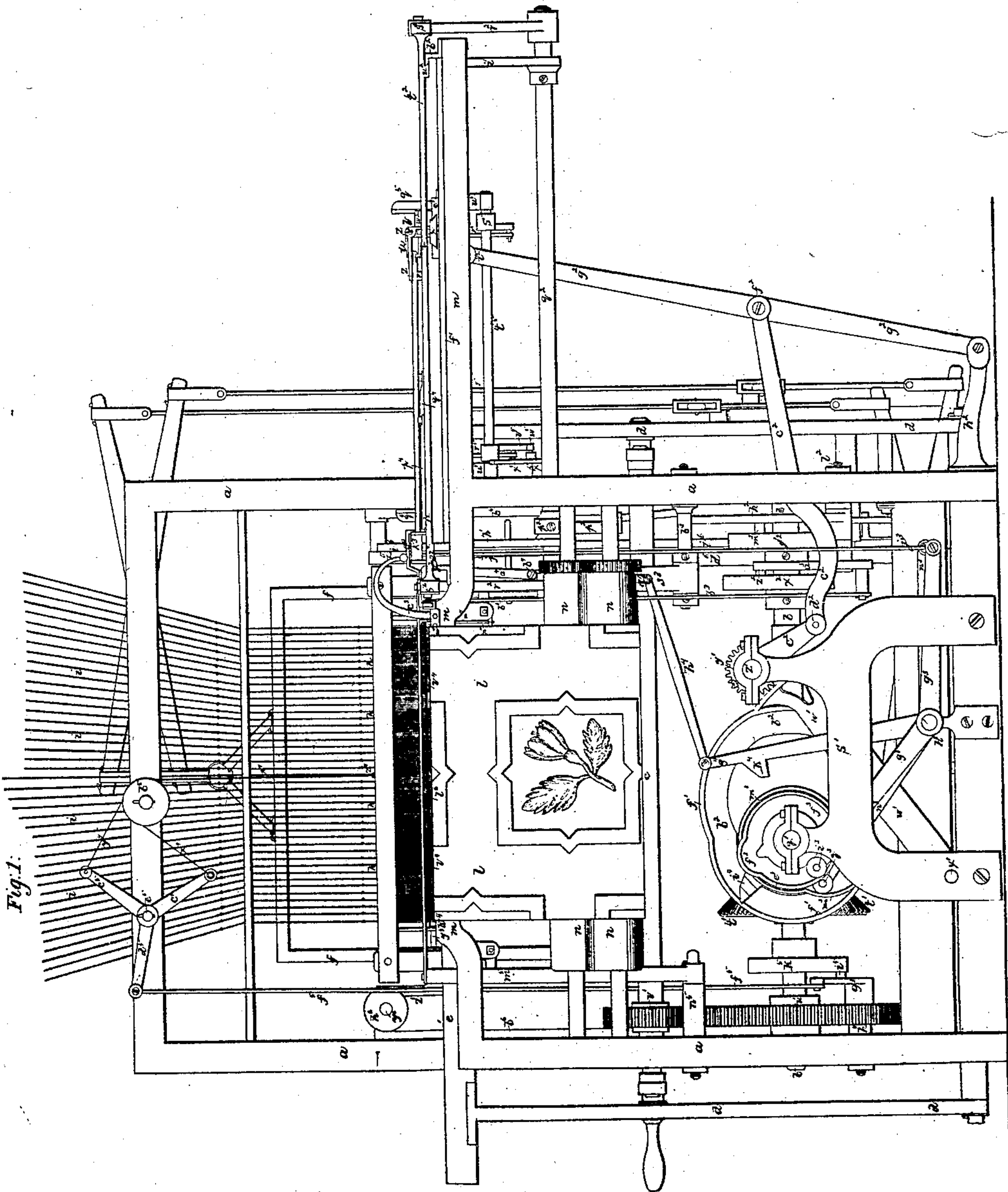


Sheet 1, of 5 Sheets.

E. B. Bigelow
Pile Fabric.

No. 10,222.

Patented Nov. 15 1853.

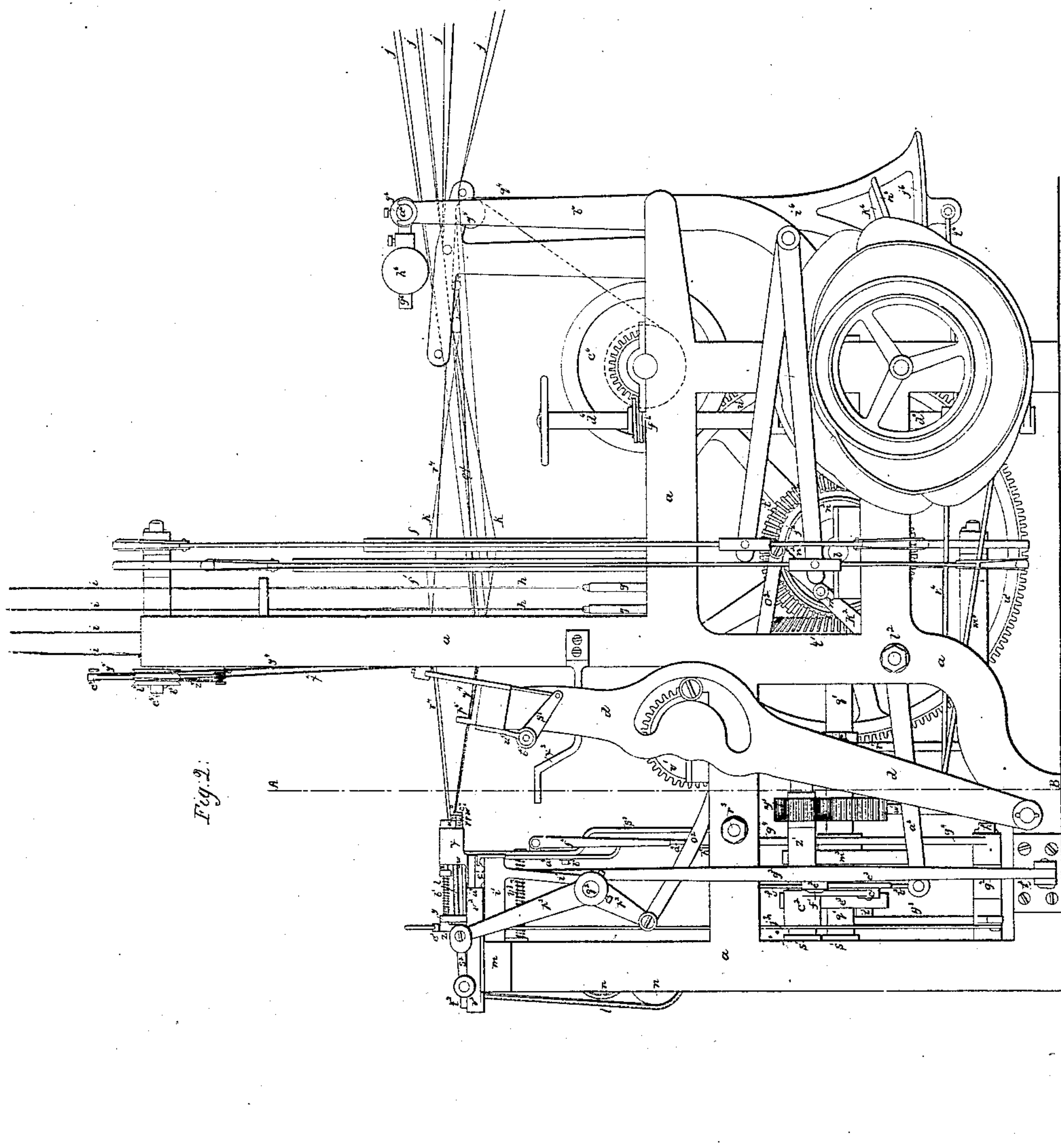


Sheet 2, of 6 Sheets.

E. B. Bigelow.
Pile Fabric.

Nº 10,222.

Patented Nov. 15, 1853.

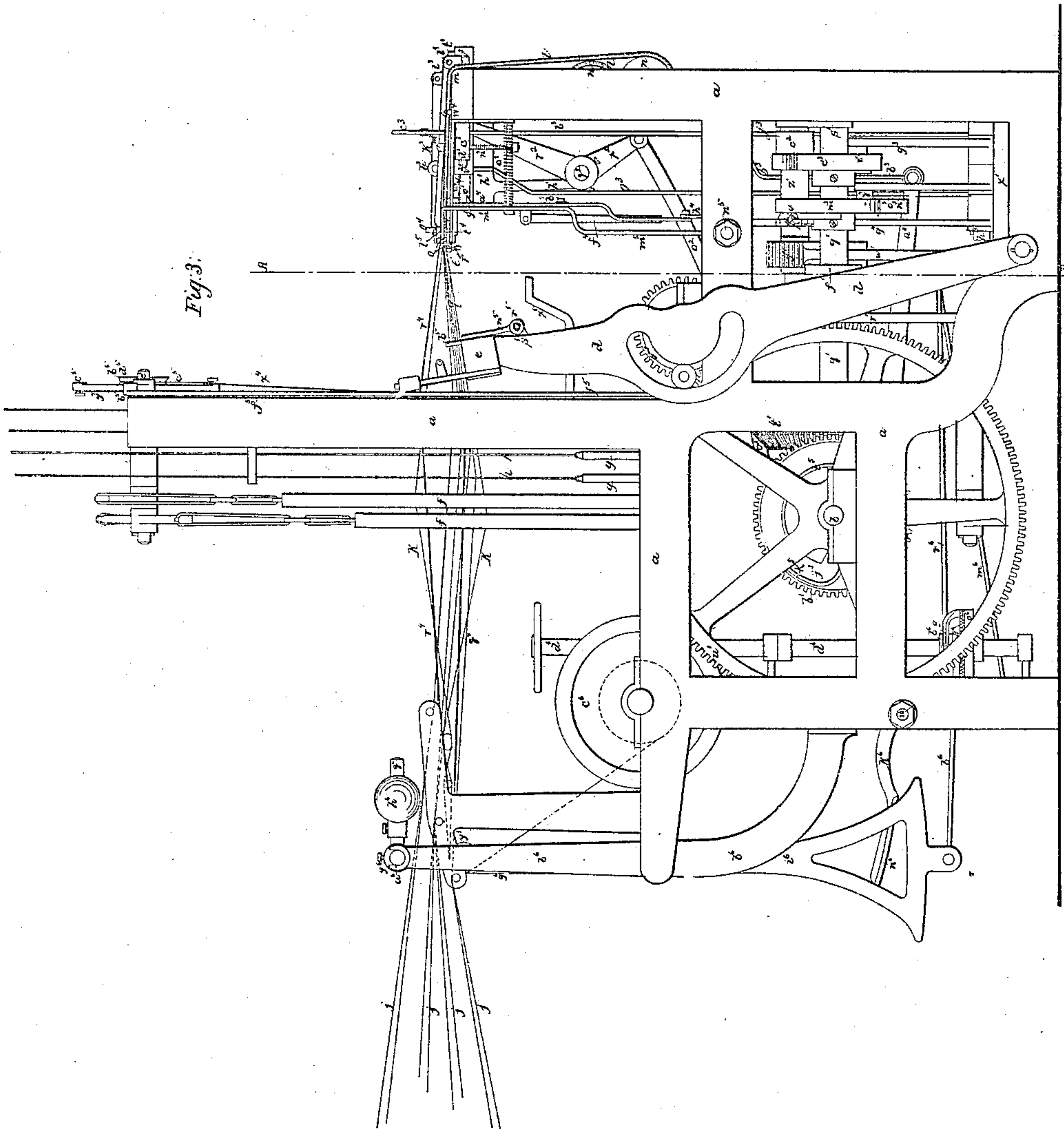


Sheet 3. of 3. Sheets.

E. B. Bigelow.
Pile Fabric.

N^o 10,112.

Patented Nov. 15, 1853.

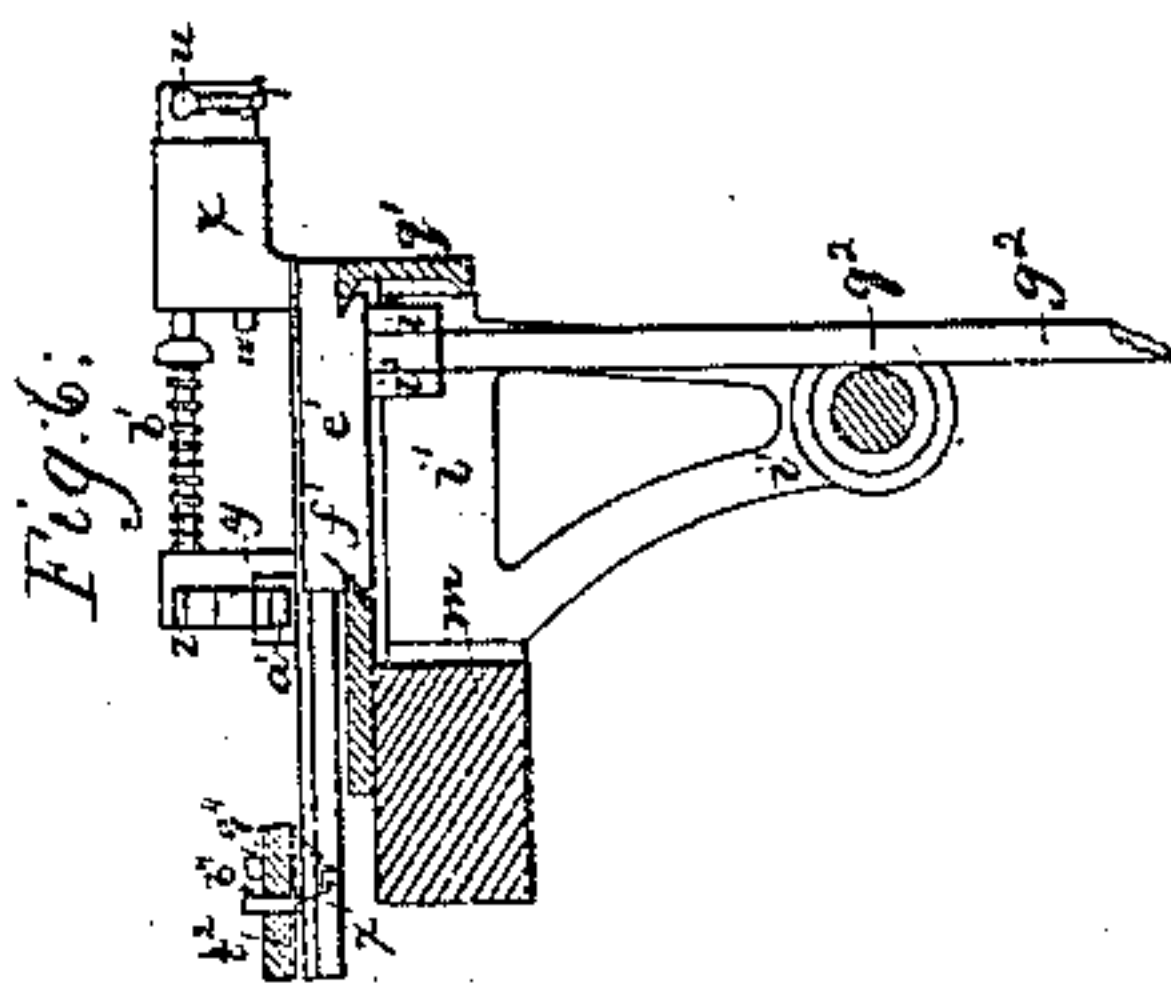
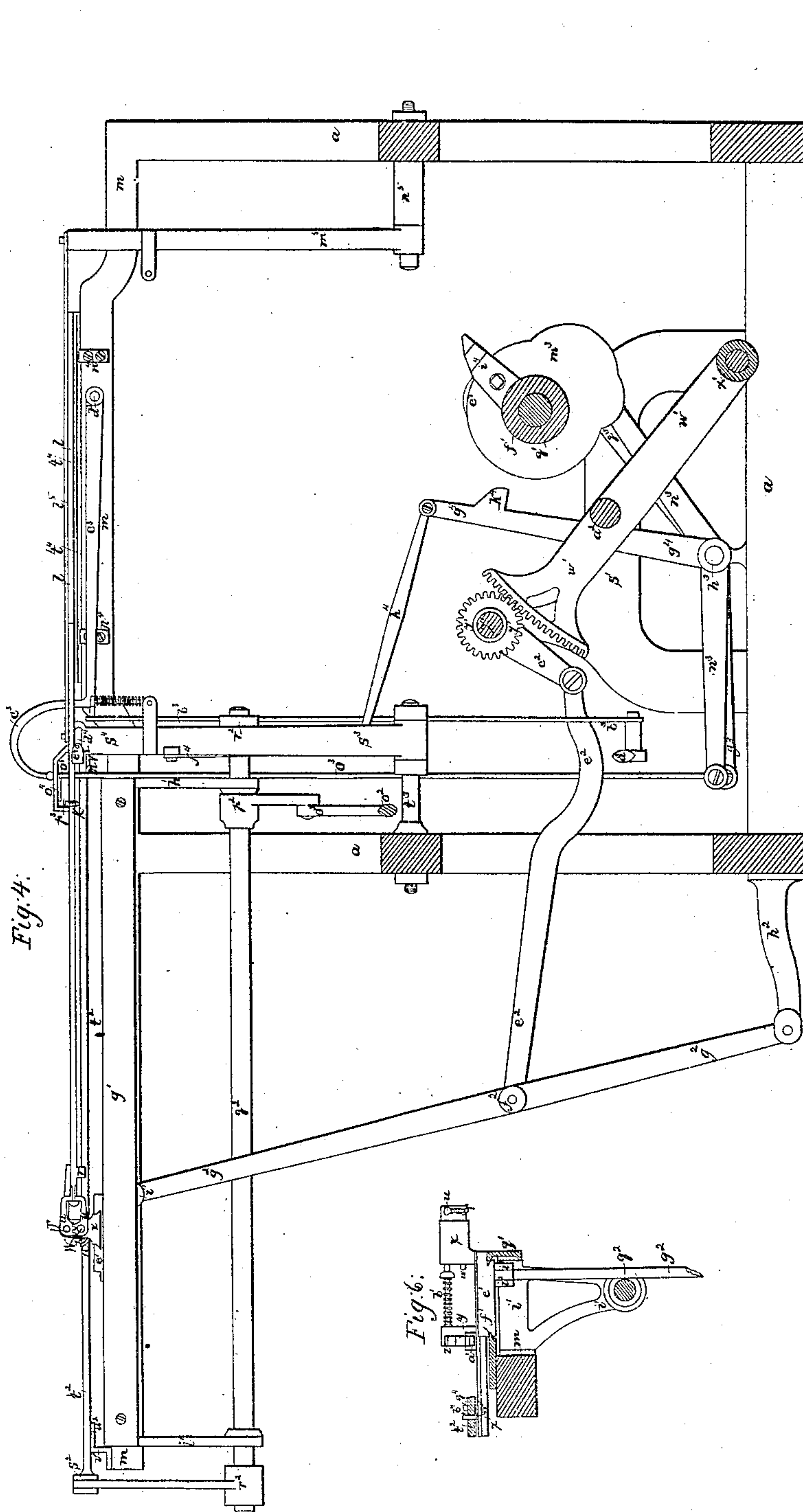


E. B. Bigelow.

Pile Fabric.

$N_{10,222}^0$

Patented Nov. 15, 1853.



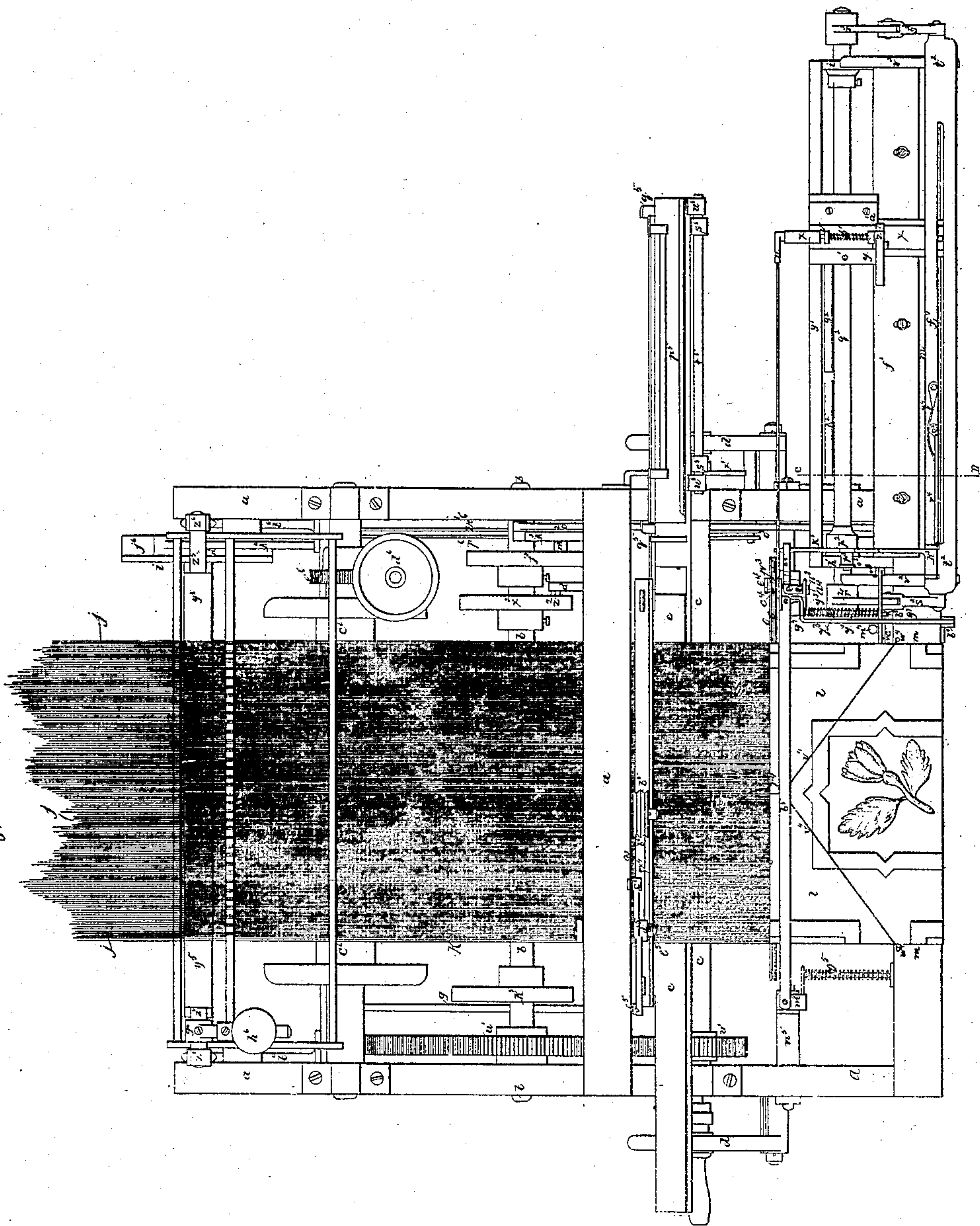
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E. B. Bigelow.
Pile Fabric.

N^o 10,222.

Patented Nov. 15, 1853.

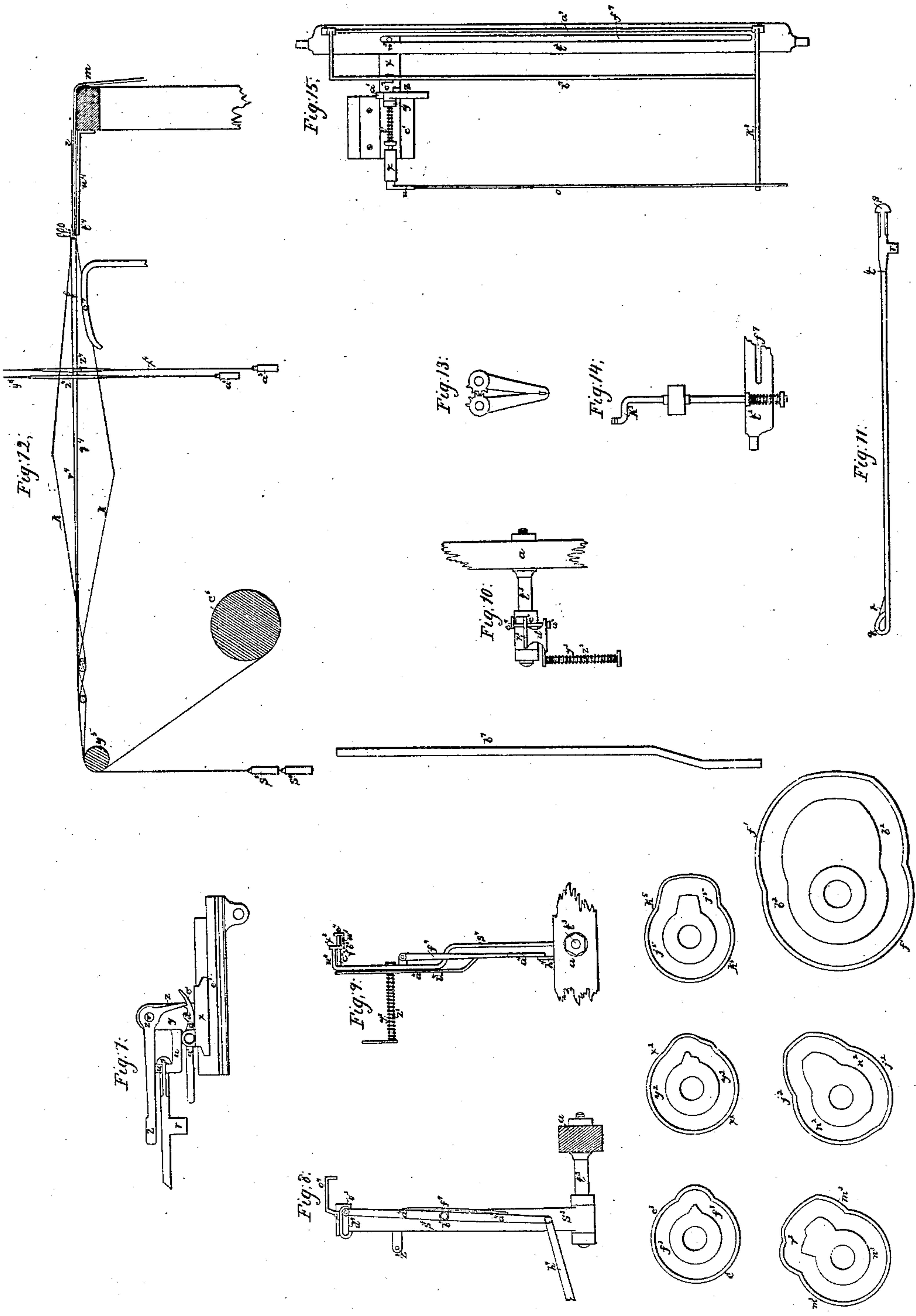
Fig. 5.



E. B. Bigelow
Pile Fabric.

No. 10,222.

Patented Nov. 15, 1853.



UNITED STATES PATENT OFFICE.

E. B. BIGELOW, OF BOSTON, MASSACHUSETTS.

LOOM FOR WEAVING PILE FABRICS.

Specification forming part of Letters Patent No. 10,222, dated November 15, 1853; Reissued February 24, 1857, No. 432.

To all whom it may concern:

Be it known that I, ERASTUS B. BIGELOW, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Power-Looms for Weaving Looped and Velvet Pile Fabrics, and that the following is a full, clear, and exact description of the principle or character which distinguishes them from all other things before known and of the manner of making, constructing, and using the same, reference being had to the accompanying drawings, in which—

Figure 1, is a front elevation of so much of the loom as is necessary to exemplify my improvements; Fig. 2 is a right hand end elevation of the same; Fig. 3 is a left hand end elevation; Fig. 4, a vertical section taken on the red line A, B, in Figs. 2 and 3, looking to the front of the loom; Fig. 5 is a plan; Fig. 6 is a cross section of the breast beam and pincer ways, taken on the red line C, D, Fig. 5, looking to the right; Fig. 7 is an enlarged front elevation of the pincers and slide, detached; Figs. 8, 9, and 10, represent the vibrating holder, detached; Fig. 11, is a side view of a pile wire; Fig. 12, is a section of the warps showing the horizontal guides for guiding the pile wires; Figs. 13, 14, and 15 are modified forms of guides to work in unison with the pincers.

The same letters indicate like parts in all the figures.

My invention relates to the mode of operating the pile wires over which the pile is formed; and also to the mode of delivering out the unwoven warps during the process of weaving.

The parts of my invention which relate to operating the pile wires are particularly applicable to the power loom for weaving looped and velvet pile fabrics in which a series or optional number of pile wires are used.

Heretofore the pincers, or other analogous devices which have been employed in the power loom to successively act upon the pile wires, have been so constructed and operated as to withdraw them from the cloth, carry them back toward the reed and deposit them in the open shed of the warps to be pushed forward by the lathe to the face of the cloth.

This mode answers very well when round wires are used, but when flat or oval shaped wires are used, as in weaving velvet pile fabrics they require to be kept with their edges upward, and as they have a tendency to fall down on their sides when left free, it is necessary to hold them with their edges upward when they are carried forward to the face of the cloth and until they are properly secured by the warps.

A part of my invention, therefore, consists in constructing and operating the pincers, or other analogous devices, for successively acting upon the pile wires, so that they shall not only successively withdraw said wires from the cloth, carry them back toward the reed and insert them in and leave them free in the open shed of the warps as heretofore done, but shall also carry them forward to the face of the cloth or cloth forming point and hold them in position with their proper edges upward until they are otherwise secured.

When pincers of the ordinary construction are employed to successively withdraw, insert, and hold the pile wires as aforesaid it is very difficult to avoid collision with the shuttle box of the lathe, and a part of my invention, therefore, consists in the mode of constructing the pincers whereby collision with the shuttle box is easily avoided. And a part of my invention also consists in the employment of long horizontal guides to guide and support the pile wires as they pass between the warps, so arranged that said wires may slide endwise upon them as they enter the open shed, and sidewise toward or from the breast beam in unison with the pincers which inserts them. And a part of my invention also consists in the employment of a vibrating box or holder for holding the pile wires at the face of the cloth with their proper edges upward, after they have been liberated by the pincers or their equivalents, and also for adapting said pincers or their equivalents, to the proper relative position to successively engage with said wires, said vibrating box or holder being arranged to vibrate with the pile wires and conform to their actual position during the operation of weaving.

When the cutting knife is used on the

end of flat or oval shaped pile wires to cut the pile as they are drawn from the cloth, they have a tendency to turn when being drawn out, and thus cut the pile of uneven
5 length.

A part of my invention therefore consists in the employment of a bar or guide to successively press against said wires to keep them in a proper position during the op-
10 eration of cutting.

Another part of my invention relates to the delivery of the warps and is an improvement upon a certain let off and take up motion, originally patented by me in
15 1845 and reissued in 1849.

The nature of this part of my invention consists in applying the tension weight and brake to an arm or arms extending from the whip-roller or frame in which said roller
20 vibrates, whereby I am enabled to make the apparatus more sensitive to the action of the yarn and consequently more perfect in its operation; and also save expense in making the apparatus.

(*a, a, a,*) represent the frame of the loom, (*b*) represents the cam shaft, and (*c*) the lathe shaft which are geared together in the usual way by the cogged wheels (*u'* and
25 *v'*) the ratio of which is as one to four.

(*d, d,*) represent the swords of the lathe and (*e*) the race beam.

(*f, f,*) represent the leaves of heddles for the ground warps.

(*g, g, g,*) represent the harness weights, (*h, h, h*) the mails and (*i, i, i,*) the jac-
35 quard harness cords, the jacquard machine being removed.

(*j, j, j*) represent the figuring warps and (*k, k,*) the ground warps, and (*l*) the
40 woven cloth which passes over the breast beam (*m*) to the take up rollers (*n, n*).

The above named parts being such as are in common use no further description of them is required; nor have I thought it
45 necessary to represent in the drawings the mode of stopping and starting the machine; nor the let off and take up motion; nor other well known parts of a loom except so far as they are required to illustrate and
50 exemplify my improvements.

(*o, o, o,*) represent the pile wires woven into the cloth.

Fig. 11 gives a side view of one of the pile wires provided with the knife (*p*) for
55 cutting the pile. (*q*) represents an eye or head on one end of the wire to guide it as it passes between the warps and to aid in sustaining it in a proper position to cut the pile of an even length when being drawn
60 out. (*r*) represents an arm or projection extending from the under side of the wire to aid in keeping it with its proper edge upward. (*s*) is a head to secure the hold of the pincers. The widest part of the wire

is made separately and joined to the other 65 part at (*t*), by brazing. I sometimes make and join the eye or head of the wire in the same manner.

The pincers for successively operating the pile wires, are constructed with two jaws 70 (*u, u,*) which open and close to release and grasp the pile wires, in the direction of a line parallel to said wires, as will be seen by inspecting the drawings, in which the pincers are represented as drawing one of 75 said wires from the cloth, which operation is supposed to be nearly completed. The ends of the jaws (*u, u,*) which grasp the pile wires, are shaped and grooved to conform to said wires as shown in Fig. 7; while 80 their reverse ends are affixed to their respective shafts (*v* and *w*). To cause both of the jaws (*u, u*) to work in conjunction, they are provided with cogs or teeth which engage with each other as represented in 85 Fig. 4. The shafts (*v* and *w*) turn in and are supported by the upper part of the pincer stand (*x*). The shaft (*v*) extends forward through a projection (*y*) to a convenient point for giving motion thereto. 90

(*z*) represents a bent lever, affixed to the shaft (*v*) for closing the jaws (*u, u*) of the pincers, and (*a'*) represents a latch lever for holding said jaws (*u, u,*) in a closed position, and (*b'*) a helical spring 95 which tends to throw them open. When a wire is to be grasped by the pincers, the horizontal arm of the bent lever (*z*) is forced down,—by means hereafter to be described,—until the jaws (*u, u,*) clasp the 100 wire, and the lighter, and notched arm of the latch lever (*a'*) rises up to secure the grip, by the projection (*c'*) engaging with the point of the dependent arm of said bent lever (*z*); then when the wire is to be re- 105 leased, the projection (*c'*) is disengaged from the said dependent arm and the helical spring (*b'*) throws the jaws (*u, u*) of the pincers open until arrested by the said dependent arm striking against the projec- 110 tion (*d'*) on the latch lever (*a'*).

By constructing the pincers in the manner above described, I am enabled to make the grooves for the wires in the jaws of said pincers near the inward extremity of the 115 parts thereof, and thus render it easy to avoid collision with the shuttle box of the lathe. The pincers require to have a motion toward and from the cloth, to withdraw and insert the pile wires, and toward and 120 from the lathe, to carry said wires forward to the open shed, and back to the face of the cloth. To allow the pincers to be moved toward and from the lathe, the edges of the bottom part of the pincer stand (*x*) are 125 shaped like ways, and slide in corresponding grooves in the sliding plate (*e'*). To allow the said pincers to be moved toward

and from the cloth, two opposite edges of the sliding plate (e') are grooved to conform to the ways (f' and g') on which they respectively slide. The way (f') is screwed to the top of the breast beam (m); and the way (g') is supported by the stands (h' and i') which are bolted to and extend forward from the breast beam (m). Motion is given to the sliding plate (e') to carry the pincers toward and from the cloth, by the double acting cam (f') on the shaft (q'). The shaft (q') turns in suitable bearings in the stands (r' and s') and is connected with the cam shaft (b) by the beveled cogged wheels (t' , t'') which are of an equal number of teeth.

(w') represents a lever, the lower end of which vibrates on the stud (x'), while the upper end has a segment of a gear which engages with the cogged pinion (y') and turns the crank shaft (z').

(a'') represents a cam roller on the side of the lever (w') which plies in the groove (b'') of the cam (f''). The crank shaft (z') turns in suitable bearings in the before mentioned stands (r' and s'), and has the crank arm (c'') affixed to it, on the side of the outer end of which the stud pin (d'') projects.

(e'') represents a connecting bar which connects the stud pin (d'') to a similar stud pin (f'') in an upright lever (g''). The upright bar (g'') vibrates at its lower end on a pin in the stand (h''), while its upper end is connected to the said sliding plate (e') by the connecting bar (i''). When therefore the pincers are to be moved from the cloth to draw a wire, the said cam (f') forces downward the said lever (w') and the reverse, when said pincers are to be moved toward the cloth, the motion being communicated to the pincers by the parts just described. The pincers are moved toward and from the lathe by the double acting cam (j'') on the cam shaft (b).

(k'') represents a lever which vibrates on the stud (l'') at its lower end, and has the roller (m'') on its side which plies in the groove (n'') in the side of the cam (j'') before mentioned.

(o'') represents a connecting bar the rearward end of which is jointed to the upper end of said lever (k''), while its forward end is jointed to an arm (p'') on the rock shaft (q''). The rock shaft (q'') rocks in suitable bearings in the stands (h' and i') and has on each end an upright arm (r'').

(s'' , s'') represent connecting bars the rearward ends of which are respectively jointed to the upper ends of the said upright arms (r'' , r''), while their forward ends are connected with a sliding bar (t''). On the under side of the sliding bar (t'') are the projections (u'' , u''), in which suitable

able grooves are formed to slide on their respective ways (v'' , v''). The ways (v'' , v'') are provided with felt by which they are secured to the top of the breast beam (m). (w'') represents a stud pin projecting upward from the pincer stand (x) through the slot (f') in the said sliding bar (t'') which connects the said pincer stand (x) and sliding bar (t'') together; but in order that the pincers may at the same time be free to move toward and from the cloth, the slot (f') is made long enough to allow said stud pin (w'') to traverse therein the extent of said motion.

The mode of latching the pincers to grasp a pile wire is as follows: The cam (x'') on the cam shaft (b) has a groove (y'') in which the cam roller (z'') plies. (a''') represents a bent lever which vibrates on the stud (l'') and has the cam roller (z'') at one end, while the other end is jointed to the lower end of the connecting rod (b''). The upper end of the connecting rod (b'') is jointed to the latching lever (c''') which vibrates on the stud (d''') at one end, while the other end is bent somewhat in the form of a semicircle, to bring the point thereof to a proper position to act on the bent lever (z), before described, to latch the pincers. The groove (y'') is so formed as to depress the latching lever (c''') at the proper relative time to latch the pincers, and elevate it again after that operation has been performed. To unlatch the pincers, the cam (e''') on the shaft (q') is employed. (g''') represents a bent lever which vibrates on the stud (h''') and has at one end the cam roller (i''') which plies in the groove (f''') in the cam (e''') while the other end is jointed to the upright rod (j'''). The rod (j''') is kept in position at its upper end by the guide stand in which it slides, and when elevated by the cam (e''') strikes against the under side of the straight and heaviest arm of the latch lever (a') and releases the catch (c') to allow the jaws of the pincers to be thrown open in the manner above described. When the rod (j''') is withdrawn from the latch lever (a') the straight, which is also the heaviest arm of said lever, throws the other arm upward to secure the hold of the pincers upon the pile wires as before described. The guide which moves in unison with the pincers to successively receive the ends of the pile wires as they are drawn from the cloth, carry them to, and guide them between the open shed of the warps will now be described. (k''') represents the guide in question which vibrates on the stud (l''') at its forward end, and terminates at the other in the form of the letter U into which the ends of the wires successively fall as they are drawn from the cloth. When the pincers approach near

to the edge of the cloth to insert or withdraw a wire, the rear end of the guide (k''') requires to be depressed to clear the jaws of the pincers. The guide (k''') is elevated to a proper position to receive the ends of the pile wires as they are drawn from the cloth, and depressed at the proper time to clear the jaws of the pincers, by the cam (m''') acting through the medium of the bent lever (n''') and connecting rod (o'''). The upper end of the connecting rod (o''') is connected to the guide (k''') by the stud pin (p'''), and its lower end to the horizontal arm of the bent lever (n'''). To the other end of the bent lever (n''') the cam roller (q''') is attached which plies in the groove (r''') in the side of the cam (m'''). The vibrating box or holder for keeping the wires in position at the face of the cloth after they are liberated by the pincers, and, for adapting said pincers to said wires, may be understood as follows: The vibrating box or holder is connected with the upper end of a vertical bar (s''') which vibrates at its lower end on the stud (t'''). The upper end of the bar (s''') is bent back at a right angle with the upright part thereof as represented by (u''') to bring it to a proper position to act upon the pile wires and at the same time clear the race beam (e). I would remark here, that this bend is required only when comparatively few pile wires are used, as in weaving velvet pile carpets. The bent part (u''') is again turned up at the end, as represented in Fig. 9, to form a proper surface (x''') to present to the pile wires. (v''') represents a projection which extends downward from the underside of the bent part (u''') and forms the front side of a box for receiving the weights or arms (r, r, r) which projects from the under side of the pile wire. (w''') represents a projection which extends backward from the part (v''') and forms a support for the ends of the arms (r, r, r) to rest upon, whereby the ends of the pile wires are kept in a proper line. The surface (x''') is constantly pressed against the most forward wire of the series of the helical spring (y''') which encircles the rod (z'''), so that the parts just described move freely with the pile wires in the cloth and adapt themselves to the actual position of said wires during the operation of weaving.

From the foregoing description it will be obvious that the projection (v'''), by acting on the front side of the arm (r) of the most forward pile wire of the series, will hold the whole series of wires from turning in that direction; and that the projection (w''') will prevent them from descending; and as they have but little tendency to rise upward from a proper line, it remains only to prevent their turning backward toward the

lathe, as they are successively brought to the face of the cloth, to properly secure them in position. To do this, the lever (a^4) is arranged to vibrate on the stud (b^4) extending from the front side of the vibrating bar (s''') and from its upper end the stud (c^4) extends backward through the slot (d^4) and supports the plate (e^4) as represented in Figs. 8 and 9. The edge of the plate (e^4) which presents itself toward the arms (r, r) of the pile wires is made beveling so as to freely slide over said arms.

(f^4) represents a spring which tends to throw the plate (e^4) over the arms (r, r) to secure the pile wires, when the lever (a^4) is left free to move.

(g^4) represents an upright lever which vibrates at its lower end on the stud (h^3) and is connected at its upper end to the lower end of the lever (a^4) by the connecting rod (h^4).

(i^4) represents an arm extending from the cam (m^3) which acts on the projection (k^4) on the lever (g^4). Just as each successive wire is brought to the face of the cloth by the pincers as before described, the arm (i^4) withdraws the plate (e^4) from the arm (r) of the wire previously secured, so as to allow the wire thus brought forward to take its place beside the one which preceded it; then just as the lathe presses said wire home, the arm (i^4) ceases its action and allows the spring (f^4) to throw said plate (e^4) forward again to hold it in position. In addition to holding the pile wires in position as described, the said vibrating box or holder has, as before stated, the function of adapting the pincers to the proper relative position to successively grasp said wires,—which will now be described. (g^7) represents a lever the forward end of which turns on the stud (l^4) while its rear end extends backward to a proper point to press upon the part (u''') of said vibrating box. (m^4) represents a rod which connects the lever (g^7) with the lever (c^3) above described. (n^4) represents a spring which, when the said lever (c^3) is depressed to latch the pincers, draws the back end of the lever (g^7) in close contact with the part (n''') and firmly holds the vibrating box or holder. (o^4) represents a projection extending from the vibrating box or holder, which is so adjusted as to strike against the jaws (u, u) of the pincers when they move forward from the lathe to grasp a wire and arrest their motion in that direction at the proper point to grasp said wire. The pincers have a capacity to yield to the action of the projection (o^4) by reason of the bar (p^4), on the sliding bar (t''), being held against the stud (w^2) only by the spring (q^4).

To give a more connected idea of the operation of the several parts of the machin-

ery employed to operate the wires I will recapitulate the several motions in the order in which they occur. Supposing the loom to be in that stage of its operation in which the pincers are about to draw a pile wire from the cloth as represented in the drawings, and the guide (k''') elevated to receive the end of the said pile wire, then just as the said pile wire is fully drawn out, the sliding bar (t'') moves back toward the lathe carrying with it the said pincers, guide, and pile wire, to the proper point for introducing said wire into the open shed of the warps, then the pincers advance toward the cloth, with said wire, which wire is guided and supported by the said guide (k''') as it is inserted in said open shed of the warps,—until the said pincers have nearly completed this part of their movement,—when the said guide (k''') is depressed to clear the jaws of said pincers, and that end of the said wire which is in the said open shed is left to rest on the warps (or upon other guides as hereinafter to be described). Now when the wire is thus completely inserted in the open shed of the warps, the said sliding bar (t'') carries said pincers forward with the wire until said wire is placed at the face of the cloth, the reed then strikes said wire, and the plate (e^4), (which had just before been drawn back to allow the said wire to take its proper place at the face of the cloth) slides over the projection (r) on said wire, to hold said wire in position. The pincers are now opened to release their hold on said wire. The said sliding bar (t'') then carries the said pincers forward preparatory to their grasping another wire; but just before this forward movement of the pincers is completed, the lever (c^3) presses the lever (g^7) down to firmly hold the aforesaid vibrating box or holder and arrest the pincers in a proper position relative to the said wire to be grasped. The lever (c^3) now completes its downward movement to latch the pincers, which pincers then move from the cloth to draw out the wire and insert it as before. I would remark here, that after the pincers have released their grasp upon a wire, they are moved toward the cloth a short distance that the jaws may clear the heads (s, s) on the wires in the cloth, when they are moved forward to act upon another wire.

When pile wires with eyes or heads are used, such as is represented in Fig. 11, said eyes or heads will rest upon the warps as they pass into the open shed, and no other support than the guide (k''') will be required to operate them; but when pile wires without heads (which must always be the case when the wires are to be drawn from under the loops without cutting them) additional guide and support will be required

between the warps, the guides for which will now be described.

(t^4) represents a bar to support the cloth, which bar is sustained in its position by the stands (u^4, u^4).

(s^4) represents a cord or wire the forward end of which is attached on the underside of the cloth to the bar (t^4) while the rear end extends back over the whiproller down to the weight (c^4) which weight is suspended from it for the purpose of giving it tension. (r^4) represents another card similar to the one just described, which is attached above the cloth to the cord (v^4). The ends of the cord (v^4) are attached to their respective pins (w^4, w^4) projecting from the breast beam (m).

(x^4 and y^4) represent two cords, similar to the cords of a jacquard harness, which are provided with the nails or eyes (z^4, z^4) through which their respective cords (q^4, r^4) pass, and also the weights (a^5, a^5) by which the said cords (x^4 and y^4) are kept under a proper tension. The cords (x^4 and y^4) pass over their respective friction pulleys (b^5, b^5) to their respective arms (c^5, c^5) of the triple armed lever (d^5) which vibrates on the stud (e^5).

(f^5) represents a rod which connects the horizontal arm of the triple armed lever (d^5), with the lever (g^5), said lever being arranged to vibrate on the stud (h^5) at its rear end.

(i^5) represents a cam roller on the side of the lever (g^5) which plies in the groove (j^5) in the side of the cam (k^5) on the cam shaft (b). The cam (k^5) by acting on the lever (g^5) and through the connecting parts moves the triple armed lever (d^5) so as alternately, to elevate and depress the cords (q^4 and r^4), except when a pile wire is being inserted in the shed of the warps, the cords or wires (q^4 and r^4) remain in the position shown in Figs. 2 and 3, but when the end of the pile wire which is being introduced has just passed the cords or wires (q^4 and r^4) said cords or wires approach each other, as shown in Fig. 12 to guide and support said pile wire while the operation of inserting it is being completed.

The number of pairs of guide cords or wires may be varied according to the length and size of the pile wires to be used, when several pairs are used, they should not close upon the wire simultaneously, but in succession as the end of the said pile wire respectively passes them. In weaving velvet pile fabrics with flat or oval shaped wires, with a cutting knife on the end thereof to cut the loops, the wires sometimes have a tendency to turn out of a proper line, toward the breast beam. To prevent this I place a bar over the cloth forward of the pile wires, as represented by (l^5), which bar

is supported at one end by the upright lever (s^3) which supports the vibrating box or holder above described, while its other end is supported by another and similar upright lever (m^5). The lever (m^5) vibrates at its lower end on the stud (n^5) and its upper end is pressed forward by the spring (o^5) in the same manner as the spring (y^3) acts upon the lever (s^3). When a wire is withdrawn from the cloth; the bar (l^5) by being pressed against it by the springs (o^5 and y^3) guides the knife in a right line during the operation of cutting the loops, and when the said wire is fully drawn out, the bar (l^5) comes in contact with the next wire of the series and so on. The shuttle boxes on the lathe usually project two inches or more forward of the reed, while the number of wires usually employed in weaving velvet fabrics do not extend more than from a half to three fourths of an inch forward from the face of the cloth. From this it will be seen, that, as the wires are drawn out during one movement of the lathe and inserted at another, the shuttle box on the end of the lathe where the pincers are located, will come in collision with the wire when drawn from the cloth, unless some provision be made to avoid this result. One mode of doing this is to make the said shuttle box movable so that it may be elevated to clear the wire when the lathe advances to beat up the cloth.

(p^5) represents the shuttle box in the usual form and (q^5 , q^5) the ways on which it slides.

(r^5 , r^5) are rods extending downward from the under side of the shuttle box (p^5) to their respective arms (s^5 , s^5) which extend from the rock shaft (t^5) which shaft turns in the stands (u^5 , u^5) projecting downward from the lathe. (v^5) represents another arm which extends from said rock shaft (t^5) and has the roller (w^5) at the end thereof; which, when the lathe moves forward rests on the cam (x^5) and elevates the shuttle box, which descends again by its own gravity when the lathe recedes. Instead of raising the shuttle box as aforesaid, the pincers, after they have drawn a wire from the cloth, may be made to move forward or toward the front of the loom with the said wire, to clear the shuttle box when the lathe advances, then move back again as the lathe recedes to the point where the wire is to be inserted in the shed of the warps.

I come now to the last part of my invention which relates to the mode of delivering out the warps. It is especially applicable to the let off motion by which the delivery of the warps is regulated by their tension, and by which the warps are free to yield at the opening of the shed, but are held firmly at the time the reed strikes the face of the

cloth. The tension of the warps is made to regulate their delivery by acting upon a vibrating roller or bar,—usually called the whip-roller,—and it is important to its most successful action that the apparatus be so constructed that the tension weight shall readily yield to the pull of the warps.

(y^5) represents the whip-roller, or bar, from either end of which an arm (z^5) extends upward and terminates in the form of studs or bearings (a^6 , a^6) on which said roller or bar (y^5) vibrates.

(b^6 , b^6) are stands which support said bearings or studs (a^6 , a^6).

(c^6) represents the yarn beam, and (d^6) the let off shaft, (e^6 and f^6) the worm and gear which operate in the usual way.

(g^6) represents an arm extending directly from the whip-roller or frame in which it vibrates, and (h^6) the tension weight, which may be adjusted toward or from the center of motion according to the degree of tension required upon the warps.

(i^6) is an arm which also extends directly from the whip-roller, and downward, and terminates in a segment of a flange as represented by (j^6).

(k^6) represents a bent lever the horizontal arm of which is provided with a flange (n^6) the outside of which is made to conform to the inside of the flange (j^6).

(l^6) represents a stud on which the bent lever (k^6) vibrates. The dependent arm of the lever (k^6) is connected with the sword of the lathe by the rod (m^6) so that when the lathe moves forward to the face of the cloth the flange (n^6) is forced down upon the flange (j^6) and holds the said whip-roller (y^5) firmly during the beating up of the weft.

By applying the brake lever and tension weight directly to the whip-roller, or the frame in which said roller vibrates, as above described, the action of those parts are rendered more perfect, and the apparatus is less costly than when constructed as has heretofore been done.

(o^6) represents a crown ratchet to turn the let off shaft (d^6).

(p^6) represents a lever which vibrates on the let off shaft (d^6) just over the ratchet wheel (o^6), and carries on the end of an arm the pawl (q^6) which acts upon the teeth of said ratchet, while the other arm is connected by the rod (r^6) to the sword of the lathe which imparts motion thereto. To cause the tension of the warps to act on the pawl (q^6) and regulate their delivery, a vibrating plate (s^6) is placed between said pawl (q^6) and the ratchet wheel (o^6) in the usual form.

The plate (s^6) is connected to the arm (i^6) by the rod (t^6) so that when the warps are being given out too fast the whip-

roller (y^5) falls back and causes the arm (z^6) to draw the plate (s^6) around to intercept the action of the pawl (q^6); but when more warps are wanted than are being given out, the whip-roller (y^5) is drawn forward and withdraws said plate (s^6) away from said pawl (q^6) and so regulates its action on the ratchet wheel (o^6).

It will be obvious that the various parts of my invention may be changed and modified within the principle thereof, as for instance, instead of applying the support, for preventing the pile wires from descending from a proper line, to the arms (r, r), it may be applied to any part of the said wires which may be found to be convenient, I sometimes also, apply a projection to the vibrating box or holder, to extend forward over the enlarged part of the wires which project from the cloth, to prevent them from rising above a proper line. Instead also, of applying the guide (k^3) which moves in unison with the pincers to receive the ends of the pile wires as they are withdrawn from the cloth, so that it shall descend to clear the pincers as above described, it may be applied above the pincers and wires, and in the form represented in Fig. 13; that is to say, two fingers may be employed with a recess in each so arranged as to open and close to successively clasp and release the wires. Instead, also of having the said guide (k^3) elevated and depressed in the manner above described, it may be attached to a shaft, the vibration of which shall elevate and depress said guide as represented in Fig. 14. Instead also of operating said guide (k^3) by a cam on a shaft of the loom, it may be operated by the pincer stand (x) as represented in Fig. 15, in which a^7 represents a shaft to which the said guide (k^3) is attached, (b^7) the cam bar, and (c^7) a cam on the pincer stand (x) which elevates and depresses the guide (k^3) by acting on the said cam bar (b^7) as the said pincer stand (x) is moved toward and from the cloth. The number of these guides to be employed may vary according to the size and length of the pile wires. Instead also of employing cords or wires to guide and support the pile wires as they pass between the warps, a long guide similar to that represented by (e^7) Fig. 12, may be used, said long guide (e^7) being connected with a bar which shall be vibrated or elevated to bring said guides up into the shed of the warps at the proper time to guide the wires, and withdraw them again during the operation of weaving. Instead also of applying the yielding bar (p^4) for allowing the pincers to yield to the action of the aforesaid vibrating box or holder, it may be applied to the cam (j^2) by making a portion of one of its flanges to

yield against a spring, in a similar manner to that in which the said sliding bar (p^4) yields against the spring (q^4). In stead also of the aforesaid vibrating box or holder, being held firmly at the time the pincers or their equivalents engage with the pile wires to cause the said pincers to yield as above described, it may be left free to vibrate with the pile wires and yield to the action of the said pincers, that is to say, instead of the pincers yielding to the vibrating box or holder to adapt the pincers to the wires, the said vibrating box or holder may yield to the pincers. When the vibrating box or holder is made to yield to the pincers, the parts which move said pincers toward and from the box may be made rigid.

When very small wires are used I employ a wire separator in connection with said vibrating box, said wire separator being so arranged as to pass between the most forward of the series, and the one adjacent to it, and crowd said forward wire away from the others, so as to insure the proper action of the pincers thereon.

In weaving some descriptions of velvet pile fabrics, it is necessary to have a greater tension on the figuring or pile warps at certain stages of the operation than at others, to effect which, I employ a cam on the main shaft of the loom to act upon a lever so as to release and apply an extra weight to the vibrating roller or other device employed to give tension to said warps.

All the parts of my invention may be used together or separately in the same loom without affecting their character; but so long as any one part is used to accomplish the same end it will partake of the nature of my invention.

Having fully described the various parts of my invention and pointed out its modifications, what I claim as new and desire to secure by Letters Patent, is as follows, viz:—

1. I claim the method of constructing and operating the pincers or other equivalents for successively operating the pile wires, so that they shall carry said pile wires forward to the face of the cloth and hold them in position with their proper edges upward until they are otherwise secured, substantially as specified.

2. I also claim, constructing the pincers, for successively operating the pile wires with grooved jaws opening and closing in a line with the pile wire and with a motion in advance of the lathe, substantially as specified, whereby collision with the lathe is easily avoided.

3. I also claim, the application of long horizontal guides k substantially in the manner and for the purpose specified.

4. I also claim, the application of a vibrating box or holder, in combination with the pincers or their equivalents for successively operating the pile wires, substantially
5 in the manner and for the purpose specified.

5. I also claim, in combination with the pile wires a bar or guide which shall successively press against said pile wires to keep
10 them in a proper position during the operation of cutting, substantially as specified.

6. And finally I claim, the method of applying the tension weight and brake to the whip-roller by means of the arms g^6 and i^6 substantially in the manner and for the purpose specified.

ERASTUS B. BIGELOW.

Witnesses:

EDWIN BYRNES,
EZRA SAWYER.