

No. 732,229.

PATENTED JUNE 30, 1903.

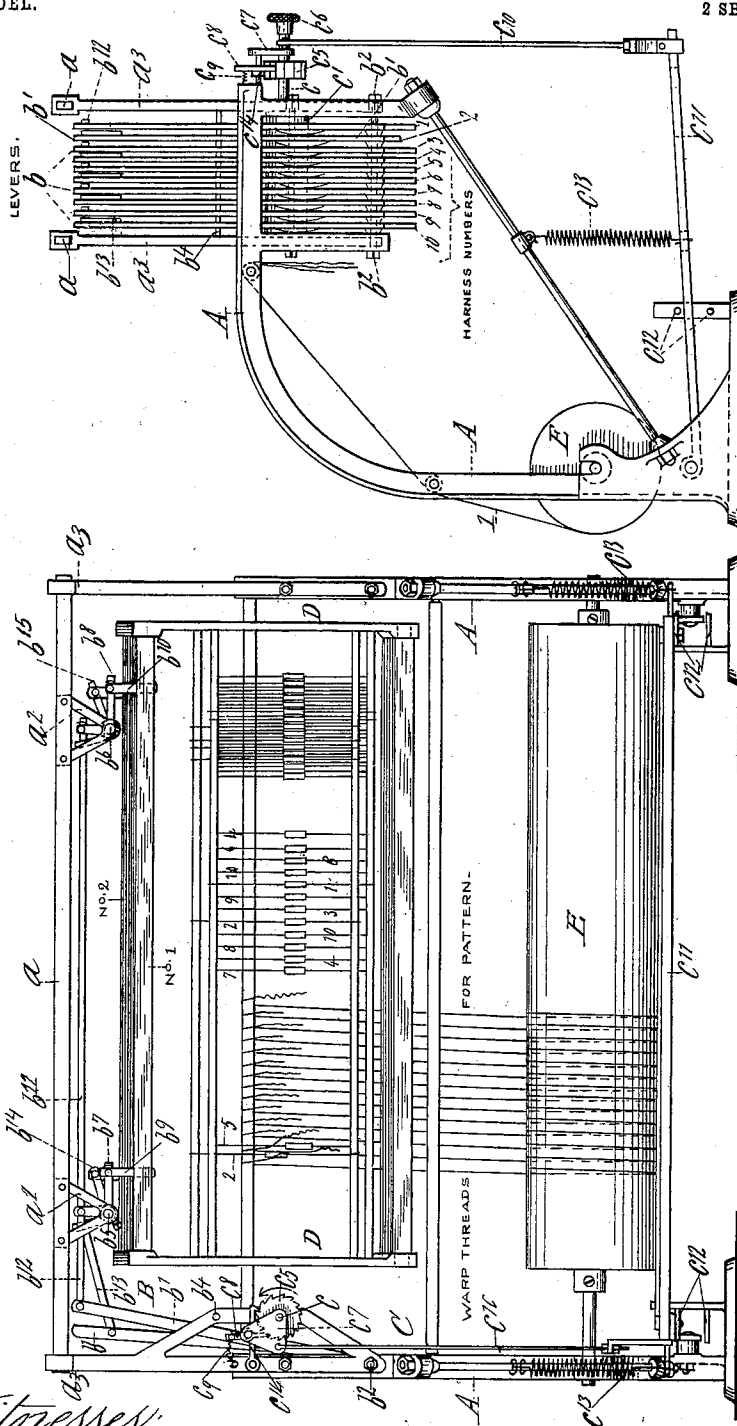
C. E. SMITH.

HARNESS FINDING MACHINE FOR USE IN MANUALLY DRAWING IN WARPS.

APPLICATION FILED JAN. 11, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:

W. E. Kinnick.

H. E. Kinnick Jr.

Inventor:

Cyrus E. Smith
by his attorney
Charles F. Richardson

No. 732,229.

PATENTED JUNE 30, 1903.

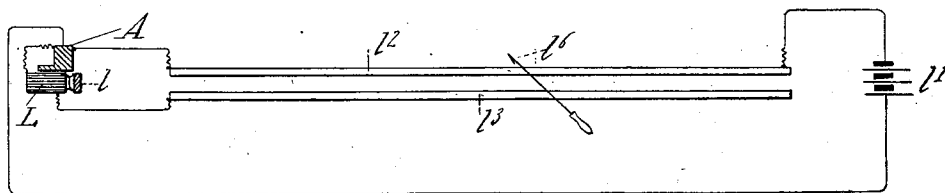
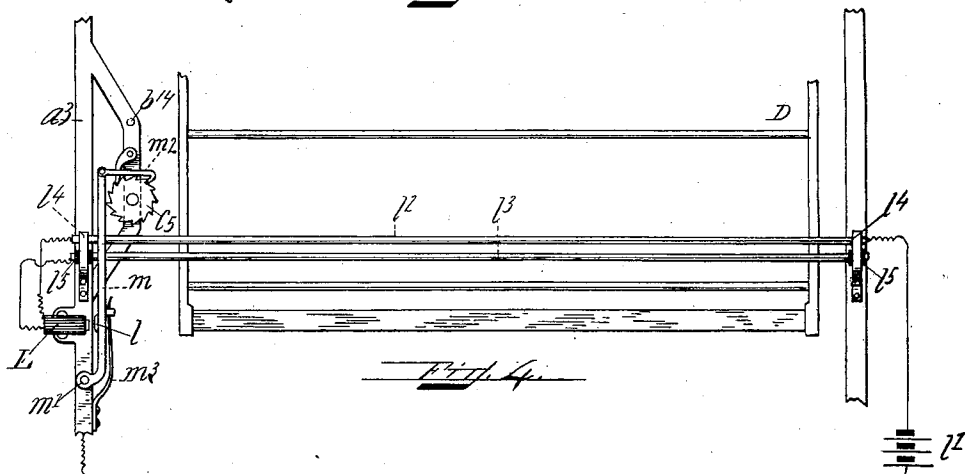
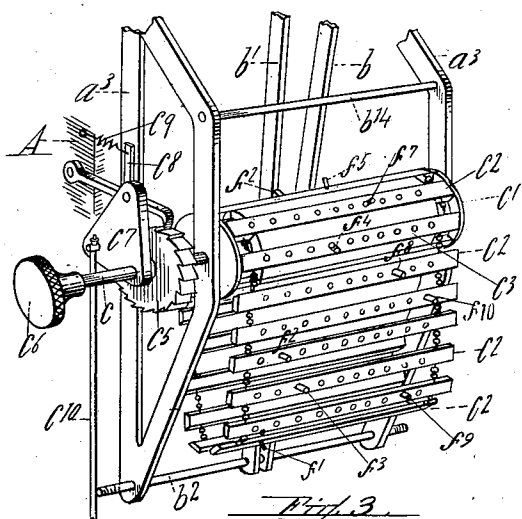
C. E. SMITH.

HARNESS FINDING MACHINE FOR USE IN MANUALLY DRAWING IN WARPS.

APPLICATION FILED JAN. 11, 1902.

NO MODEL.

2 SHEETS—SHEET 2.



Witnesses:

C. E. Rennie.

H. E. Rennie, Jr.

Inventor:

C. E. Smith.
by his attorney
Charles S. Richmond

UNITED STATES PATENT OFFICE.

CYRUS E. SMITH, OF FALL RIVER, MASSACHUSETTS.

HARNESS-FINDING MACHINE FOR USE IN MANUALLY DRAWING IN WARPS.

SPECIFICATION forming part of Letters Patent No. 732,229, dated June 30, 1903.

Application filed January 11, 1902. Serial No. 89,250. (No model.)

To all whom it may concern:

Be it known that I, CYRUS E. SMITH, a citizen of the United States, residing at Fall River, in the county of Bristol and State of Massachusetts, have invented a certain new and useful Harness-Finding Machine for Use in Manually Drawing in Warps, of which the following is a specification.

Figure 1 is a front elevation of my invention embodied in a harness-finding machine for use in manually drawing in warps. Fig. 2 is an end elevation thereof. Fig. 3 is a perspective view of a detail of said machine. Fig. 4 is a front elevation showing a modified form of means whereby said machine may be operated electrically, and Fig. 5 is a diagrammatic plan view of the means shown in Fig. 4.

The object of my invention is to provide a machine whereby in the operation of drawing succeeding warp-threads into a number of harnesses required in weaving any given pattern each of said harnesses is presented in a predetermined order for the reception of its respective warp-thread.

Heretofore to enable the operative to select the right harness for the right warp end the operative was compelled to memorize a combination of numbers in series that represented the order in which the harnesses were to be manually selected for the reception of succeeding warp-threads. For example, let us suppose that a pattern to be woven was made up of fourteen consecutive warp-threads and that to weave this pattern ten harnesses (numbered from 1 to 10, inclusive) were required. Now each of the fourteen consecutive warp ends in turn must be drawn into its respective harness, the particular harness being determined by reference to a series of fourteen numbers made up of the ten harness-numbers. Further, let us suppose the series used is as follows: 2 5 7 4 8 10 2 3 9 1 10 8 9 4. This series means that the first thread end is to be drawn through the heddle of No. 2 harness, the second warp-thread through No. 5, the third through No. 7, and so on until the fourteen warp-threads have been drawn through their respective harnesses; but before the operative can begin this operation of drawing in he must memorize this series of harness-numbers. Having memor-

ized the series, he begins the operation of drawing in in the manner above described—that is, first, he manually picks out No. 2 harness, draws in through the first heddle the first warp-thread; second, picks out No. 5 harness, draws in the second warp-thread; third, picks out No. 7 harness, draws in the next warp-thread, and so on until the fourteen warp-threads are drawn in, when the operative begins anew, repeating the above operation with the next fourteen warp-threads and continues the repetition until all the warp-threads of the beam are drawn in. Now it often happens that after the last heddle, which ought to have received the last warp-thread of the beam, has been filled there is a warp end left over. This indicates that the operative forgot one number of the series and that the harness, which ought to have received its respective warp-thread, has been skipped—that, for instance, No. 5 harness of the series was forgotten, the warp-thread which ought to have been drawn in No. 5 was drawn in No. 7 and that each succeeding warp end is drawn into the wrong harness. Sometimes the warp-threads become crossed; but whether or not the error has destroyed the pattern remains a question until an attempt has been made to weave the pattern. If it is destroyed, the warp-beam is then removed from the loom, and the warp-threads erroneously drawn in are withdrawn and then redrawn.

It will now be plain that the present method of drawing in involves the employment of operatives with skilled memories that often fail through inadvertence, accident, or mistake and are thus the source of pecuniary loss. This method is further objectionable in that the operative is subjected to a great mental strain to retain the series—say, for example, one hundred and eight numbers or warp-threads—and also give the close attention to drawing in required. My invention overcomes these objections by eliminating the element of a skilled memory and providing mechanical means that will in one-half the time usually required indicate the particular harness to receive a particular warp-thread.

In the drawings illustrating the principle of my invention and the best method now known to me of embodying said principle, A

is the frame of said machine; B, a series of levers and connecting-links mounted in a head fixed to said frame A; C, a driving mechanism to operate said levers, and D harnesses which are operated by said driving mechanism C and said series of levers and links B.

E is a warp-beam mounted on frame A. Levers b b' are pivotally mounted upon a rod b^2 , secured in upright parallel frames a^3 , forming part of the head, and have their free end portions resting against a rod b^{14} . Above the levers' pivot-rod b^2 is located a small shaft c , having bearings in said frames a^3 . On this shaft c and fast thereto (see Fig. 3) is a cylinder c' , having its curved surface recessed to receive bars c^2 , formed into a chain, each bar throughout its length having a series of holes c^3 for the reception of pegs to engage such of levers b b' as may be desired. Also fixed to said shaft c are a ratchet-wheel c^5 and a thumb-piece c^6 , while a plate c^7 is loosely mounted on said shaft. A pawl c^8 , pivoted to said plate, engages the ratchet-wheel c^5 and is held in said engagement, as by a spring c^9 . A link c^{10} has one end pivoted to the plate c^7 and the other to a treadle c^{11} , whose vertical movement is limited by stops c^{12} . A spring c^{13} holds the treadle in its highest position. A catch c^{14} , pivoted to the frame A, engages the ratchet-wheel c^5 and permits the latter to turn in only one direction.

Depending from supporting-rods a of the frame are hangers a' a^2 , in which are the bearings of two arbors b^5 b^6 , having pivotally mounted thereon bell-crank levers, as b^7 b^8 , to support the harnesses D and to receive motion imparted by the levers b b' , the characters b' , No. 2, being used simply to point out a lever and harness which in the drawings, Figs. 1 and 2, are in operation. When in their normal positions, one arm of each bell-crank lever is vertical, while the other is horizontal. To the horizontal arms of each pair of bell-crank levers b^7 b^8 are pivoted a pair of hooks b^9 b^{10} , which support their respective harness. A link b^{11} connects the vertical arms of each pair of bell-crank levers, and each of the levers b b' is connected with its respective pair of bell-crank levers by links b^{12} b^{13} . The links b^{12} b^{13} may be placed in different planes to enable the series of levers to be compressed into smaller compass, if desired.

It will be noted that for each lever, as b' , there is a pair of bell-crank levers, as b^{14} b^{15} , and consequently a harness, as No. 2, and that corresponding to each lever there is a peg-hole c^3 in each chain-bar c^2 for the reception of a peg. Therefore if it is desirable to move, say, lever b' and its harness No. 2 if a peg f^2 is put into a peg-hole corresponding to said lever and the cylinder is so turned that the peg passes into and out of operative engagement with the lever b' the lever b' will move away from the peg f^4 , operate the bell-crank levers b^{14} b^{15} , raise said harness, and after the passage of the peg said harness will

resume its normal position—that is, any harness may be moved provided the peg is put into such chain-bar hole as corresponds with the lever operating said harness.

For the purpose of illustration I have assumed that fourteen warp-threads are essential to make the design employing ten harnesses and that the combination 2 5 7 4 8 10 2 3 9 1 10 8 6 4 indicates the combination and order in which the ten harnesses are to be raised to receive their respective warp-threads. For the sake of clearness (see Fig. 1) I have separated from the heddles at the right and used to repeat the design the four-teen heddles of the ten harnesses.

The operation of my invention is as follows: The operative, beginning at the left, presses down the treadle c^{11} , and by so doing movement is imparted to the cylinder c' through the link c^{10} , the plate c^7 , and the pawl c^8 , which is in engagement with the treadle ratchet-wheel c^5 , fast to the arbor c . The peg in the chain-bar comes into contact with lever b' , which is operatively connected by means of links b^{13} b^{11} , and bell-crank levers b^{14} b^{15} with harness No. 2, which is the first of the above combination—viz., 2 5 7 4 8 10 2 3 9 1 10 8 6 4. As the treadle c^{11} moves downward the peg, as f^2 , engages the lever b' , and when the treadle has reached stop c^{12} and the catch c^{14} has hooked into the next tooth of the ratchet-wheel c^5 the peg f^2 has given to the lever b' and to harness No. 2 its maximum movement. The harness No. 2, with its heddle, being above the others, the operative sees at a glance that that harness is the one having the heddle through which the first warp-thread is to be drawn and draws in said thread through the first left heddle in the harness. The treadle c^{11} having been raised to its highest position by the spring c^{13} , the operative again presses down the treadle, and by so doing the peg f^3 , arranged in the next chain-bar, so as to coöperate with the lever operating the next harness required by the combination—viz., No. 5—moves said lever and its harness in the same manner as No. 2 harness was moved, and No. 5 harness appears above the other harnesses. The operative then draws in the next or second warp-thread through the heddle in the said harness. The operative again presses down the treadle and in like manner raises the next lever and harness of the combination—viz., No. 7—draws in the next or third warp-thread, and repeats the same operation with each succeeding warp-thread until fourteen warp ends are drawn in. As the chain is usually made up of as many bars as there are warp-threads in the pattern and being endless, the pattern is then repeated until all the warp-threads on the beam are drawn in through the remaining heddles at the right of the machine.

If by chance a warp end is left over after the last heddle in the last harness is filled, the operative knows that there is an empty heddle, which when found has to have drawn

therethrough an extra warp-thread, there usually being the same number of heddles in all the harnesses together as there are warp-threads on the beam.

5 It will now be plain that by means of my invention I avoid all errors arising from skipping or mixing harnesses.

Fig. 4 is a fragmentary view and shows a modified form of apparatus for operating the cylinder. It consists of an electromagnet L, an armature l , mounted upon one arm, m , of a toggle-joint, pivoted to the frame, as at m' , the other arm, m^2 , having at its other end a catch to engage the ratchet-wheel c^5 . The electrical energy has its source as in a battery V . Two metallic bars l^2 l^3 are supported across the front of the frame in metallic brackets l^4 , the bar l^2 being in electrical contact with the iron frame A, the bar l^3 being insulated from the bracket, as by a rubber collar l^5 , and electrically connected with one end of the coil of the electromagnet L, the other end of the coil being connected with the iron frame.

25 The operative is provided with the usual wooden-handled metallic drawing-in hook h , so that when she wishes to cause the cylinder c^5 to move the peg of the next chain-bar into operation with the next lever of the combination she lays said hook across the two bars, as shown in the diagrammatic view Fig. 5, which short-circuits the current. The magnet becoming magnetized then attracts the armature l of the arm m of the toggle-joint, and thus moves the cylinder, &c. When the pick is removed, (see Fig. 4,) the circuit is broken, and the spring m^3 , acting on the toggle-arm, causes the catch m^2 on the other arm to slide into engagement with the next tooth of the wheel c^5 , and the driving mechanism is in position to repeat its said operation.

40 It will be plain to all those skilled in the art to which this invention appertains that it may be embodied in many different forms without departing from the spirit thereof, and I wish to be understood as claiming my invention in the broadest manner legally possible.

What I claim is—

1. In a harness-finding machine, used in manually drawing in warp ends, a frame; a series of harnesses, for the reception and support of loose warp ends; means, not only whereby, in accordance with a drawing-in draft, a particular harness of said series may be moved into an obvious position and then locked in said position, but also whereby, simultaneously with said movement of said harness, the next preceding harness is permitted to return to its normal position; and apparatus, the movement and stoppage of which so moves and stops said means that said harness is moved into said obvious position and locked, and simultaneously therewith said previous harness, is unlocked from its indicating position, and moves back to its normal position.

2. In a harness-finding machine, used in manually drawing in warp ends, a frame; a series of depending harnesses; a series of levers operatively attached only to the top of said series of depending harnesses; a chain-cylinder; a chain of bars in engagement with said cylinder, and having pegs mounted therein, each of which is so located in its bar that it may be moved, in accordance with a drawing-in draft, into and then out of engagement with its particular lever of said series, to move said lever and its connecting-harness into a fixed and obvious position; and simultaneously therewith, to release and unlock a lever and its harness, previously moved into said obvious position and locked therein, and permit said harness to drop, by reason of its own weight, back into its normal position; and means to start and then stop said cylinder and thus move two of its pegs, one into, and one out of operative engagement with its respective lever operating its respective harness.

In testimony whereof I affix my signature in presence of two witnesses.

CYRUS E. SMITH.

Witnesses:

EDWARD SHAW,
FREDERICK C. CANFIELD.