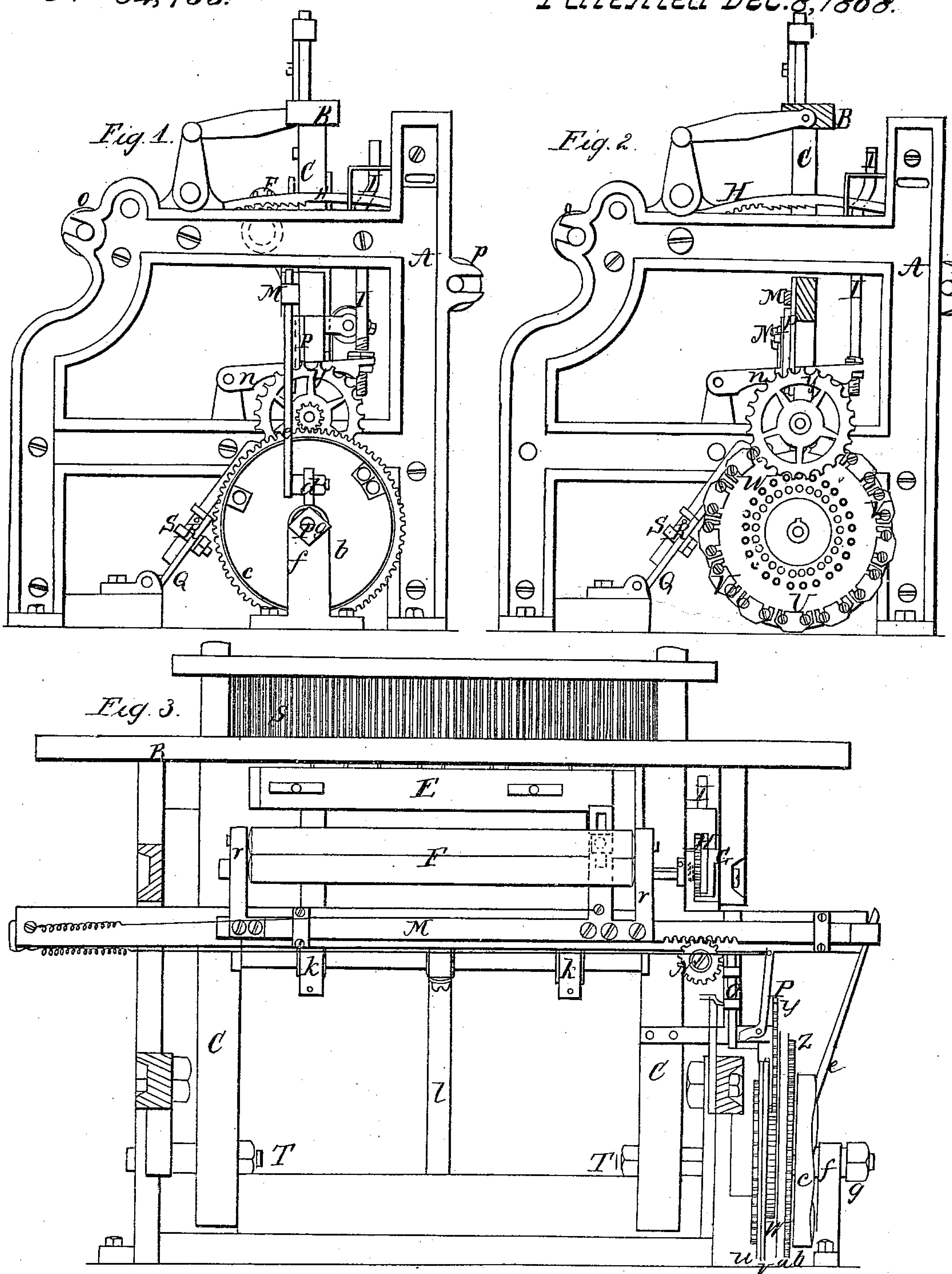
Sheet 1. 3 Sheets.

F. W. Newton.
Lannet.

No. 84,753. Patented Dec. 8, 1868.

Fig. 1. Fig. 2. Fig. 3.



Witnesses,
W. McCoatey
A. C. Jackson

Inventor
Fredrick W Newton

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

Sheet 2 - 3 Sheets.

F. W. Newton.

Lamp.

No. 84,753. Patented Dec. 8, 1868.

Fig. 4.

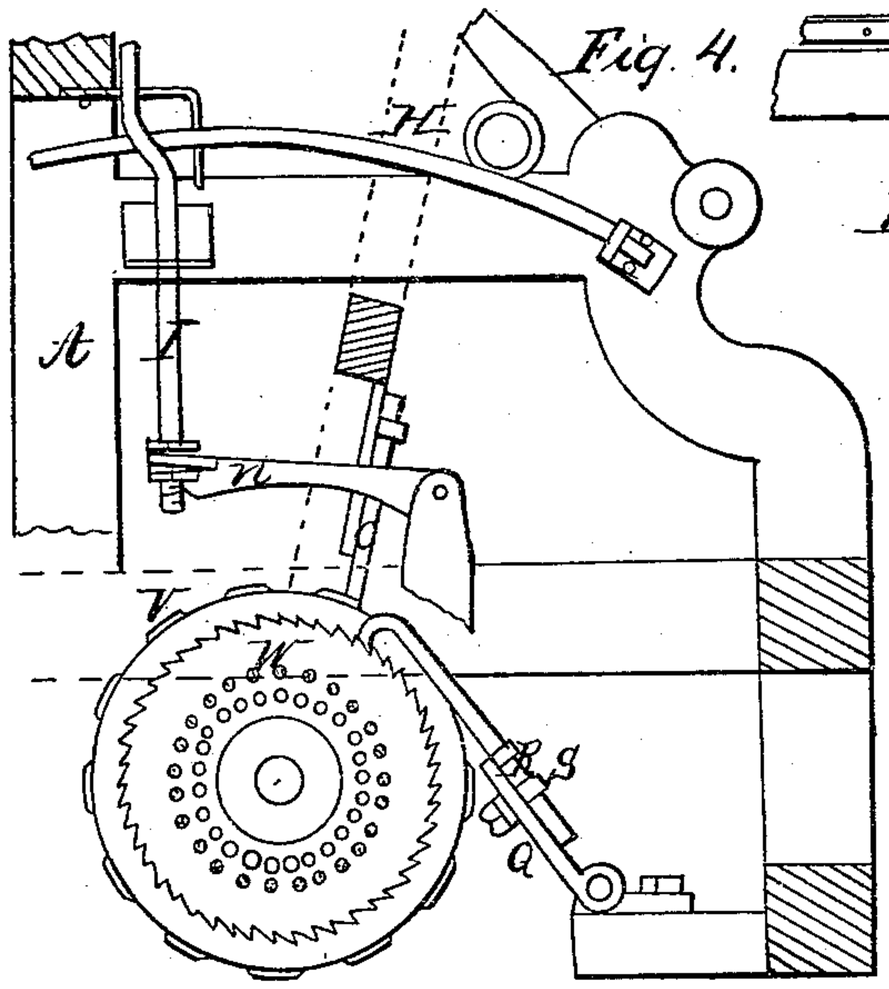


Fig. 9.

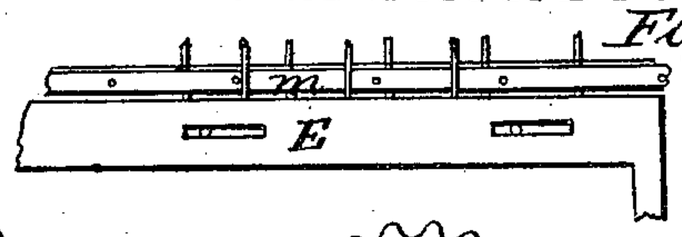


Fig. 10.

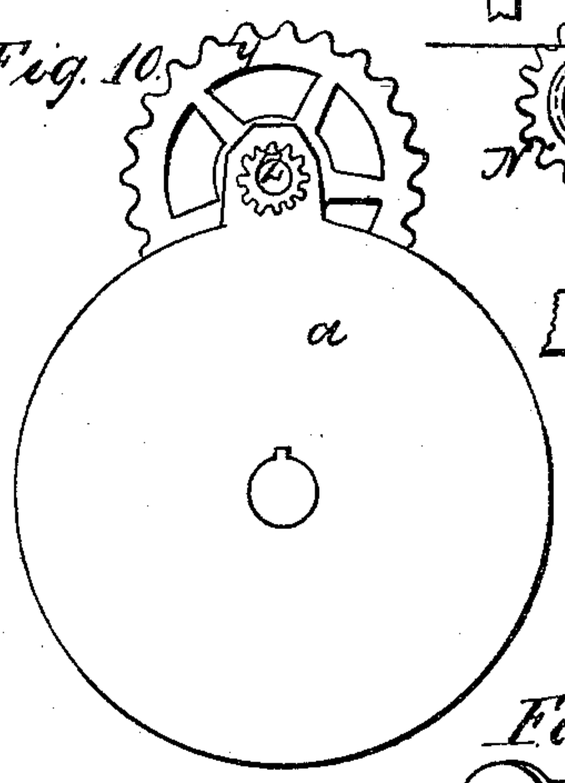


Fig. 12.

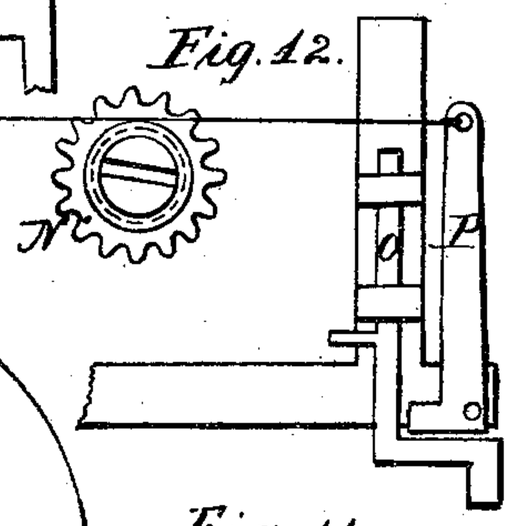


Fig. 11.

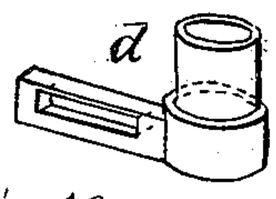


Fig. 16.

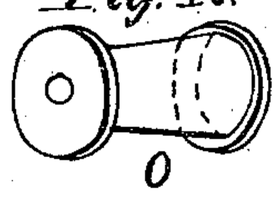


Fig. 6.

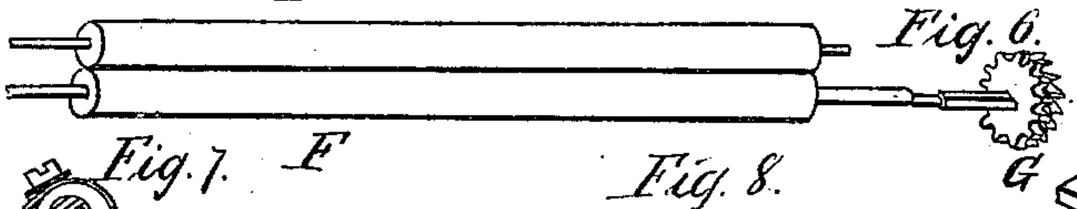
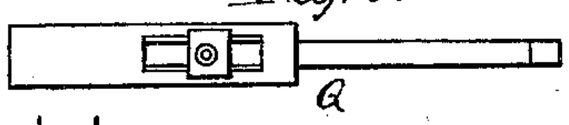


Fig. 7.

Fig. 8.



H Fig. 13.

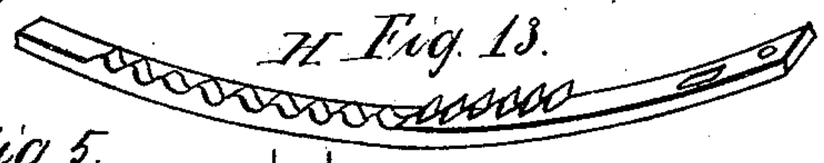
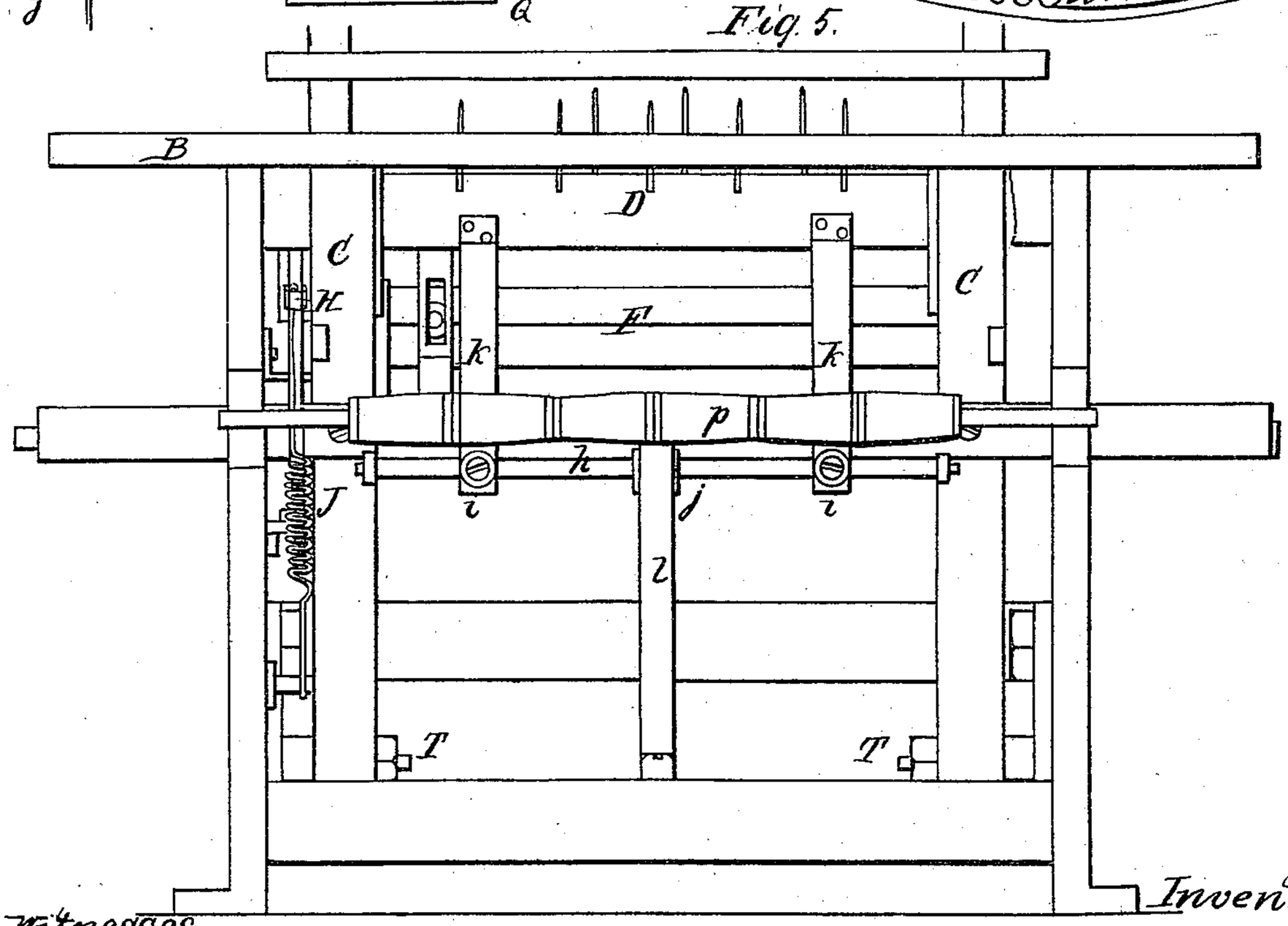


Fig. 5.



Witnesses,
H. McGate
A. Jackson

Inventor,
Frederick W. Newton

Sheet 3. 3 Sheets.

F. W. Newton.

Lancet.

No. 84,753. Patented Dec. 8, 1868.

Fig. 14.

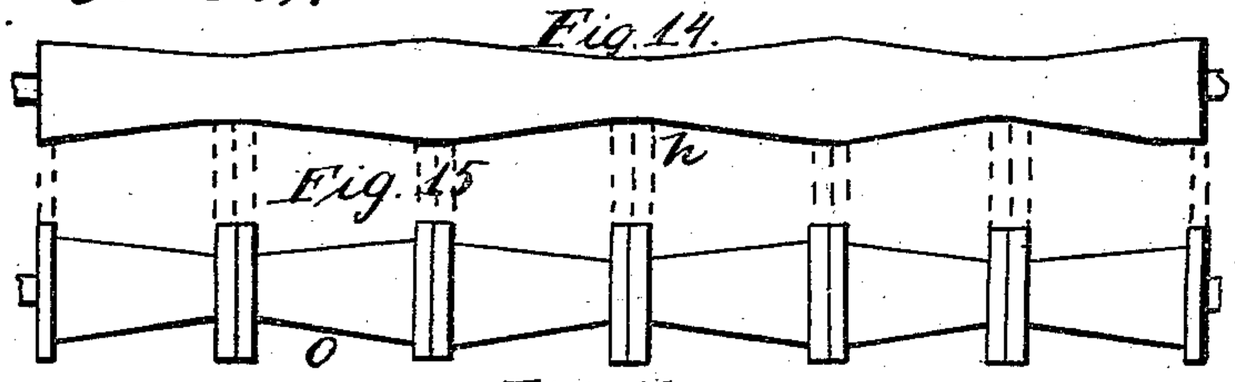


Fig. 15.

Fig. 18.

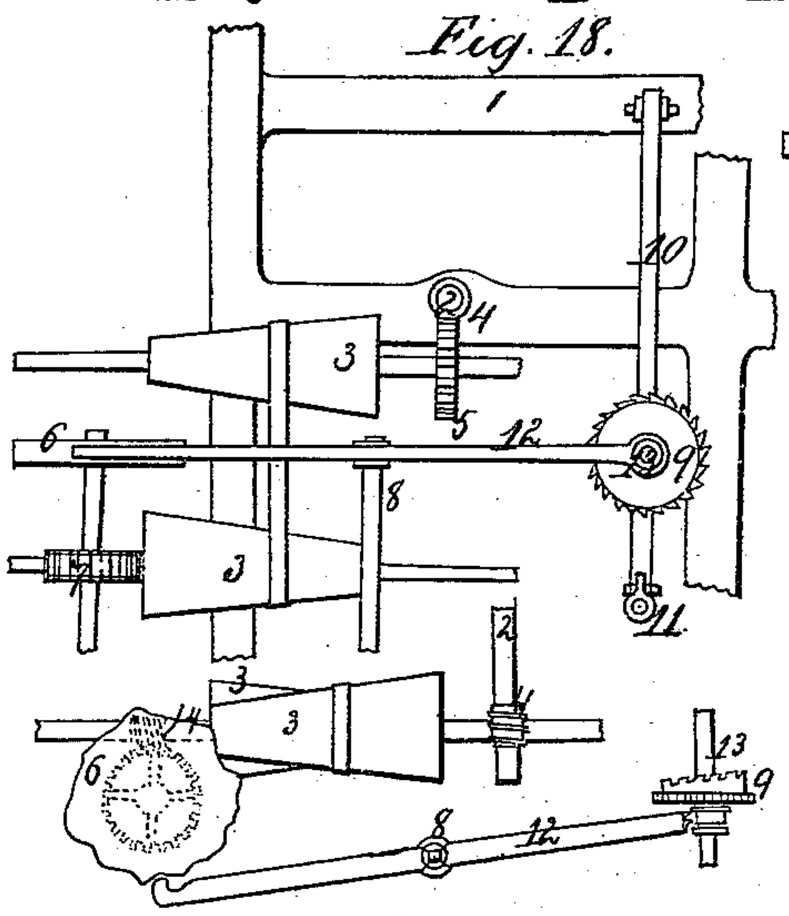


Fig. 19.

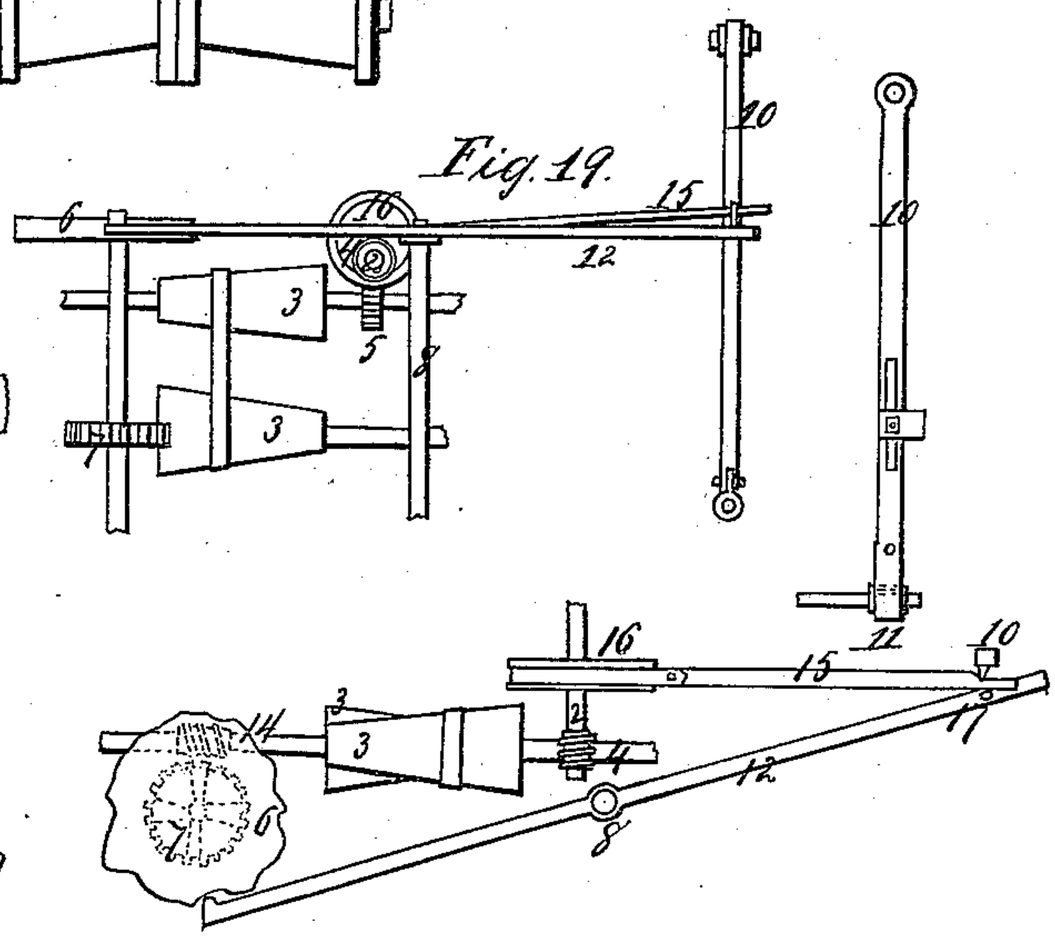
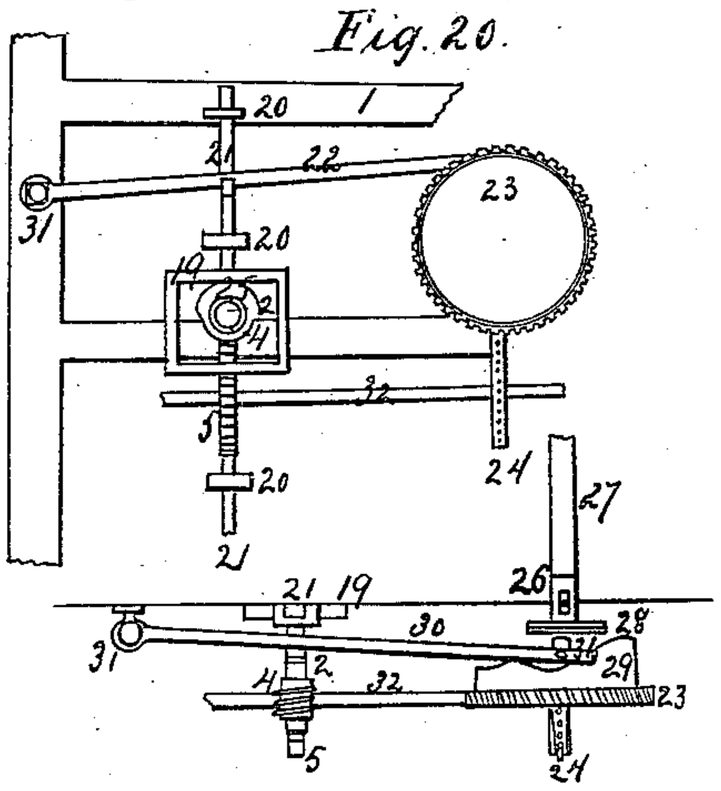


Fig. 20.



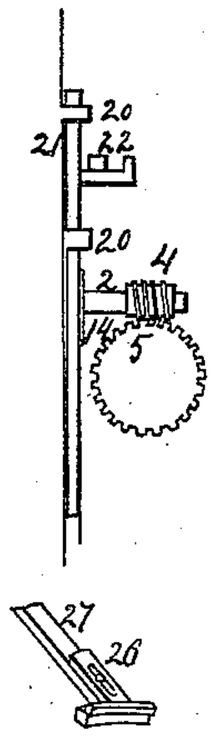
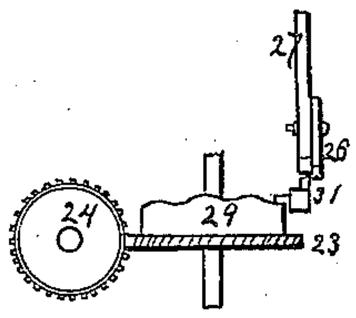


Fig. 21.



Witnesses,
H. M. Coates.
A. C. Jackson

Inventor,
Frederick W. Newton

United States Patent Office.

FREDERICK W. NEWTON, OF SOUTH ORANGE, NEW JERSEY.

Letters Patent No. 84,753, *dated December* 8, 1868.

IMPROVEMENT IN LAPPET OR EMBROIDERING-LOOM.

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

To whom it may concern:

Be it known that I, FREDERICK W. NEWTON, of South Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in the Fancy Power-Loom commonly known as the "Lappet-Loom;" and that this specification contains a full and accurate description of my invention, reference being had to the accompanying drawings, which form a part thereof.

The nature of this invention is the adaptation of the lappet-loom to producing, not only a better class of work than it has heretofore done, but also to the weaving of large and flowing figures, such as are suitable for the borders of gored skirts or dresses, either woven on the body of the garment, or separately, and attached afterwards.

The figures produced by the lappet-loom have heretofore been very limited in their longitudinal section, by the fact that in all lappet-looms run by power, the stitch-motion has been an adjunct of the pattern-mechanism, both the stitch and the pattern being generally made by the lappet-wheel, the scope of which was necessarily limited, and in adapting the loom to a class of work requiring a large circular or irregular figure, I have found it necessary to separate the stitching-mechanism from the pattern-mechanism, in order that the pattern-mechanism might have scope sufficient for the pattern desired. For this purpose I have found it essential that the two mechanisms be actuated by different powers, or by connecting them with the same power, but through intermediate gearing or other suitable attachment, so as to give each mechanism a motion distinct from the other.

My invention consists in means for giving the "whip"-yarns to the needles, in definite adjustable quantities, without tension, besides other arrangements and combinations of parts, which will be found hereinafter fully described.

In the accompanying drawings—

Figure 1 gives an end elevation of a loom, showing the position and connections of one arrangement of the pattern-mechanism.

Figure 2 is a sectional view, the pattern-wheel *b* and stud *a* being removed, showing the position and connection of one arrangement of the stitching-mechanism.

Figure 3 is a rear elevation of the lay, showing the position of the needle-bar and let-off rolls, and their connection with the pattern and stitch-mechanism.

Figure 4 is an obverse elevation of the ratchet-wheel *u*, showing its position and connection with the pawl Q, the lever *n*, wedge-bar I, and pins W.

Figure 5 is a front elevation of the lay, showing the position of the pin-bar and lifting-apparatus, together with the cloth-beam.

Figure 6 shows the friction-rollers and combined spur and ratchet G.

Figure 7 is a section of the lifting-rod *h* with the lifting-cam roller *j*.

Figure 8 shows the bottom of the pawl Q, with the position of the slot in which the bearing S is adjusted.

Figure 9 shows the position of the guide-strip *m* and its connection with the needle-bars and the needles and pins.

Figure 10 shows the stand *a*, with its connections with *y* and *z*.

Figure 11 shows the friction-sleeve *d*.

Figure 12 shows the operation of the friction-gear N, the stitch-lever P, and the stitch-bar O.

Figure 13 shows the under side of the compound rack H.

Figure 14 shows the cloth-beam *p* in juxtaposition with the conical spools *o*.

Figure 16 shows one of the conical spools detached.

Figure 18 shows an arrangement of the stitching and pattern-mechanisms, in which the pattern-mechanism is connected with the stitch-wheel by a lever.

Figure 19 shows another arrangement of the pattern-mechanism and stitching-mechanism.

Figure 20 shows still another arrangement of the stitching and pattern-mechanisms.

Figure 21 shows a device for expanding the conical spools and cloth-beam.

A is the frame of the loom.

B, the lay.

C C, the lay-swords.

D, the pin-bar and pins.

E, the needle-bar and needles.

F, the let-off rollers.

G, compound ratchet and pinion-wheel, to regulate the motion of the let-off rollers.

H, compound rack.

I I, double-wedge bar, to give motion to the rack H.

J, spring to hold the rack H against the compound pinión G.

M, traverse-bar with upright stand.

N, friction-gear, to give the stitch-motion to the traverse-bar M.

O, stitch-bar.

P, stitch-lever.

Q, sliding pawl.

R, pin that stops the slide in the pawl.

S, movable bearing for the slide in the pawl.

T T, bearings of the swords of the lay.

U, ratchet-wheel for making the stitch.

V, stitch-swells or teeth.

W, pins for giving motion to the spur-wheel Y.

Y, spur-wheel.

Z, pinion-wheel.

a, stand for supporting Y and Z.

b, pattern-wheel.

c, pattern-rim.

d, friction-sleeve and stand for the lever *e*.

e, traverse or pattern-lever.

f, bearing.

g, friction-nut.

h, lifting-rod.

i i, lifting-rollers.

j, cam-roller.

k k, upright bars for lifting the pin-bar and needle-bar.

l, lifting-strap.

m, guide for pins.

n, horizontal lever for moving the wedge-bar.

o, conical spools for the warp.

p, cloth-beam in conical sections.

r r, arms attached to the traverse-bar for the purpose of giving lateral motion to the friction-rollers F.

s, the reed.

The figs. 18, 19, 20, and 21, modifications of my invention, are hereinafter described.

The peculiar motion required for the formation of the embroidered figure in a lappet-loom is obtained from the operation of the pattern-mechanism, which, in the arrangement shown in the drawings, is placed upon the stud which forms the axis of the lay-sword, although I do not wish to be understood as being confined to placing the combined stitching and pattern-mechanisms, operating as described, upon this part of the loom.

The form of carrying out my invention, that I have shown in the drawings hereto annexed, consists of two wheels, U and *b*, placed side by side on the same axis, having intermediate gearing, and they are moved by the movement of the lay itself.

As the lay rocks back and forth, these wheels and stand rock with it, and the required motion is given by the action of the sliding pawl Q.

This pawl is fastened to the floor or frame of the loom, and is adjusted to take as many teeth in the ratchet-wheel U as may be wanted. If but one tooth is required, the slide-catch is adjusted by the pin R and the movable bearing S, so that the catch will slide out for the whole distance of the stroke of the lay, except one tooth, allowing the ratchet-wheel to go with the lay until the slide is stopped by the pin, which holds the ratchet during the remainder of the stroke

As the lay rocks back, the slide slips back by its own weight, or, if necessary, a spring may be attached, to insure its coming back.

If it is desirable to take two or more teeth, the slide is adjusted accordingly.

To make this arrangement work properly, it is better that the number of teeth in the ratchet should be such a number as will be divisible by the number of strokes that the lay would make in going entirely around and making a complete circle.

The lay ordinarily moves the twenty-fifth or twenty-sixth part of a circle at a stroke, and the number of ratchet-teeth must then divide by twenty-five or twenty-six, as the case may be.

In order to correct any lost motion that may occur, the bearings of the crank-arms might be so affixed to the lay that they could be raised or lowered.

Upon the ratchet-wheel U is a raised rim upon which are fastened the stitch-swells or teeth V. These swells must correspond with the number of teeth in the ratchet U in the proportion of one to two, one to four, one to eight, &c.

If it is desirable to make a stitch-movement at every pick, (the pawl being set for one tooth,) there must be one swell to two ratchet-teeth. If for every two picks, one swell to four ratchet-teeth, &c.

The swells are arranged with slots and fastened with screws, so that they can be adjusted as to weight, thereby enabling me to make stitches of unequal lengths. The swells may be of varied length, also, using a less number, and covering any desirable number of teeth in the ratchet. The swells may also be arranged on a chain, instead of on the rim of a wheel, thereby giving greater scope to the principle of varying the pattern by using stitches of different lengths.

Upon the side of the wheel U is placed a concentric row of pins W, which gives motion to the spur-wheel Y. The stud of this wheel passes through the stand *a*, and is there made fast to the pinion Z, which in turn moves the pattern-wheel *b*.

The spur-wheel Y may be changed for a larger or smaller one whenever it is necessary to alter the speed of *b*, in which case larger or smaller circles of pins must be arranged accordingly.

By the use of the pins W, I can not only vary the speed of the pattern-wheel, but I can give it an irregular motion, or keep it entirely still by removing a part or all of the pins from U.

Whenever the figure is formed, partly by the adjustment of the swells, to different heights, it will obviously be necessary that one revolution of the pattern-wheel *b* should be equal to some number of complete revolutions of the stitch-wheel U.

The stand *a*, which is a part of a disk, is made fast to the shaft T, by a key or steady-pin, but so as to slide on the key or steady-pin; and this stand, by its frictional contact with the wheel U, holds it from slipping when not positively moved.

This friction is regulated by the nut *g*, which presses against the sleeve *d*. This sleeve passes through the stand *f*, thus forming a bearing for the shaft T, and at the same time binding the whole together.

The placing the wheels U and *b* upon the same shaft, and gearing them together, or connecting them in any manner so that *b* takes its motion from U, is purely a matter of convenience and economy of room, as it is quite easy to arrange them so that they could be actuated by distinct powers.

The sleeve *d* has a vertical stand or projection, in which is a slot to receive a stud, which is the fulcrum of the lever *e*. This lever bears against the pattern-rim *c*, and is held in position by the action of a spring attached to the traverse-bar M, which draws the traverse-bar, and everything attached to it, towards the other end of the lay.

The pattern-rim *c* is movable, and is attached to the wheel *b* by screws. As the pattern revolves, its projections push out the lever *e*, and its depressions allow it to come back, thereby giving the needles the motion which makes the figure on the cloth.

By raising or lowering the fulcrum of the lever *e*, a greater or less traverse is given to the needles.

The lever *e* passes, at its upper end, into a slot or bracket in the traverse-bar M, giving it the outward motion. The inward motion is caused by a spring or weight.

The stitch-movement is caused by the stitch-bar O, the lower arm of which is lifted by the movement of the teeth or swells V. The upper side of this arm raises the heel of the stitch-lever P, and throws out its upright arm.

To this arm is attached a steel wire, either round or flat, which has a turn around the pulley N. When the lever P is at rest, the wire does not bind the pulley so tightly but that it will allow the pulley to slide in the bight of the wire without revolving; but as the lever P is drawn back, it tightens its hold on the pulley so much as to cause it to revolve sufficiently to move the traverse-bar as much as is necessary to form the stitch without interfering with its motion in shaping the figure. This wire is attached, at its other end, to a spring, so adjusted as to be at rest when the stitch-bar is down.

The bar O and lever P may be varied in shape or position, as practice may show to be desirable.

The stitch itself is formed by the lateral movement given to the needles by the stitch-gear N. As the needles fall down below the warp, the stitch-movement throws the needles under one or more threads of the warp, so that when the needles rise again, and the shuttle goes under the whip-yarn, it forms a stitch. The needles then drop, are thrown again the other way

under one or more threads of the warp, and then up, as before.

The stitch-motion may be made at every stroke, or every two or more strokes of the lay, according to the adjustment of the swells and the pawl Q.

The combination of the stitching-mechanism and the pattern-mechanism, with the other arrangements of the loom, may be effected in another manner, as shown in fig. 18.

In this figure, No. 1 is the frame of the loom; 2 is the cam-shaft, on which is placed a worm, 4, which turns the worm-gear 5. This moves the cone-pulleys, 33, which again transmits motion by another worm, 14, to the worm-gear 7. This worm-wheel is fast to the shaft of the pattern-wheel 6, which thus obtains a very slow motion, which is communicated by the lever 12 to the stitch-wheel 9, sliding or traversing this wheel on the stud 13.

The stitch-teeth of the wheel 9 operate on the bit or projection of the stitch-lever 10, which lever is made fast, at its upper end, to the loom-side. At the lower end it transmits its motion, through the universal joint 11, to the needle-bars, which are placed on the lay, as usual. Thus the stitch and pattern-motions are both transmitted through the stitch-wheel to the lever 10.

The wheel 9 is revolved on its shaft by a pawl, (made as broad as the traverse of the wheel requires,) which gives the stitch-motion, while the pattern-cam, 6, shapes the figure on the cloth.

Fig. 19 gives another plan of stitching. The pattern-mechanism is the same as in fig. 18, but in this arrangement I do not use the stitch-wheel at all, but instead of it I put an eccentric on the cam-shaft, just behind the worm, and to the strap of this eccentric I attach a stitch-bar, 15, which is pushed, by the eccentric, between the bit of the lever 10 and an upright pin standing near the end of the lever 12.

As the eccentric draws the bar 15 back, the bit of 10 slips from the broad to the narrow part of the lever 15, thus giving the stitch-lever the same motion that it has from the stitch-teeth, in the stitch-wheel 9, or from the operation of the stitch-swells V, in the stitch-wheel U, heretofore described.

The cone-pulleys regulate the speed of the pattern-cam 6, and thereby govern the length of the pattern on the cloth.

Fig. 20 gives another arrangement of the stitching and pattern-mechanisms, in which I dispense with the cone-pulleys. I place the worm, 4, on the cam-shaft, as before, and thereby move the worm-wheel 5; but instead of cone-pulleys, I use a pin-wheel, 24, to regulate the motion of the pattern-mechanism.

In the periphery of the wheel 24, I place a row of movable pins, which play into the slanting gear-teeth of the pattern-wheel 23. By this means, I obtain the effect of an adjustable worm-gear, as I can, by removing pins, change and regulate the motion of the pattern-wheel 23 at pleasure.

The stitch is made by the cam 18, which moves in the square frame 19, thereby raising and lowering the lever 22. This lever is hung on a bearing, made to allow the lever to be moved laterally and vertically. The movement of this lever is controlled by the upright bar 21 21, which is made square, and slides in the bearings 20 20 20.

The lever is held by a projection on the bar 21, which allows it to slide laterally as it is moved by the pattern-rim 29.

At the end of the lever is a projection, 31, and a pin, similar in arrangement and operation to that in fig. 19, except that instead of resting against an upright lever, 10, it presses against the end of the traverse-bar 27, which has a circular T-shaped end, to accommodate the oscillation of the lay, for it will be borne in mind that in this case the pattern-mechanism is not placed on the axis of the lay-sword, but on an independent stud.

On the upper side of the traverse-bar 27 is placed a sliding projection, 26, which rests over the T-shaped end of 27. At half the revolution of the cam-shaft the lever is up, and the bit 31 rests against 26; at the other half it is down, and rests against 27, thereby giving a regular reciprocating stitch-motion to the traverse-bar.

In all these forms and ways of carrying out my invention, the back motion is given to the needles by a weight or spring.

In all the arrangements described above, there are so many obvious ways of adjusting the length of the stitch, that I will not refer to them.

For the sake of convenience, the traverse-bar M, heretofore described, may be made shorter, and connected with the lever *e*, by the use of a chain; and by elevating and depressing this chain between roller-bearings, a stitch-motion may be made.

Also, in connecting the wheels U and *b*, a system of levers and ratchet-teeth, or an arrangement of belts and pulleys, might be used, instead of spur and pinion-wheels.

The traverse-bar M is, as I consider, a valuable novelty in lappet-looms.

In all lappet-looms heretofore, as far as I can learn, the whip or embroidery yarn has been delivered to the needles from a beam, or spools, or bobbins, while the tension has been regulated by friction, applied to the beam, or spools, or to the yarn itself, by sliding plates, or otherwise, merely to retain or hold back the yarn, but it has never been found possible to obtain, by such means, a uniform delivery. The consequence has been that the stitch has never been uniform or regular.

For this reason, lappet-work has always been an inferior class of work. It has long been seen that if a uniform stitch could be obtained, lappet-work would rank with embroidery.

I have obtained this result by passing the whip-yarn between the friction-rollers F. The yarn is put on a beam, or on spools or bobbins, as before. A wire faller, or some equivalent arrangement, is placed so as to take up the slack, and keep the yarn straight. It then passes between the rollers F, and thence to the needles. The rollers are covered with some material sufficiently adhesive to hold the yarn from slipping. The rollers F are moved laterally, by the upright arms *r r*, on the traverse-bar, so that the yarn is always directly under the needles.

The lower roller slides on a square shaft, which revolves in bearings fixed to the sword, so that the traverse-bar moves the rollers with the needles. The upper roller is a friction-roller, moved by the lower one.

To the end of the square shaft is fixed a combined pinion and ratchet-wheel, G, having spur and ratchet-teeth side by side.

The spur-teeth play into the rack H, as the lay comes up to the breast-beam. The spur-teeth in the rack turn the pinion-wheel and cause the rollers F to take back the whip-yarn that has been given out. When the pinion gets to the end of the spur-teeth in the rack, it does not revolve further, but having a friction sufficiently strong for the purpose, it slides on the rack as well as on the ratchet-teeth, and of course takes up no more of the yarn.

The yarn thus left, is what is required for the stitch, and as soon as the stitch is formed and the slack yarn used up, the lay starts to go out. At this point the ratchet part of the wheel N catches into the ratchet-teeth of the rack, and it begins at once to revolve, and give out yarn from the rollers.

The ratchet-teeth cause the pinion to revolve until it catches into the spur-teeth, and they continue the revolution until the end of the stroke, when the needles are full up. By this means a certain definite quantity

of yarn is furnished to the needles without tension or irregularity, and the stitch is always uniform.

But it is necessary that the quantity of whip-yarn thus furnished to the needles should be susceptible of variation and adjustment. I accomplish this by the use of the double-wedge bar I I, working vertically in the rack H, drawing it out or pushing it in, as the double wedge moves up and down.

When the bar rises, the inclination of the wedge draws the rack towards the breast-beam, and gives the spur-teeth more action, and of course causes the rollers to take up more yarn, leaving less for the stitch. Reversing the motion gives out more yarn for the stitch.

This wedge-bar is held in an upright position by bearings attached to the loom-side, and the lower end rests upon the lever *n*. This lower end of I is adjusted with a screw, so that the length of yarn for the stitch can be regulated without reference to the lever *n*.

The vertical motion is given by the pin in the stitch-bar O, raising the lever *n*, which in turn raises I. The lever *n* may be adjusted by a stop-motion, which would hold the lever just out of the range of the pin in the stitch-bar O, so that in ordinary stitching, it need not be moved except when a stitch longer than usual is wanted.

A modification of the above plan is to place the whip-yarns on one roller, instead of passing it between two, giving a turn completely around the roller, which should be covered with sand-paper, to give it sufficient adhesion to the yarn.

Another plan is to attach the roller or rollers to the upright bars that raise the pin-bar, in which case they would give out and take up yarn by the action of rising and falling, and would only need sufficient motion to give off what is wanted for the stitch.

Another plan is to place the roller or rollers near the whip-yarn beam, having the faller between it and the needles.

Another, still, is to place the whip-yarn beam so that it should rest on a drum, properly geared to give off the right quantity.

I think the plan first described to be more precise in its action, and more closely adjustable than any others.

In making the circular borders for gored skirts or dresses, it is necessary sometimes to make so large a circle as to require more traverse than can easily be given to the needles by the above arrangement. When this is the case, I propose to weave the border separately from the garment, and attach it afterwards.

To do this, I put the warp of the cloth upon the conical spools *o*, which are placed upon one shaft, and are put in the place of the usual warp-beam. The cloth woven by this arrangement is taken up by a cloth-beam, *p*, or upon cloth-rollers, shaped to match the arrangement of the spools *o*. The lappet-work is thrown into the centre of these strips, which, when cut apart, will form circles of a radius proportioned to the difference in the diameters of the different ends of the conical spools.

If, in the employment of the conical spools, it should be necessary to make the degree of taper adjustable, it can be done by cutting a screw on the shaft, to which a conical nut may be fitted.

The spools or rollers may be made in longitudinal strips, like the staves of a barrel, then fastened together at one end, and expanding or contracting the other end by the conical nut. Fig. 21 of the drawings shows the operation of the device.

It has been found difficult to arrange the pin-bar D so that the pins may be sufficiently firm, as well as in a straight line, without making the pin-bar too heavy and clumsy. It is of great importance to have the least possible weight in the pin-bar as well as the needle-bars, and especially to have them occupy the least possible space, so that the race-board may be as close as possible to the reed.

To remedy this difficulty, I attach a thin strip of metal, or other suitable substance, close to the edge of the race-board, leaving just space enough to allow the pins to pass easily between the edge of the race-board and the guide-strip. The position and use of this guide-strip are shown by letter *m*, fig. 9, of the drawings.

Another plan to accomplish the same result, is to bore holes in the edge of the race-board, and set it back far enough to allaw the pins to pass up through the holes, or to attach little eyes or brackets to the edge of the race-board, to guide the pins. The pin-bar, as well as the needle-bar which is attached thereto, as will be understood from the drawings, is made of thin strips of metal or other suitable substance, and has the pins and needles let into the edge and made fast.

In raising the pin-bar, it is necessary, in order to give the needles time to shift their position in making the stitch, that the pin-bar should not start up until the lay has made one-fourth, or thereabouts, of a stroke, and then it should be full up when the shuttle enters the shed.

To obtain the irregular motion necessary for this result, I make the lifting-roller *j* of irregular shape, instead of round. The same result would follow from making the rollers *i i* of the same shape, instead of *j*. This shape must raise the pin-bar rapidly at first, and dwell when the pins are up.

In the foregoing description, I have described a loom containing only one needle-bar, but it is evident that the bar and its operating-mechanism can be duplicated, or can be used with the old or any known form of lappet-mechanism.

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

1. The combination of the pattern-mechanism with the stitch-mechanism, when the two are actuated by different powers, or are connected with the same power by intermediate gearing or attachment, so as to give to each mechanism a motion distinct from the other, substantially as described.

2. The friction-rollers or cylinders, one or more, for the purpose of giving a definite yet adjustable quantity of whip-yarn to the needles without tension, substantially as described.

3. The roller *j*, of irregular or cam-shape, in combination with the pin and needle-bars, for the purpose of giving them an irregular motion, substantially as described.

4. The combined ratchet and pinion-wheel G, in combination with the rack H, substantially as and for the purpose described.

5. The double-wedge bar I, for the purpose of regulating the quantity of whip-yarn to be furnished to the needles, substantially as described.

6. The lever *n*, in combination with the bar O, and its pin for raising the double-wedge bar, substantially as described.

7. The traverse-bar M, in combination with the needle-bar and friction-rollers, substantially as described.

8. The combined pinion and friction-wheel N, in combination with the friction-wire, substantially as described and for the purpose set forth.

9. The lever *e* with adjustable fulcrum, in combination with the traverse-bar M, and needle-bar for regulating its movements, substantially as described.

10. The friction-sleeve having an upright stand, in combination with the pattern and stitch-wheels, and traverse-lever *e*, substantially as described.

11. The combination, with the stitching-mechanism, of the adjustable pawl Q, constructed and operating substantially as described.

12. The combination of the mechanism which makes the stitch with the mechanism which gives the whip-yarn to the needles, arranged and connected substantially as described, so that the motion of the mechanism which gives off the whip-yarn to the needles may be regulated and controlled by the stitching-mechanism.

FREDERICK W. NEWTON.

Witnesses:
W. M. COATES,
A. C. JACKSON.