Sheet 1. 2 Sheets.

J. D. Butler.

Braiding Mach.

No. 86,642. Patented Feb. 9, 1869.

Fig. 1.

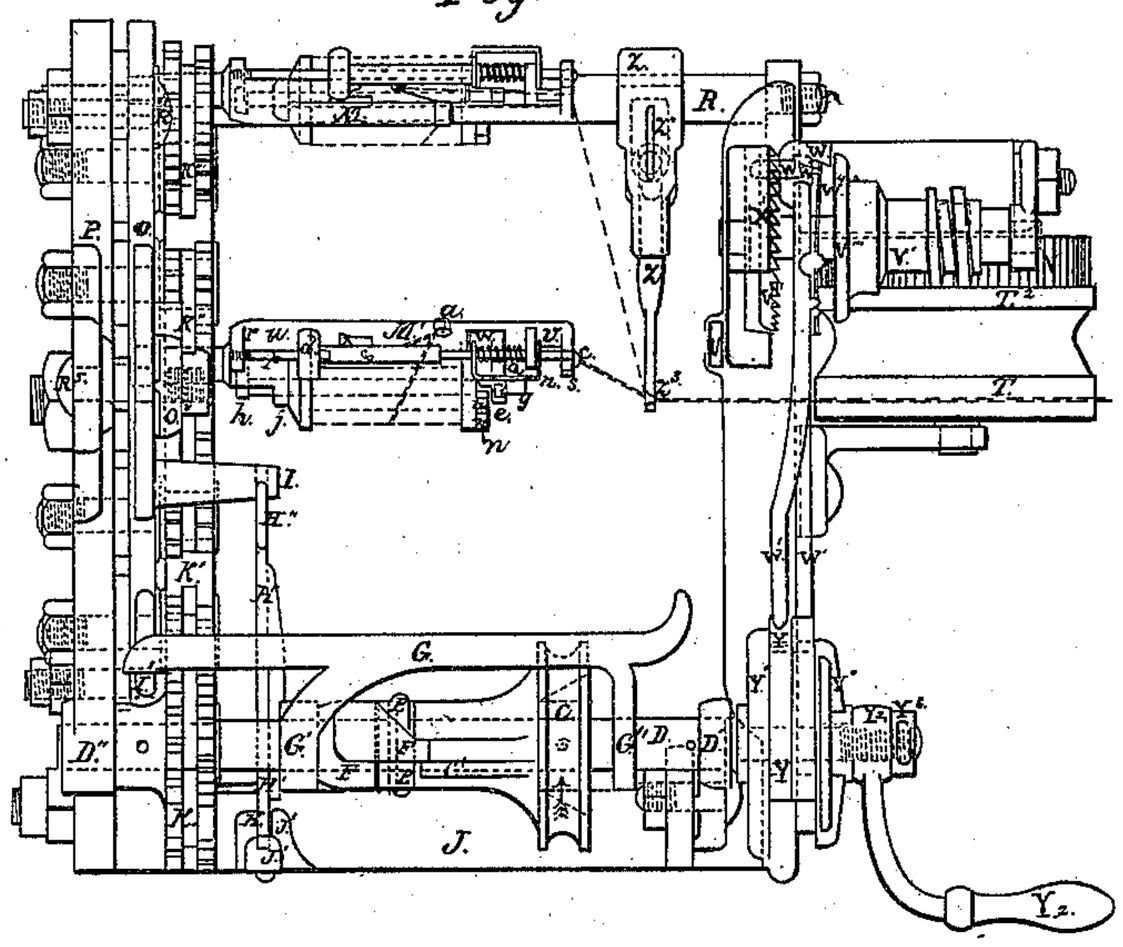


Fig. 11.

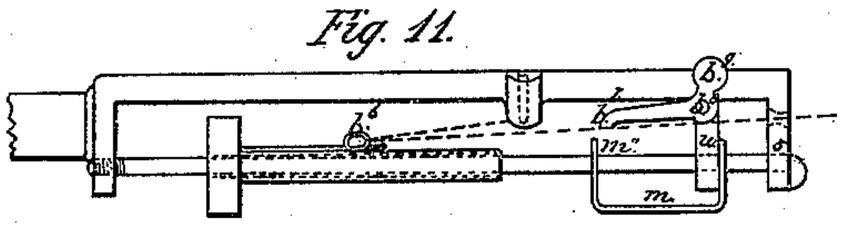


Fig. 4.

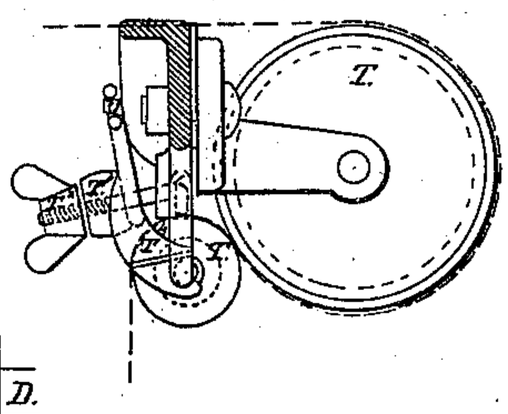


Fig. 10.

Fig. 3.

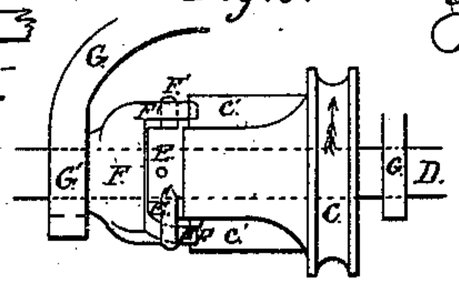


Fig. 9.

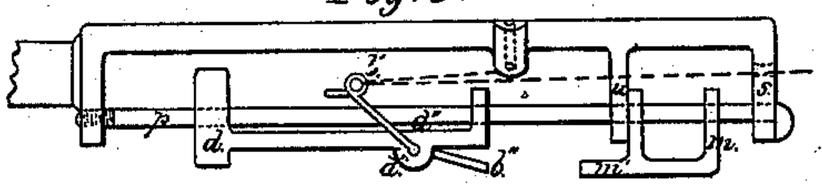
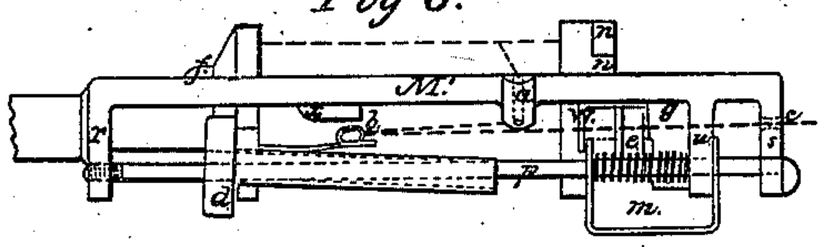


Fig 8.



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Braiding Mach.

No. 86,642. Patented Feb. 9, 1869.

Fig. 2.

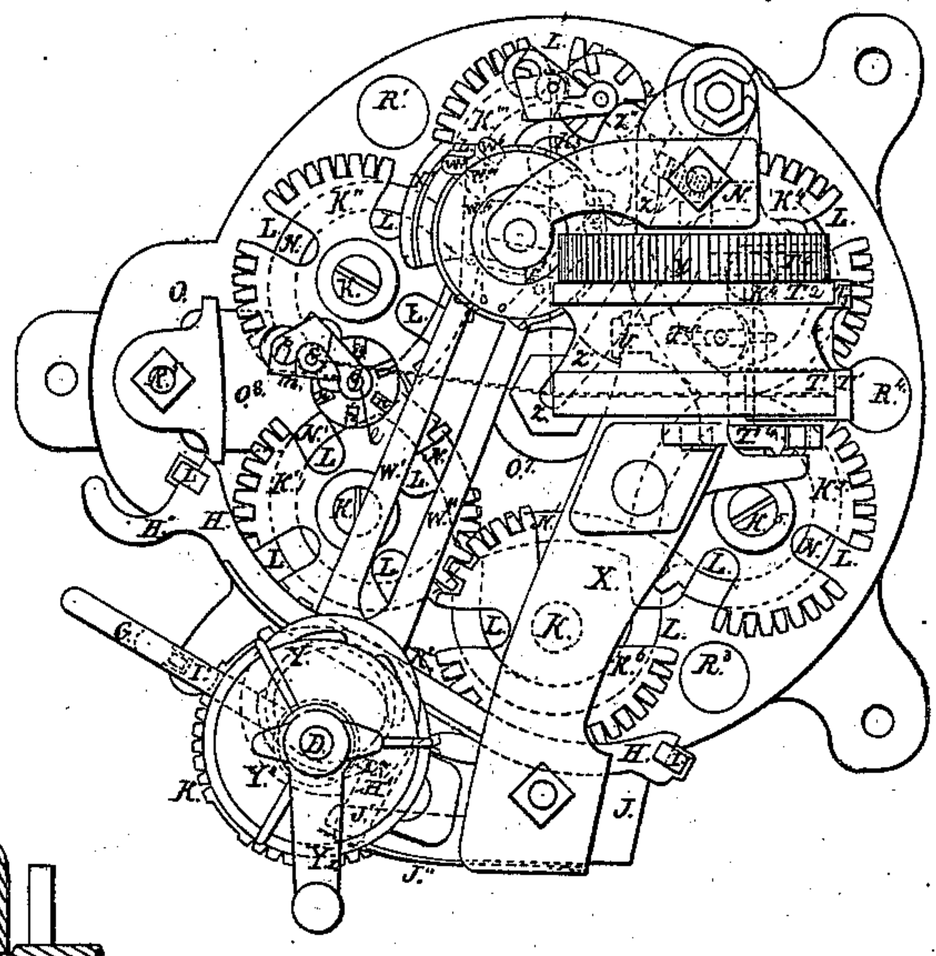


Fig. 7.

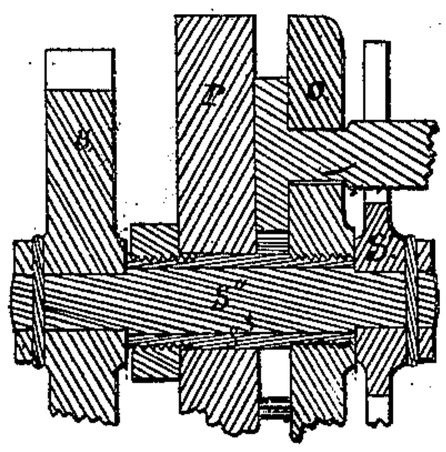


Fig. 6.

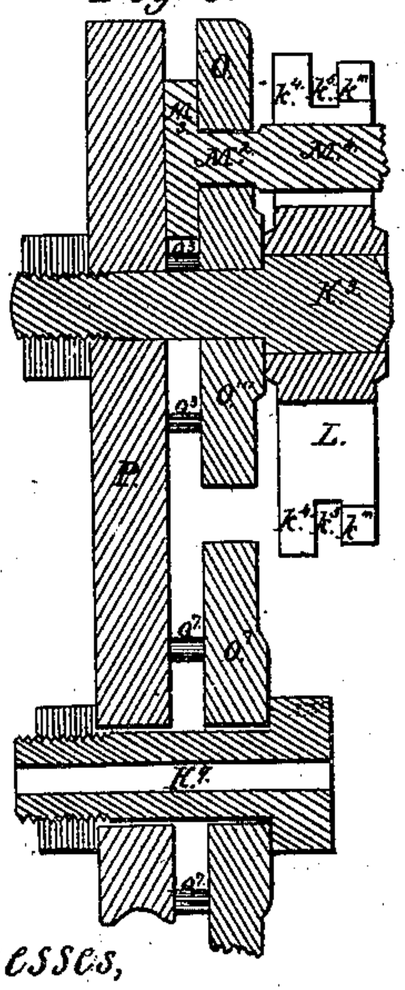
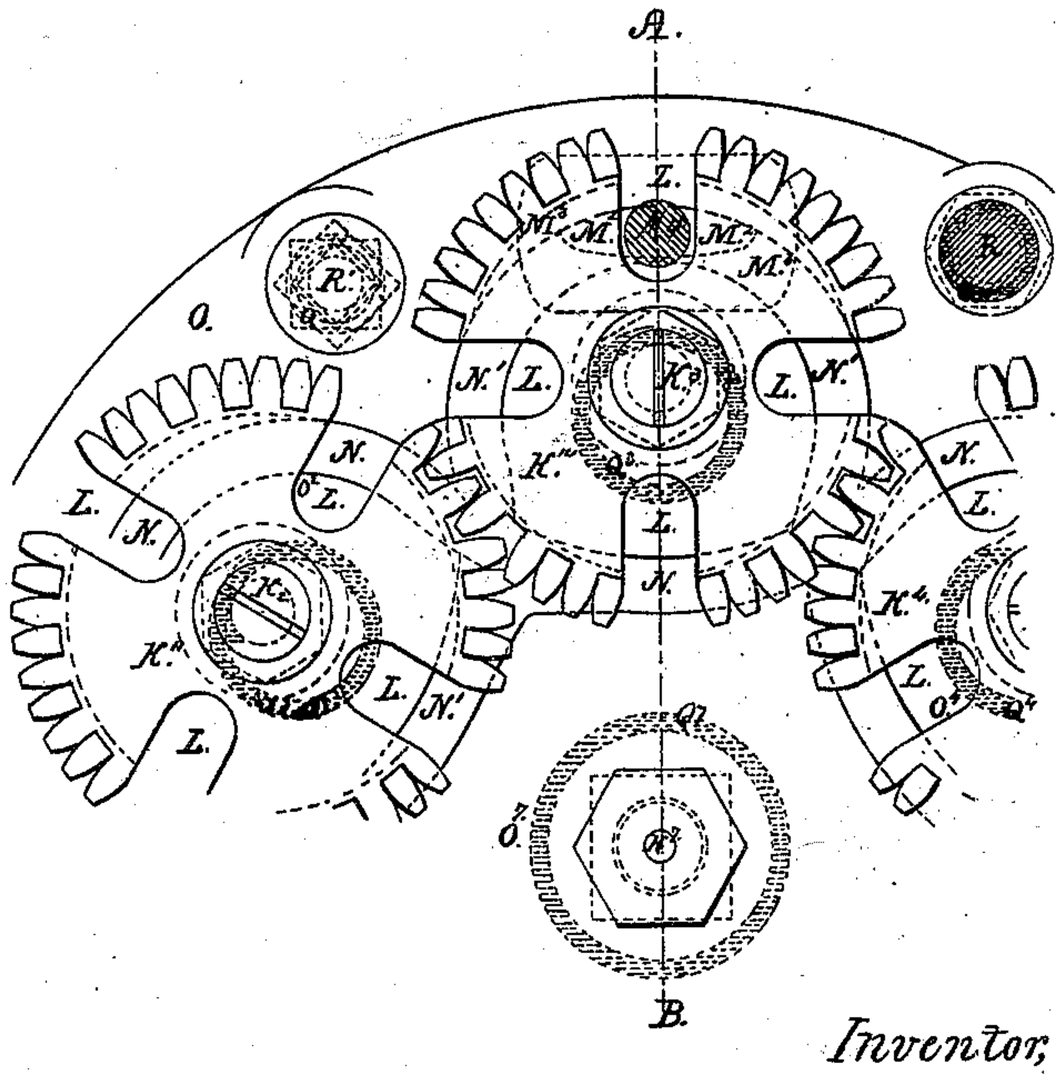


Fig. 5.



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JAMES D. BUTLER, OF LANCASTER, MASSACHUSETTS.

Letters Patent No. 86,642, *dated February* 9, 1869.

IMPROVEMENT IN BRAIDING-MACHINE.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, JAMES D. BUTLER, of Lancaster, in the county of Worcester, and State of Massachusetts, have invented a new and improved Braiding-Machine; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is a front view of the machine, as laid upon its side;

Figure 2, a top view;

Figure 3, a side view of the driving-coupling arrangement;

Figure 4, a side view of the take-up and binder-rolls;

Figure 5, a detailed plan of the plates, travellers, and gears;

Figure 6, a vertical section through A B of fig. 5.

Figure 7, a vertical section, corresponding to fig. 6, of a modified form of the arrangement;

Figure 8, a partial vertical projection of one of the travellers; and

Figures 9, 10, and 11, partial vertical projections of the traveller, showing different forms of the tension-weights, spool-catches, &c.

Figs. 1, 2, 3, and 4, are drawn on a scale one-half that of figs. 5, 6, 7, 8, 9, 10, and 11.

This machine is of the class in which threads running from different spools are braided together by the proper motion being given to these spools, either as a covering to one or more cords, or simply upon each other. To secure the means of accomplishing this work in a more convenient and satisfactory manner than it has heretofore been done, is the object of my invention.

Although the particular machine represented is adapted to twelve travellers, or spool-carriers, but two of these are given, there being no novelty in their relative movements, and a representation of more tending only to confuse.

The grooved pulley C, figs. 1 and 3, turns loosely upon the shaft D, in the direction indicated by the arrows.

This shaft runs in bearings D′ D″, and through it the machine is set in motion.

All that is necessary, therefore, to start the machine, is to engage the shaft with the pulley, which is supposed to be always in motion.

This engagement is accomplished through the collar E and clutch F.

The collar E is fast upon the shaft, while F is loose, having a sliding as well as rotating movement upon it.

As represented in the drawing, the clutch has engaged E and C, by being raised so that its horns F″ F″ bear each, on the one side, against the wings C′ C′ of the pulley, and on the other, against the arms E′ E′ of the collar.

When the horns on the clutch have fallen away from contact with the wings of the pulley, the engagement of the pulley with the shaft is broken, and the machine stops.

The bringing up again of the clutch starts the machine.

This style of coupling is not new, and almost any other form can be used in place of it, including friction-couplings. The arrangement and construction of the parts for working the coupling, however, are new. Heretofore it has been customary to work the coupling by a lever, upon which the sliding hub of the coupling rests. In this case, this hub is supported upon the starting-handle G, which is represented as sliding upon the shaft D at G′ and G″, the groove I′, in which it also runs, serving to keep it from turning about the shaft.

The advantages in the use of a sliding starting-handle instead of a lever, consist in its compactness and simplicity. It would answer to have the handle guided in any other way than upon the shaft D.

When the handle is raised, in starting the machine, a bar, H, slides, so as to bring the projection H′ on it under the spur G‴ on the handle.

To allow the starting-handle to fall, and the machine to stop, it is only necessary to push the bar H to the right, by the handle H″, a sufficient distance to move H′ out from under G‴.

The handle is kept from falling too far by the main part of H, upon which G‴ strikes, when it falls from H′.

The bar H is supported in the posts I and I, and the bracket J′ of the standard J, as shown in the drawing.

The shoulders on the bar, striking against the posts I and I, limit the motion of the bar in the one direction, and H′ striking against J′ in the other.

The spring J″ tends to move H′ under G‴, and to keep the bar against the posts.

The gear K is fast upon the shaft D, and, of course, turns with it.

It is connected with the gearing K′ K″ K‴ K^4 K^5 K^6, and gives motion to these wheels, which turn loosely upon the studs K^1, K^2, K^3, &c.

In the gears are the slots L L, &c., which serve to drive the travellers around in their tracks N′, N, &c., N′, N′, &c., the stems of the travellers being caught by and carried in these slots as the gears turn.

It is not necessary to point out the order in which the travellers follow each other, or the direction which they take in the tracks N, N, &c., N′, N′, &c., there being nothing of novelty in these general features.

M_1, figs. 5 and 6, is the stem of a traveller, in the slot L of the gear K‴.

M_2 is the upper part of the foot of the traveller, so shaped as to run in the groove, N′, N′, &c.

M_3 is the lower part of the traveller-foot, and bears on its under side upon the bed-plate P of the machine, and on its upper side against the guide-plates O, O‴, O^7, &c.

This part M_3, being held between the plates, the traveller is kept in an upright position as it moves.

The guide-plates O, O‴, O⁷, &c., are attached to the bed-plate P, by bolts passing through each of them, and it, and the bed and guide-plates, are kept the proper distance apart, by collars between the plates.

For O, the bolts are those marked R^1 R^2 R^3 R^4 R^5, fig. 2.

The lower end of the standard R also serves the same purpose.

R^5 also passes through the piece marked O^8, figs. 1 and 2, which piece may be taken off when the bolt is unscrewed, leaving an opening through which the travellers may be taken out of or put into the machine. The collars to keep O the proper distance from P are represented at Q Q, fig. 5.

For the plates O‴, &c., the gear-studs serve as bolts, and the collars Q‴, &c., to keep them the proper distance from P.

For O^7, the bolt K^7 and the collar Q^7 are used.

These collars, between the bed-plate and each of the plates bolted to it, being of the same length, make a space of uniform width all around, for the lower part, M_3 of the traveller-feet.

The form of the traveller-foot and stem M_3 M_2 M_1 is not new, and the guide and bed-plates, while modified in details of construction, are, in general, like such as have been heretofore used. In connection with them, however, there has never yet been a convenient arrangement for driving the travellers around the machine. But the use, in combination with these, of the slotted gears K′, K″, &c., seems to supply what is needed. Slotted gears are at present in use in other combinations, and the feature of novelty which I claim setting forth, consists in the combination of these gears with travellers in which the stem M_4, or its equivalent, against which the gears act, is between the bearing-foot M_2 M_3 and the main part of the traveller. And this applies as well if the bed and guide-plates have curved, instead of plain faces, as shown.

The taking out of the teeth of the gears in making the slots has had a tendency to impair somewhat the smooth running of the wheels. To relieve this difficulty, I make two rows of teeth on each gear, the one above the other, and with the teeth in one row opposite the spaces in the other. Gears with a single row of teeth, however, may answer.

An open space is left between the two rows, in order that, with the rough workmanship which is allowable for such machinery, there may be no interference of each row with the working of the other, as they act upon the adjoining wheels.

In fig. 6, k''' shows the upper row of teeth, k^5, the space between them, and k^4, the lower row.

The modified form shown in fig. 7 consists of the gear S (which is of the ordinary style, having teeth all around) and the driving-plate S′, both attached to the same stud, S″, turning in the tube S^3, this tube also serving as a bolt, to fasten the plates together, as clearly shown in the drawing.

The braided cord passes over the take-up roll T, figs. 1, 2, and 4, and is held between it and the binder-roll T′, this binder-roll being pressed against the other by the thumb-nut T″, acting, through the rubber spring T^3, upon the frame T^4, in which the binder-roll has its bearings.

The roll T^6 is part of T′, and bears against T_2, which is part of T. Therefore, as T is turned, T′ is turned, through the action, as friction-gears, of T_2 and T^6.

It is found that T′ will not be turned by T directly, inasmuch as the cord between them will slip upon one or the other. Between T_2 and T^6, however, there is nothing to interfere with the action, as explained.

The frame T^4 is supported at two points only, viz, T^3 and U, and may, therefore, rock about the line connecting these points, so adjusting itself that the pressure of T^6 upon T_2 shall be proportionate to the pressure of T′ upon the cord, and, through it, upon T, whatever the size of the cord may be.

It is now quite customary to have toothed gears between the two rolls, corresponding to the friction-gears T_2 and T^6.

The worm-wheel V is part of the same piece with T T_2. It is moved by the worm V′, upon the same shaft with which is the ratchet-wheel V″, acted upon by the eccentric-rods W′ W″, which catch upon the ratchet by means of pins in their ends.

These two rods being alike, it is sufficient to refer to one of them as W′.

At the end of this rod is a hub, in which the pin W‴ slides loosely, being kept against the ratchet-teeth by a spring, W^4, bearing against its upper end.

Near the hub is a projection, W^6, which, being underneath the rim V‴, keeps the rod from lifting.

The rod is kept from falling by the ratchet-wheel, upon which it slides.

Outside of the ratchet-wheel is a stationary rim, X′, which is shaped to a curve concentric with the wheel.

In the space between this rim and the wheel runs the spur W^5, projecting from the hub on the rod, thus guiding the end of the rod, and keeping the pin upon the ratchet.

As the rod reciprocates, the wheel will be moved from right to left.

The rod W″ has the same motion with W′, being moved by the same eccentric, Y, and, as it acts on the opposite side of the wheel, the one gives motion to the wheel, while the other is sliding back over the ratchet-teeth, so that, in every stroke, either to the right or left, one or the other rod is acting upon the wheel, and through the worm and worm-wheel, upon the take-up roll.

The ring Y, acting as an eccentric, is held between the two plates, Y′ and Y″, on the shaft D.

The plate Y′ rests upon a shoulder on the shaft, as shown, and Y″ is pressed upon the upper side of the ring, pinching it between itself and Y′, by screwing down upon it the crank-handle Y_2.

This handle also serves for turning the machine by hand.

Y_3 is a check-nut for Y_2.

When Y_2 is unscrewed, the eccentric may be slid between Y′ and Y″, and so set as to give any required stroke.

When set, it may be fastened by again screwing down Y_2 upon Y″, as explained.

It will be seen that the eccentric must have a hole larger than the shaft D, since, otherwise, it could not be slipped between the plates, to vary the stroke.

As the eccentric has a greater or less stroke, the ratchet-wheel and take-up roll will be moved a greater or less extent, thus giving a more or less rapid rate of taking up the cord. The take-up is, therefore, adjustable by simply changing the stroke of the eccentric, as explained.

Of course the take-up will be intermittent in its action, the points of rest being at the dead-points of the crank in the eccentric-motion.

To work with theoretical perfection, a regular movement for the take-up is required, and such has been attempted in the machines heretofore used. It is found, however, that, practically, the variation from a regular movement, in the intermittent action described, is of no account, while there are very obvious advantages connected with the plan, consisting in convenience of construction, and the ease with which the rate of taking up is varied, because of the greater facility with which, in general, the extent of reciprocating, as compared with the rate of rotating motion, is changed.

Of course there is an opportunity to vary considerably the details, and yet have what is, in all essential points, substantially such a mechanism as I have

described. For example, the connection between the wheel and rods, instead of being by a ratchet and pins, might be by a friction-clamp; or the rods might be moved in any other way than by an eccentric; or one rod only might be used.

What is of consequence is the connection of a reciprocating part with the take-up roll, in the general manner indicated.

In some kinds of braiding, it is customary to use a guide for the cord, which shall be set just above the braiding-point. This point varies with the different sizes of cord made, and consequently the guide should be adjustable.

The particular arrangement which I use is shown at Z Z′ Z″.

The part Z has a jaw, the inside of which bears upon the standard R, and the inner end of which has projecting lugs, between which Z′ fits loosely. Z′ bears upon the other side of R.

These two pieces are drawn together by the thumb-screw Z″, which passes through Z, and is tapped into Z′.

As Z and Z′ are thus brought together, they pinch the standard R between them, and so hold upon it.

In the end of Z′ is a hole, Z‴, through which the cord passes.

The hole in Z for the thumb-screw, being slotted in the direction of the length of the bar, allows Z′ to be moved in this direction, the point Z^3 being thus brought nearer to or carried further from R, as may be required.

The guide may also be slipped in the direction of the length of the standard R, or turned about it as an axis. An opportunity is thus given for adjustment in any direction.

The tightening of the thumb-screw fastens the whole as set.

This combination of the two pieces, bearing on opposite sides of the standard, and the thumb-screw, makes a very convenient arrangement.

The travellers M and M′ are alike, except that they are right and left, the one running in the one track around the machine, and the other in the other.

Of the travellers not shown, those running in the track with M are like it, and those with M′, like it.

In explaining the construction of the travellers, it will be sufficient to refer to one of them as M′.

The red lines show the thread as wound upon the spool, and running from it through the hole, *a*, in the upright part of the traveller; from *a* through the hook *b*, on the weight *d*, sliding upon the rod *p*; from *b* through the hole *c*, in the top of the traveller; and from *c* to the braiding-point, near Z^3.

The weight *d* corresponds to one used on all braiding-machines to take up the slack of the thread, when the traveller, in following its track, comes nearer the centre of the machine, thus lessening the distance from *c* to Z^3.

The weight of *d* regulates the tension of the thread.

The spool turns upon the loose spindle *g*, which passes through the ears *f* and *e*, and rests upon the projection *h*.

The spool is supported upon *f*.

The delivery of the thread from the spool is regulated through the notches, *n n*, on the spool, and the catch *m*.

This catch slides upon the rod *p*, and, by its own weight, and the action of the spiral spring *q*, is kept caught upon *n n*, preventing the spool from turning.

When, however, in the running of the machine, the supply of thread becomes insufficient, the weight *d* will be lifted against the catch, and raise it from the notches, allowing the spool to turn, and deliver the thread needed.

It may be thought that the weight of *m* is sufficient to keep it caught, so that the spring *q* will not be needed.

When the thread breaks, the weight *d* drops upon the ear *r*, and, as the traveller passes the bar H, the weight strikes against this bar, crowding it back, thus stopping the machine, in the manner already explained.

The use of the distinct slide-rod *p* is a feature of considerable importance.

Heretofore it has been customary to have the tension-weight slide upon the upright part of the traveller proper, or in a hollow spindle of the spool. The latter form is inconvenient, and, with the other, it has been found necessary to have the upright part upon which the weight slides of considerable size, as it has had to guide the thread from its upper end, at a point corresponding with *c* and at another corresponding with *a*. It has been inconvenient to finish this upright, and so the weight has slid upon a rough surface. Besides this, the weight has been clumsy, and of undesirable shape, it having been necessary to adapt it to the slide.

The slide-rod *p*, separate from the upright part of the traveller proper, and from the spool-spindle which I use, passes through the ear, *s*, of the traveller, and is screwed into *r*. It also passes through *u*, getting no bearing upon it, however. Being supported at both ends, and having nothing to do but to guide the weight and catch, it may be quite small, and, if desired, of wire, as represented, which is smooth and well adapted for a slide. With this arrangement the weight can be made of convenient form.

The style represented consists of a tube, loosely enclosing the wire, with a bulb cast upon its lower end, and a steel-wire hook upon its side, for the thread.

Now, the details of these parts may be considerably varied, but I consider it essential to the best arrangement that there be used a slide-rod for the weight, separate from the upright part of the traveller proper, and from the spool-spindle.

It is believed that the advantages arising from the use of such a rod, from the nature of the case, have been set forth with sufficient clearness. And it is not intended to confine the invention to the use of this distinct slide-rod, in connection with any particular form of traveller, since it has advantages which are independent of exact details.

It may be thought in some cases sufficient to support the slide-rod at one end, but in general it will be better to hold it at both ends, as described.

It has been explained that the delivery of the thread from the spool is accomplished through the lifting of the catch *m*, by the tension-weight *d*. Considerable difficulty, however, has been experienced in this direction, arising from the fact that in the rapid running of the machine, the weight would, because of the momentum it had acquired, continue to rise after the thread had ceased to draw, and, striking upon the catch, let off thread from the spool when it was not needed, and could not be taken care of.

Now, to meet this most serious difficulty, I make an arrangement, in which the tension of the thread directly controls the action of the weight upon the catch independently of the momentum of the weight.

The particular form which I prefer will be made plain by a reference to fig. 8.

The hook *b* being on one side of the weight, the latter hangs at an angle, tending to bear at the upper end of the tube, on the side adjoining the hook, and at the lower, on the side opposite the hook.

It will be seen that between the end of the ear *w*, which is fast to the traveller proper, and the rod *p*, there is a space a little more than the thickness of the tube. If, then, the tube is bearing against the rod on the side adjoining the ear, it will pass by the latter, and strike upon the catch, letting off the thread.

Now it has just been explained that when the thread draws, it will keep the top of the weight-tube against the rod, on the side adjoining the hook, which is the one adjoining the ear. It is therefore plain that the weight-tube will, when drawn by the thread, pass by

the ear without touching it, and, acting upon the catch, will let off the thread as may be desired. If, however, the thread ceases to draw before the weight-tube has reached the ear, there will no longer be a tendency to keep the tube against the rod on the side next the ear, so that it shall pass by the latter, and in general it will strike against the ear, instead of passing it, and acting upon the catch.

In order to prevent the tube from passing the ear by accident, when it is carried by its momentum, a projection, x, is made upon the traveller, against which one side of the weight will strike with sufficient force to make a very decided movement of the upper end of the tube against the outside of the rod, and under the ear.

The projection x must be so small that the weight can pass along by the side of it as it slides upon the rod.

Figs. 9, 10, and 11, show modified forms of mechanism for controlling the action of the tension-weight upon the spool-catch.

In fig. 9 the thread is shown as passing through the wire hook b'. This hook, instead of being fast upon the weight, swings in an ear, d', upon it.

b'' is the other end of the wire.

The projection d'' on the weight limits the motion of the hook upon the weight in the one direction.

When the thread draws upon b', in lifting the weight, the end b'' is thrown out, so that it will strike against the projecting part m' of the spool-catch, and lift the catch, letting off the thread.

When, however, the thread ceases to draw upon b', the end b'' will swing against the side of the weight, and pass m' without touching it.

In fig. 10, the hook b^3, through which the thread passes, is fast to the weight.

A wire, b^4 b^5, swings in the ear d^3 on the weight. One end, b^4, of this wire bears against the thread, as shown, and the other end, b^5, serves the same purpose as b'' in fig. 9.

When the thread becomes slack, through the jumping of the weight, b^4 being unsupported, falls, swinging b^5 clear of the spool-catch.

In fig. 11, the piece b^7 b^9 swings upon a pin, b^8, on the traveller.

b^7 bears against the thread, as shown.

b^9 serves as a weight to keep b^7 against the thread.

If the thread become slack, b^7 swings, so as to catch upon m'', and thus prevent the catch from lifting, even though the weight jump against it.

Another form would be to have the spool-catch guided laterally by the thread, so as to be carried in or out of line with the tension-weight, or under a shoulder, which would keep it from lifting.

These different forms of the arrangement for controlling the action of the tension-weight and spool-catch are only specimens of the great variety of shapes which the invention may take. They are, perhaps, sufficient to call attention to the comprehensiveness of the invention, which includes regulating the horizontal movement of either the tension-weight or the spool-catch, or a latch or spur, acting upon either, by the tension of the thread, to prevent the moving of the catch by the weight, when the thread has ceased to draw, substantially in the manner and for the purpose set forth.

It is evident that this part of the invention may be applied to travellers of the general form heretofore used.

The improvements included in this invention are equally applicable to the different styles of braiding-machines used, including those for making flat braid.

The modifications required will be plain to any one familiar with such machines.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of the slotted gears with travellers, constructed substantially as described.

2. The slotted gears, provided with a double row of teeth, substantially as described.

3. The combination of the traveller with mechanism, substantially such as described, or its equivalent, for preventing the movement of the bobbin-detaining catch by the irregular or unseasonable action of the weight, as set forth.

4. The combination and arrangement of the take-up, and friction-roll T T_2, the binder and friction-roll T^1 T_3, and the rocking-frame T^4, constructed and operating substantially as described.

5. The compound adjustable bar Z Z′ Z″, constructed as and for the purposes described.

6. The sliding starting-handle G, in combination with the driving-coupling and the tipping-bar, with its holding spring, constructed and operating substantially as described.

JAMES D. BUTLER.

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