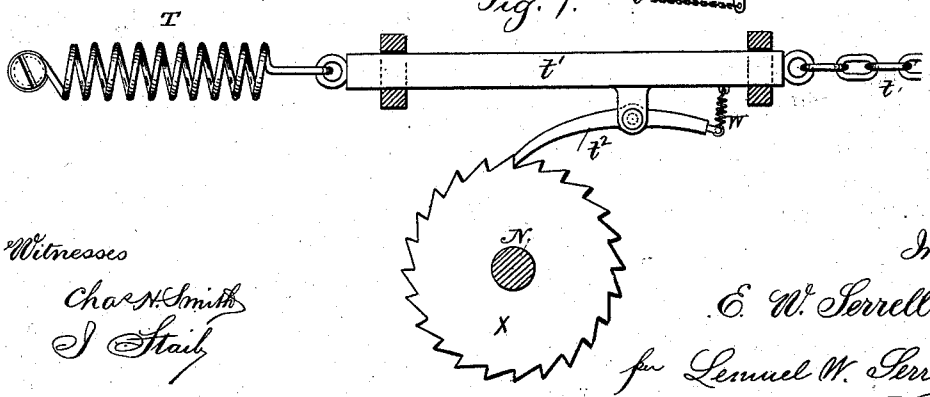


Fig. 7.



Witnesses

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atty

UNITED STATES PATENT OFFICE.

EDWARD W. SERRELL, JR., OF NEW YORK, N. Y.

SILK-REELING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 406,598, dated July 9, 1889.

Application filed April 25, 1884. Serial No. 129,196. (No model.) Patented in France February 25, 1882, No. 147,624; in Sweden March 21, 1882; in Italy March 23, 1882; in Germany March 28, 1882, No. 19,885; in Austria-Hungary May 17, 1882, No. 10,629; in Portugal June 30, 1882, and in Spain September 26, 1882.

To all whom it may concern:

Be it known that I, EDWARD WILLIAM SERRELL, Jr., of the city, county, and State of New York, a citizen of the United States, temporarily residing in Chabenil, in the Department of the Drôme, Republic of France, have invented an Improvement in Silk-Reeling Machinery, of which the following is a specification.

Letters Patent for this invention have been granted in the following countries: France, No. 147,624, deposited February 25, 1882, granted May 9, 1882; Austria-Hungary, granted May 17, 1882, No. 10,629; German Empire, dated March 28, 1882, No. 19,885, and in Italy, dated March 23, 1882; in Spain, dated September 26, 1882; in Sweden, dated March 21, 1882, and in Portugal, dated June 30, 1882.

In Letters Patent No. 141,083, granted to me in France March 30, 1881, a device called a "seregraph" is described, the same consisting of two drums of different diameters and driven at the same speed, around which a thread of silk is passed and led off around a pulley. The drums being of different diameters, the larger drum draws the filament or thread more rapidly over the pulley than the smaller drum supplies the thread to such pulley, thereby the thread is stretched to the extent of the difference in the circumferential measurements. A silk thread that is fine stretches under less strain than one which is coarser; hence a scale or indicator acted upon by the pulley shows the difference in the strain upon the filament and indicates the relative sizes of the thread or of the part of such thread which is being acted upon.

My present invention consists of improvements by which I avail myself of the same principle and mode of operation in the reeling of silk from the cocoons.

The filament from a cocoon is coarsest at the outer end and becomes finer toward the inner end; hence in the reeling of silk from cocoons it is usual for the operator to add a fresh filament from time to time to the thread being reeled, in order that the thread, which is composed of a number of such filaments, may be of about a uniform size and strength. The operation requires very close attention and great experience on the part of the operator. It is found in practice that the threads produced are very irregular in size and strength, and hence the fabric made from such threads is not uniform in quality.

The object of my invention is to gage the thread during the reeling, and to automatically supply to it as it is reeled additional filaments as it becomes weaker in consequence of a cocoon becoming exhausted or of the diminution in the size of the filaments, so that I am enabled to maintain the greatest possible uniformity in size and strength of the thread as reeled.

In the drawings, Figure 1 is a side view, partly in section, of my silk-reeling machine. The floor upon which the apparatus rests is also in section. Fig. 2 is a plan view of the frame, reel, and adjacent parts. Fig. 3 is a plan of a portion of the table, the water-basin, a pair of cocoon-holders, feeding-drums, and filament-attaching devices, and the pulleys and belts for rotating the drums and filament-attaching devices. Fig. 4 is an elevation of the electro-magnet and its connected parts that control the revolution of the cocoon-holder. Fig. 5 is a plan view similar to Fig. 3, but with the parts represented in larger size. Fig. 6 is a sectional elevation of the parts shown in Fig. 5. Fig. 7 is a sectional plan showing the ratchet-wheel upon the shaft of the cocoon-holder and the devices at one end of the chain for turning said wheel and shaft. Fig. 8 is a diagram illustrating the electric devices and connections of the apparatus. Fig. 9 illustrates how the croisure is made, and Fig. 10 is a section of the filament-attaching device.

In practice I prefer to wind two threads upon the same reel, and for this purpose I employ two cocoon-holders and two sets of apparatus in conjunction with each basin and with one reel; but as these are similar I herein describe but one, and I remark that usually there are several basins side by side, each being provided with two sets of devices, as aforesaid, and that the reels for each set of devices are in a frame common to all, with but one driving-shaft to rotate all the reels.

The pulley A is revolved by any suitable

power and transmits motion to the friction-wheel *a*, both being made fast to the same shaft *n*. The friction-wheel *a* in turn sets in motion the friction-wheel *b*, which is immovably fixed to the shaft of the reel B. The reel B is thus put in motion. There is also fixed upon the shaft of the reel B a grooved pulley *c*, and this latter also revolves with the reel and reel-shaft. Around the grooved pulley *c* passes the endless cord or driving-belt *d d d*, and this latter, guided by the guide-pulleys *e e' e² e⁴*, passes around the pulley e^3, Figs. 5 and 6, fixed upon a shaft, to which the drum D is also fixed. This shaft is supported by the standard S^3. It will therefore be evident that the drum D is made to revolve at the same time as the reel B. For the sake of convenience to the operative I prefer to cause the cord *d d d* to pass under the floor in its path between the pulley e^3 and the grooved pulley *c*.

From the preceding description it is plain that by means of the cord *d* or equivalent means of transmission the drum D may be made to revolve with a speed which will always be in any desired proportion to the speed of the reel B. Now, the respective diameters of the grooved pulley *c*, which is on the reel-shaft, and the pulley e^3, which is on the shaft of the drum D, are such that when the apparatus is in motion the drum D will have a peripheral speed about five per cent. slower than the winding speed of the reel B.

As will hereinafter be more fully explained, the thread in being reeled passes first around the drum D, and thence to the reel B, and because the winding speed of the reel B is greater than the peripheral speed of the drum D the thread is stretched by a percentage or fixed proportion of its length. The effect of this disposition is that the drum D acts as one pulley and the reel B as the other of the two pulleys or drums set forth in the specification of my invention, called the "seregraph," to which reference has been made.

Above the basin E there is fixed a small hollow cylinder *i*, which is continually revolved at a great speed while the reel B is running. This cylinder *i* is furnished with projecting hooks for catching filaments, and is as a whole a device for attaching additional cocoon filaments to the running thread whenever such filaments are presented by the automatic parts of the machine in the manner to be further explained. This cocoon-attaching device is not of itself claimed herein as my invention. It usually contains a perforated agate, through which the running thread passes. I prefer to cause the cylinder *i* to revolve by the means indicated in Fig. 1, and more clearly shown in Figs. 5 and 6. The cylinder *i* is carried by the support S' in such a manner as to be free to revolve, and a portion of its exterior is grooved, so as to serve as a pulley, around which passes the cord *d'*.

As heretofore set forth, the cord *d*, which gives motion to the drum D, passes over guide-pulleys *e e' e² e⁴*. I fix the guide-pulleys e^4 upon a shaft *z*, which is free to revolve and is sustained by the support S^3, and to each extremity of the shaft *z*, I fix a pulley e^5. The pulleys e^4 e^5 will therefore revolve when the reel is in motion in consequence of the cord *d* passing over the pulley e^4, and motion is given to the cylinder *i* by means of the belt *d'*.

Within the cylinder *i* an agate may be secured, as at *i'*, said agate being perforated to allow for the passage of the thread.

A shaft J is fixed at any convenient point, but preferably below the floor of the filature, and this shaft is kept in constant revolution by the motive power of the establishment.

I have shown the belt *m* passing around pulleys on the shafts *n* and J as the means for revolving this shaft J. This shaft J serves to give movement to the automatic filament-supplying devices in a manner hereinafter described.

The parts of the machine that are driven by the belt *d* are in constant movement while the reel is running, and the shafts J and *n* and the friction-wheel *a* are kept in constant revolution, irrespective of the stoppages of the reel B.

The shaft J has rigidly attached to it a ratchet-wheel *l*, which is in constant revolution, as aforesaid, and around this ratchet-wheel there is a cam-case *o*, which is loose upon the shaft J and so disposed as to turn concentrically with it when the pawl *p* engages with the ratchet-wheel *l*. The cam-case *o* has attached to it on one side a cam *q*, (shown by dotted lines,) and there is a lever I free to swing upon the pivot *m*.

The spring T, Fig. 7, draws the lever I against the cam *q* by means of the chain *t* and bar *t'*. The disposition of the parts and the shape of the cam are such that when the cam-case *o* revolves the lever I oscillates and allows the spring T to contract during the first part of the time employed by the revolution of the cam-case *o* with the shaft J, and then as the cam-case *o*, with the cam *q*, finishes its revolution it presses upon the lever I and restores the parts to the position occupied before the revolution began. Thus when the cam-case begins to revolve with the shaft J the spring T is allowed to contract, and as the revolution of the cam *q* is completed the spring T is again extended. The bar *t'* is attached at opposite ends to the chain *t* and to the spring T, respectively, and is held in slides, so as to be free to move longitudinally and form part of the connection between the spring T and the lever I, the connection being completed by the chain *t*.

Attached to the slide-piece *t'* is a pawl t^2, which is held against the teeth of the ratchet-wheel X by the spring W. The ratchet-wheel X is rigidly attached to the vertical shaft N. When the spring T is extended, the end of the pawl t^2 rests against one of the teeth of

the ratchet-wheel X, and when the spring T contracts it draws with it the bar or slide t' and the pawl t^2, which causes the ratchet-wheel X to advance one tooth. Each succeeding extension of the spring T by the lever I, acting through the chain t, causes the pawl t^2 to be drawn back in readiness to act upon the succeeding tooth of the ratchet-wheel X. These movements of the cam-case o, the cam q and the lever I, the chain t, the slide t', the spring T, and the pawl t^2, acting on the ratchet-wheel X, take place at the same time, but are intermittent and only occur when it is necessary to add a cocoon filament to the running thread which is being reeled. The manner of determining the proper time for and of causing these movements will be hereinafter explained.

The vertical shaft N, which is attached to the ratchet-wheel X, passes up through a tube in the basin E, as shown in Fig. 6. At the upper end of the shaft N is a magazine or cocoon-holder H, containing as many compartments as there may be teeth in the ratchet-wheel X. This cocoon-holder consists of a lower platform divided into compartments, and of an upper plate or plates which are somewhat above the level of the hooks of the small cylinder or cocoon-attaching device i. The position of the magazine H with reference to the cylinder i is such that the hooks upon the latter in revolving pass under the upper plate of the magazine H, so as to engage a cocoon filament when stretched from the cocoon in a lower compartment of the magazine H over the edge of its upper plate.

From the above it will be evident that a filament from a cocoon will be taken by one of the hooks of the cylinder i when the cam q revolves upon the shaft J, and, through the devices aforesaid, turns the cocoon-holder so as to bring a filament into position to be taken by one of the hooks.

Above the basin E are two counterweighted levers F F'. There is a small pulley or roller at the end of each lever nearest the reel for the running thread to pass around, and the other or tail end of each lever is made with a screw-thread upon a reduced and cylindrical portion thereof. The counter-weights, in the form of nuts, are upon these screw portions of said levers F F', so that by revolving said weights they can be adjusted to their proper positions. The counter-weight upon the lever F is to be so positioned that it will tend to cause the end of said lever F nearest the reel to rise and close an electric circuit at c'; but the force is not sufficient to overcome the pull of the thread, except when said thread falls below the standard size and strength, when its pull will be so lessened from the weakness of the thread that the weighted short arm of the lever will be sufficient to raise the other end of the lever into contact with c'. The weight of the lever F' is to be so positioned that the end of the lever nearest the reel tends to fall; but the weight of this long end of the lever F' is not sufficient to overcome the lifting action by the pull of the running thread until after the tension has fallen below the minimum amount and the lever F has made contact with c'. In other words, the lever F' is to be so balanced that it will make contact with c^2 only when a thread breaks or when the thread becomes very weak, arising from the failure to add cocoon filaments after the lever F has closed its electrical circuit at c'.

As will hereinafter be set forth, the thread in process of reeling acts, in combination with the levers F and F', to regulate the working of the machine. The levers F F' are placed in electrical communication with the same pole of the battery B^2 or other source of electricity. This is preferably accomplished by arranging the wire-connections as shown in the diagram, Fig. 8, in which a wire is represented as passing from the pivot of each lever and connected to a wire from the positive pole of the battery.

The electro-magnet G is connected with the contact c' by the wire y and with the negative pole of the battery by the wire y'. The electro-magnet G' is connected with the contact c^2 by the wire y^2 and with the negative pole of the battery by a wire connected to the wire y'. The contact-point c' is so placed that when the lever F is allowed to rise the current passes through the wire y to the magnet G, and the circuit is completed through the wire y' to the battery or source of electricity. Now, the armature r of the magnet G is furnished with a hook which engages with the latch-lever S, and when so engaged the latch-lever S presses upon the tail of the pawl p and keeps the point of the latter clear of the ratchet-wheel l, which is constantly revolving with the shaft J, so that the pawl p remains stationary; but when the lever F rises and completes an electric circuit by touching the contact-point c', then the electro-magnet G is excited and attracts its armature r, thus releasing the latch-lever S. The spring w^2 now forces the pawl p into a tooth of the revolving ratchet-wheel l, and as the pawl p is attached to the cam-case o the latter is forced to make a revolution with the shaft J, thus allowing the spring T to contract and cause a movement of the magazine or cocoon-holder H through the action of the pawl t^2, as has been described. During the revolution of the cam-case o the latch-lever S is restored to its place by the spring w^3 as soon as it is cleared by the pawl p, and when the revolution of the cam-case o is nearly complete the end of the latch-lever S again engages with the tail of the pawl p and causes the end of the latter to be disengaged from the teeth of the ratchet-wheel l. The cam-case o then remains at rest until the magnet G is again excited by another closing of the circuit at c' by a rising of the lever F.

The operation of the machine is as follows: The operative places a cocoon in each com-

partment of the cocoon holder or magazine H and leads the filament of each of the cocoons up over the upper plate, attaching them in any convenient manner, as shown in Fig. 6. The filaments of several other cocoons are then passed through the attaching device or cylinder *i* and united to form the beginning of a thread. The thread thus formed is passed one or more times around the feeding-drum D, so as to secure sufficient adhesion to prevent slipping, and the thread, after making the croisure, is carried over the small pulley at the end of the lever F and under the pulley at the end of the lever F′, and thence to the reel B. The croisure is shown in Fig. 9 as formed by passing the thread from one feeding-drum D several times around the thread leading from the other feeding-drum D, or the croisure may be of any known character to consolidate the threads. The counter-weight of the lever F is adjusted by trial to the position required for the size of silk which it is desired to reel, and the reel is allowed to revolve. From the disposition of the parts which has been described it follows that the thread is delivered from the drum D at a speed about five per cent. less than that at which it is wound in by the reel B. The result is that in the process of winding the thread is uniformly stretched this per centage or a fixed proportion in relation to its length, being the proportional difference in winding speed between the drum D and the reel B. The passing thread thus stretched acts upon the lever F with a force which varies according to the strength of the thread to resist the elongation. Now, the force which is required to stretch a silk thread a given proportion in relation to its length is practically in direct proportion to the sectional area or size of the thread, and from this it follows that the forces tending to depress the lever F, being in proportion to the resistance to elongation are proportional to the size of the thread which is passing at any given moment. The lever F, having been adjusted for the desired size of silk, is held down at the end nearest the reel as long as the passing thread is sufficiently strong, and therefore of the required size; but as soon as the thread becomes too weak the resistance diminishes and the lever F rises and touches the contact-point *c′*. An electric circuit is thus closed, and the magnet G attracts its armature, releasing the latch-lever S. The spring w^2 now causes the pawl *p* to engage with a tooth of the ratchet-wheel *l* and the cam-case *o* begins to make a revolution. This, as has been described, allows the spring T to contract, causing the ratchet-wheel X to advance one tooth through the action of the pawl t^2. The shaft N revolves with the ratchet-wheel X sufficiently to advance the magazine H by one compartment, because the magazine contains the same number of compartments as there are teeth in the ratchet-wheel X. In thus partially revolving the cocoon-holder H brings a cocoon filament within reach of one of the hooks upon the rapidly-revolving cylinder *i*. The filament so brought within reach is seized by the hook, and the revolution of the latter causes the newly-caught filament to be wrapped around those which are already paying out at a point between the lower end of the cylinder *i* and the water in the basin E. The filament so wound around the running thread adheres because of the glutinous matter with which heated and wet cocoon filaments are naturally coated, and becomes attached to and a part of the thread being reeled. The thread, being thus strengthened, is usually of sufficient size, and, in consequence, strong enough to draw down the end of the lever F and break the electric circuit before the cam-case *o* has completed its revolution with the shaft J. When this is the case, the lever F no longer touches the contact-point *c′*, and the magnet G not being excited the hook of the armature retains the latch-lever S, and the pawl *p* being withdrawn from the teeth of the ratchet-wheel *l* the filament-supplying mechanism comes to rest until the thread becoming again weakened the operation is repeated and another cocoon filament added. Should however, the first cocoon not be sufficient, or should the cylinder *i* fail in seizing and attaching it, then the lever F is not drawn down, the contact remains closed at the point *c′*, and the cam-case *o* continues to revolve, thus progressively advancing the magazine and causing to be added as many cocoon filaments as may be necessary to bring the thread up to the desired strength and size.

The lever F′ is used in combination with the magnet G′, the armature *r′*, the lever s^4, the spring U, and the slide-rod V to stop the reel when the thread breaks, and the operation of the device is as follows: As long as the thread is unbroken the lever F′ is held up and does not touch the contact-point c^2; but as soon as the thread breaks the lever F′ falls and makes contact at the point c^2. The electric circuit is completed through the magnet G′ and the wires y' y^2. The magnet G′ is thus excited and the armature *r′* is attracted, thus releasing the lever s^4 and allowing the spring U to lift the friction-wheel *b* of the reel off of the friction-wheel *a* by means of the rod V, lever s^6, and rod s^7. This causes the reel B to stop.

To put the reel in motion, the cord s^8 is drawn upon by means of a pedal, or otherwise, which again latches the armature *r′* and moves the lever s^6, and this extends the spring U and allows the friction-wheel *b* to bear upon the friction-wheel *a*, which, as has been said, is constantly in motion.

By means of the above-described mechanism I am enabled to accurately gage the thread while being reeled and to cause the machine to automatically add new cocoon filaments from time to time, as may be necessary to maintain the uniformity of the thread.

I claim as my invention—

1. The combination, with the filament-attaching device and means, substantially as set forth for rotating the same, of a feeding-drum around which the thread is passed, a reel upon which the thread is wound, means, substantially as set forth, for rotating the reel and feeding-drum, a regulating-lever operated by variations in the tension of the thread, an electro-magnet and its circuit, which includes the regulating-lever, a cocoon-holder, and mechanism, substantially as set forth, that is brought into action by said magnet to rotate the cocoon-holder, substantially as and for the purposes set forth.

2. The combination, with the filament-attaching device and means, substantially as set forth, for rotating the same, of a feeding-drum, a reel upon which the thread is wound, means, substantially as set forth, for rotating the reel and feeding-drum so that the reel is revolved at a greater surface speed than that of the feeding-drum, a regulating-lever operated by variations in the tension of the thread, an electro-magnet and a circuit which includes the regulating-lever, a cocoon-holder, and mechanism, substantially as set forth, brought into action by the electro-magnet for rotating the cocoon-holder, substantially as and for the purposes set forth.

3. The combination of a winding-reel, a feeding-drum, mechanism, substantially as set forth, for rotating the reel and feeding-drum, the former at a greater speed than that of the feeding-drum, a lever operated by the breaking of the thread, a filament-attaching device, a cocoon-holder, means, substantially as specified, for rotating the cocoon-holder and filament-attaching device, an electro-magnet and circuit which includes the aforesaid lever, and mechanism, substantially as set forth, operated by said magnet for disconnecting the reel from its driving-wheel, substantially as and for the purposes set forth.

4. The combination, with the electro-magnet G, armature r, lever S, spring w^3, and electric circuit for said magnet, of the revolving shaft J, ratchet-wheel l, pawl p, spring w^2, case o, cam q, and lever I, substantially as and for the purposes set forth.

5. The combination, with the electro-magnet G, its armature r, its electric circuit, the revolving shaft J, ratchet-wheel l, pawl p, case o, cam q, levers I and S, and springs w^3 w^3, of the cocoon-holder, shaft N, ratchet-wheel X, pawl t^2, slide t', spring T, and connection t between the lever I and slide t', substantially as and for the purposes set forth.

Signed by me this 4th day of April, A. D. 1884.

EDW. W. SERRELL, JR.

Witnesses:
I. P. A. MARTIN,
A. GERVAIS.