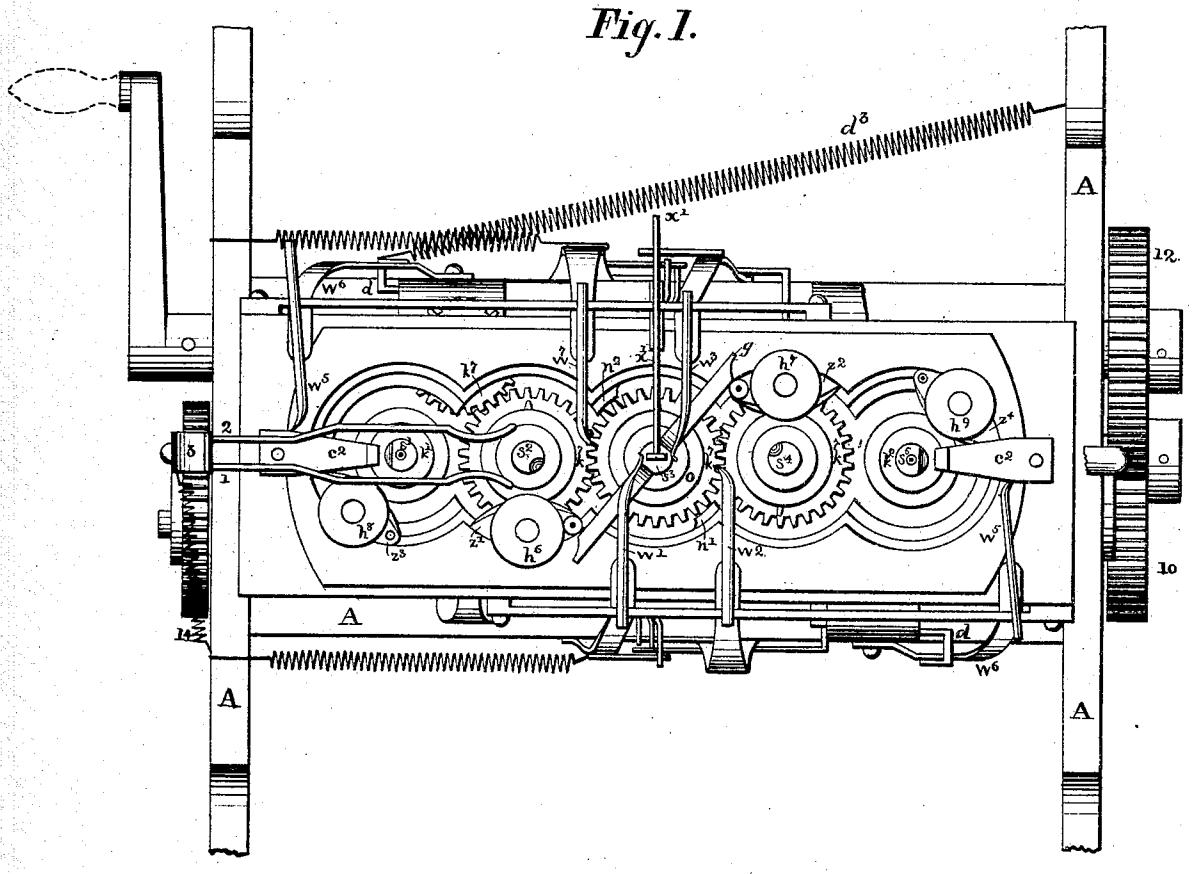
2 Sheets--Sheet 1.

J. H. CROWELL.

Machines for Making Weavers' Harness.

No. 145,282. Patented Dec. 9, 1873.

Fig. 1.



Witnesses,

John D. Thurston.

J. Knight.

Inventor,

John H. Crowell

2 Sheets--Sheet 2.

J. H. CROWELL.

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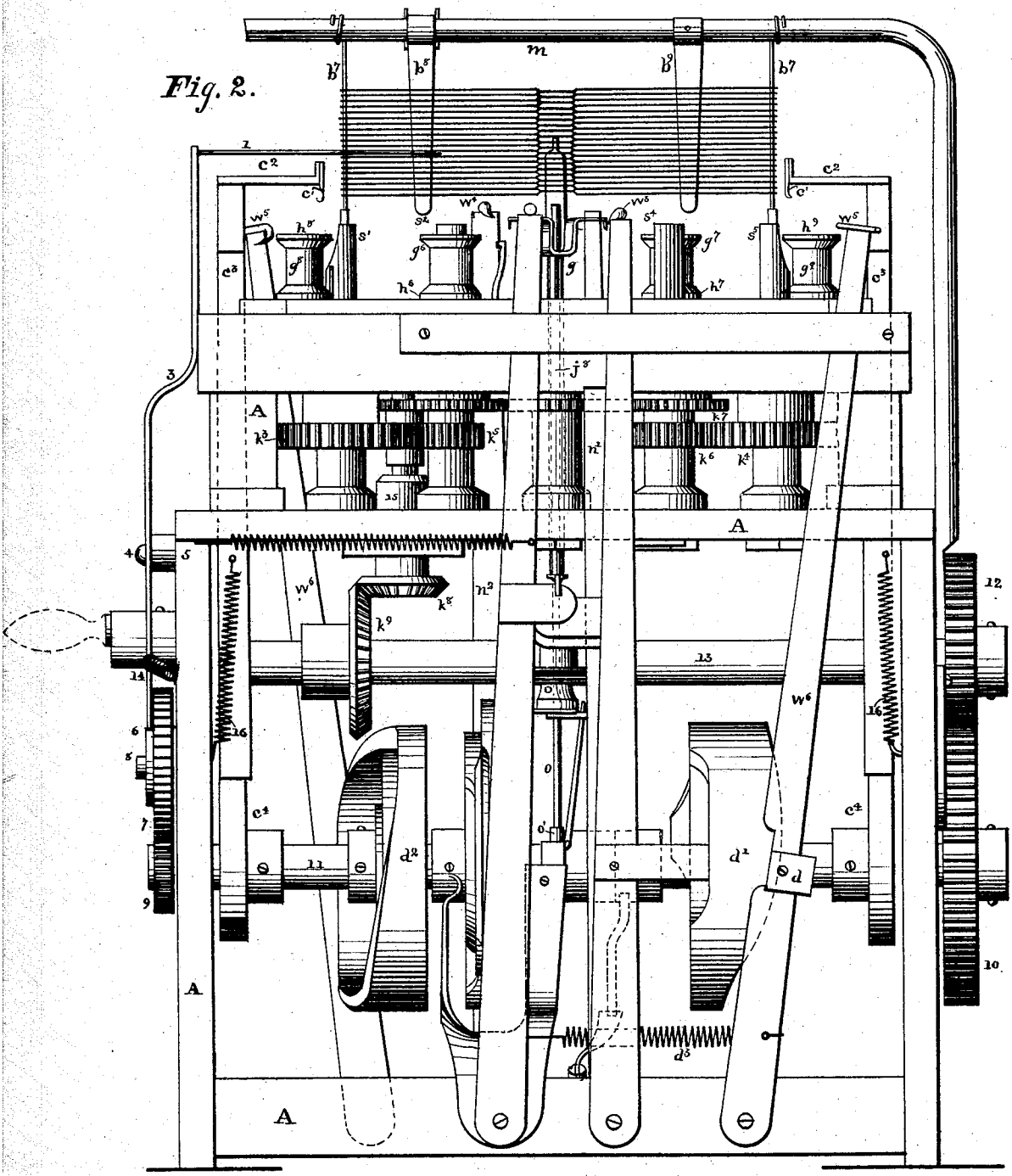
Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN H. CROWELL, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO THE KENDRICK LOOM-HARNESS COMPANY, OF SAME PLACE.

IMPROVEMENT IN MACHINES FOR MAKING WEAVERS' HARNESS.

Specification forming part of Letters Patent No. **145,282**, dated December 9, 1873; application filed July 2, 1873.

To all whom it may concern:

Be it known that I, JOHN H. CROWELL, of the city and county of Providence, in the State of Rhode Island, have invented certain new and useful Improvements in Machines for Making Weavers' Harness; and I do hereby declare that the following specification, taken in connection with the drawings making a part of the same, is a full, clear, and exact description thereof.

My invention is an improvement upon the machine invented by Joseph S. Winsor, and patented to him January 2, 1855. In that machine the twines forming the several heddles are tied at the ends of the heddles around the side bands, and the time occupied by the twine-carrying spools or bobbins in performing this work, which is capable of being performed by other devices, detracts from the productive capacity of the machine. Furthermore, in the said Winsor machine the heddle-eyes are formed from two twines, which are tied with a half-knot each around the other at the two ends, respectively, and the said knots are respectively formed on points or fingers, whose distance from each other is intended to, and substantially does, gage the length of the eye. As the said knots are drawn tight by the action of the devices employed for drawing out the twines toward the side bands, they are discharged from the fingers upon which they were formed; but it often occurs that slight variations in the length of the eyes will result from the draft upon the knots after they have been discharged, by reason of the possibility which exists of closing the knots more tightly upon the twines (which they embrace) after they have been discharged from the fingers than before.

To improve the said Winsor machine in the respects above mentioned is the object of my invention.

Figure 1 represents a plan view of my improved machine; Fig. 2, a front elevation of the same.

In the accompanying drawings, A represents a suitable frame, which may be varied to suit the judgment of the constructer. The two bands b^7 b^7 of the harness are taken from spools, and led thence under friction pressure-springs, through hollow vertical studs s^1 s^5, and, finally, made fast to a sliding bar above the machine, adapted to slide on a vertical standard, as shown and described in the drawings and specifications attached to and forming a part of the Letters Patent of the said Winsor aforesaid. In the present instance, for convenience, the two bands are shown as secured to said studs s^1 s^5 and arm m, as it was not deemed necessary to show said arrangement of spools, standard, &c., for the reason that they are fully described in said patent.

It is to be understood that as the heddles are formed in succession and secured to the side bands they are drawn upward by the movement of a sliding bar actuated by a screw-feed and over two arms, b^8 b^9, whose offices are to form and preserve the leese of the harness in a manner different from that in which the leese is formed in the said Winsor machine. The lower ends of said arms, which are situated in the central vertical plane of the machine, are pointed. The point of arm b^9 is in the horizontal plane, and at the right of the top of stud s^4; the point of arm b^8 is just above the plane, and at the left of the top of stud s^2. Arm b^9 is stationary. Arm b^8 is intermittently reciprocating, receiving its forward movement by means of the fingers 1 2, Fig. 1, located one upon each side of said arm, and secured to lever 3, pivoted, at 4, to the frame at 5, and bearing on cam 6, Fig. 2, attached to gear-wheel 7, which latter is made to revolve on the horizontal stud 8 by means of pinion 9 and gear-wheel 10, secured to shaft 11, driven by pinion 12, secured to primary shaft 13, which shaft receives motion from any competent prime mover. The return movement of said fingers 1 and 2 is effected by the recoil of spiral spring 14, Fig. 1. The two twines g^6 g^7, Fig. 2, to form the heddles, are carried by two spools, h^6 h^7, mounted on two spool-stands, z^1 z^2, Fig. 1, each provided with a standard by the side of the spool, through which the twine passes on the way to an eye in the top of the spindle on which the spool turns. Said spool-stands are constructed and made to travel in their peculiar path around studs s^2 s^3 s^4, as described in the Letters Patent of said Winsor. The two twines g^8 g^9 (hereafter called "binding-twines" in this description, for binding or se-

curing the heddles as they are successively formed to the bands) are carried by two spools, h^8 h^9, which are independent of the heddle-spools h^6 h^7, mounted on two spool-stands, z^3 z^4, each provided with standards similar to spool-stands z^1 z^2. Stands z^3 z^4 are secured to the collars k^1 k^2 of gear-wheels k^3 k^4, Fig. 2, which are revolved around studs s^1 s^5, once during the formation of each heddle, by means of pinions k^5 k^6, receiving motion through the series of gear-wheels k^7 k^7 k^7 k^7, one of which is secured at the top of vertical shaft 15, and connected, by bevel-gear wheels k^8 k^9, to primary shaft 13, Fig. 2. c^1 c^1 are latch knitting-needles of the ordinary construction, one at and along the outside of each band. These needles are secured to arms c^2 c^2, projecting from the vertical bars c^3 c^3, which are arranged to slide up and down in the frame-work of the machine, and to be actuated by cams c^4 c^4 on shaft 11, in connection with spiral springs 16 16. g in the Winsor patent is an instrument denominated the "double depressor;" x', an instrument called the "discharger;" w^1 w^3, fingers, and w^2 w^4 hooks, all having motions as and for the purpose described in the Letters Patent aforesaid. w^5 w^5 are arms constructed with a hook at their ends, and are attached to the top of levers w^6 w^6, which are located at the front and back of the machine, respectively, and at their lower ends are pivoted to the foot-rail of the frame A. These levers carry arms d d, bearing on arms d^1 d^2, which, in connection with spiral springs d^3 d^3, give to said levers a vibratory movement. If deemed preferable, the arms w^5 w^5 may be constructed to have a reciprocating rotary motion, the offices which the said hooks perform being to carry out the heddle-twines toward the side bands and within reach of the devices for knitting them to the side bands. o represents a gage-rod arranged in the center of the machine, extending from above the horizontal plane in which the heddles are formed, down through the hollow spindle j^3 of the double depressor g, to the top of cam o', and has an intermittent vertical motion communicated to it by means of said cam on shaft 11, for the purpose of keeping the heddles, after they are formed, sufficiently above the plane of their formation to prevent their interfering with the formation of the succeeding heddle. The return movement of the gage-rod may be effected by the recoil of a spiral spring, or, as in the present instance, by gravity. The top portion of this gage-rod is flattened, through which is an open space or slot, made to receive the end of the discharger, to enable it to discharge the heddle-eye knots from the fingers w^1 w^3. The distance between the outer edges of the top portion of this rod, or in other words its width, is equal to the desired length of said heddle-eye. n^1 n^2 are switches for changing the path of travel of the bobbins, having motions as described in the Letters Patent of said Winsor.

Supposing the arm m to be moved to a position near the plane where the heddles are formed, the bands b^7 b^7 to be drawn off their spools, under pressure-springs, through studs s^1 s^5, and thence to said arm, the heddle and binding-twine spools h^6 h^8 to be in front, as shown in the drawings, with their twines drawn and fastened to the band through stud s^1, and spools h^7 h^9 to be back of center line of machine, with their twines drawn and fastened to the bands through stud s^5, the operation of the within-described machine (power being applied to the primary shaft 13) is as follows: The spool-stand z^1, with its spool, is carried around to the right of stud s^2; the twine of the spool passes over the top of said stud and against the finger w^1, which, at this time, is lying in a groove at the side of the upper end of said stud. After the spool-stand has passed around during its first revolution beyond the stud s^2, and while the twine is stretched from the finger to the spool, it is caught by the hook w^2, which carries it to the center of the machine over the end of stud s^3. This having been effected, the stand passes around the stud s^2 again, to wind the twine once around the finger w^1. During the operation already described with reference to the stand z^1 and its spool and twine, the other stand z^2, with its spool and twine, has been performing corresponding operations on the other side around stud s^4. The two twines, being drawn by the two hooks w^2 w^4, and extending from the two fingers w^1 w^3, with the hooks over the middle of stud s^3, are taken and drawn down by the double depressor g, the arms of said depressor having been previously turned to bring them into the proper position therefor, thus forming two square loops, one on the left with the twine from spool h^6, and one on the right of depressor g with twine from spool h^7. The spool-stands were last described as being the one, z^1, in front of stud s^2, and the other, z^2, back of stud s^4. From these positions the spools on their stand z^1 and z^2 pass through the loop of their own twine, and thence the one z^1 back of, and z^2 front of, stud s^3, having been guided there by the switches n^1 n^2. The stands both continue their motions in opposite directions—stand z^1, with its spool, passing through the loop of the other twine on the right, while stand z^2, with its spool, passes through the loop on the left, having been guided, as heretofore, by switches n^1 n^2. In this way, it will be seen that each twine has been carried through its own loop to form the knots, and then each through the loop of the other twine. In this state of things the depressor begins to rise to liberate the two twines, that the two knots thus formed may be drawn tight to complete the eye of the heddle, and, as the depressor rises, the twines are drawn tight to close the knots by the continued motion of the stands and their spools in connection with the hooks w^5 w^5, which catch the twines and carry them toward the right and left sides of the machine. Stand z^1 passes around in front of stud s^4, and thence to a position between studs s^4 and s^5, and in

the meantime stand z^2, with its spool, has passed around the back of stud s^2, and to a position between studs s^1 and s^2. By the time the stands have reached these positions, the depressor has been elevated, and the twines composing the two knots and the eye continue to be held by the two hooks w^2 w^4 and the fingers w^1 w^3, and the two twines are, respectively, stretched from the knots through which they were passed, the one from spool of stand z^1 to and partly around the right-hand hook w^5, which, in its outward movement, caught and carried said twine to a position in front of stud s^5, and the other from spool of stand z^2 to and partly around the left-hand hook w^5, which, in its outward movement, caught and carried said twine to a position back of stud s^1. The two twines are now around the two fingers w^1 w^3, hooks w^2 w^4, and gage-rod o, with the eye and two knots not yet complete.

In closing the eye and drawing the knots tight, a considerable length of twine must be drawn out, and somewhat quickly, to effect the operation properly. This is done by the inward motion of the two spools and outward motion of the two hooks w^5 w^5.

To effect the completion of the eye and the knots at each end, the two fingers w^1 w^3 are carried gradually toward each other by mechanism already described, until they come within a distance which is a little greater than the length of the eye will be after the knots have been discharged from the fingers and drawn tight. The two knots are still one around one finger and one hook, and the other around the other finger and the other hook, with the eye around the gage-rod; but before the two fingers approach, the arms of the depressor swing around out of the way. So soon as the fingers have been brought to their inward position, the two hooks w^2 w^4 are permitted, by the mechanism before described, to be carried outward until they reach their original position, preparatory to another operation. This leaves the eye still around the gage-rod and the two knots on the two fingers, the points of which are conical, so that the knots may be gradually closed as they are discharged therefrom by the discharger x'. The downward motion of the discharger through the space in the gage-rod, to force the knots off the ends of the fingers, takes place while the stand z^1, with its spool, moves to the original position of stand z^2, and the stand z^2, with its spool, to the original position of stand z^1, and also while the hooks w^5 w^5 are moving from their last-mentioned position in front and back of studs s^5 and s^1 to their extreme outward positions, which, in connection with the motion of the spool-stands, gives the last pull to the two twines, to complete the drawing of the knots tight and the eye to the form of the gage-rod, which determines the minimum length of the eyes, if in the operation of drawing out the twine there should be any tendency to contract the length of the eyes. During the outward movement of the hooks w^5 w^5 with their respective twines, the knitting-needles pass down into the loops formed by said hooks, there remaining until said loops are deposited by the return movement of said hooks to their original position upon said needles. With the heddle-twines thus held, and the twines from each of the binding-twine spools, through their rotary movement, wound around said needles and the bands, the heddle and binding twines are taken by the needles in their upward movement and knit to the bands in the usual manner of knitting. In the meantime, while the hooks w^5 w^5 are returning to their original position, stands z^1 z^2, with their spools, have commenced the formation of another heddle by the process already described.

What is termed the "leese" of the harness is preserved by the arms b^8 b^9, which have position and motion, as hereinbefore described, that permit the heddles, as they are formed, to be drawn onto said arms in the proper relation to each other. The heddles, as they are formed, with their eyes drawn around the gage-rod, are taken out of the plane in which they were formed, and finally off of said rod by the upward motion of the sliding bar, to which the side bands are attached.

From the foregoing description of my invention, it will be seen that the employment of sets of traveling twine-carrying spools for forming the heddles, in combination with separate sets of spools and vibrating needles for attaching the heddles to the side bands, greatly increases the productive capacity of the machine; that the employment of the arms b^8 and b^9, in combination with heddle-forming twine-spools, is an efficient way of selecting and preserving the leese of the harness, in place of the reversal of the paths of movement of the spools around the side bands and the leese-arms shown in the Winsor patent, and that the gage rod or bar o, in combination with the fingers upon which the eyes are formed, serves to insure perfect uniformity in the length of all the eyes of the harness.

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

1. The combination and arrangement of the twine-carrying spools h^6 h^7, for forming the heddles, traveling eccentrically in paths, as described, with the continuously-revolving spools h^8 h^9 and the reciprocating needles c^1 c^1, for attaching the heddles to the side bands, substantially as herein set forth.

2. In combination with the heddle-forming spools h^6 h^7, the vibrating arm b^8, for selecting the leese of the harness during the formation of the heddles, and the stationary arm b^9, for preserving, with the rod b^8, the leese after it has been selected, substantially as described.

3. In combination with fingers w^1 w^3, or their equivalents, on which the knots of the heddle-eyes are formed, gage-bar o, for limiting the minimum size of the eyes, substantially as described.

4. In combination with the heddle-forming

spools and devices w^5 w^5, for carrying out the twines to the side bands, the gage-rod *o*, having a vertically-reciprocating movement for raising each eye, after it has been formed, above the plane in which it was formed, to give room for the formation of the next, substantially as described.

5. The gage-rod *o*, provided with an open slot to give admission to the discharger for discharging the knots of the eyes from the fingers whereon they are formed, substantially as described.

JOHN H. CROWELL.

Witnesses:
JOHN D. THURSTON,
J. KNIGHT.