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J. H. NORTHROP.

LOOM.

No. 454,808. Patented June 23, 1891.

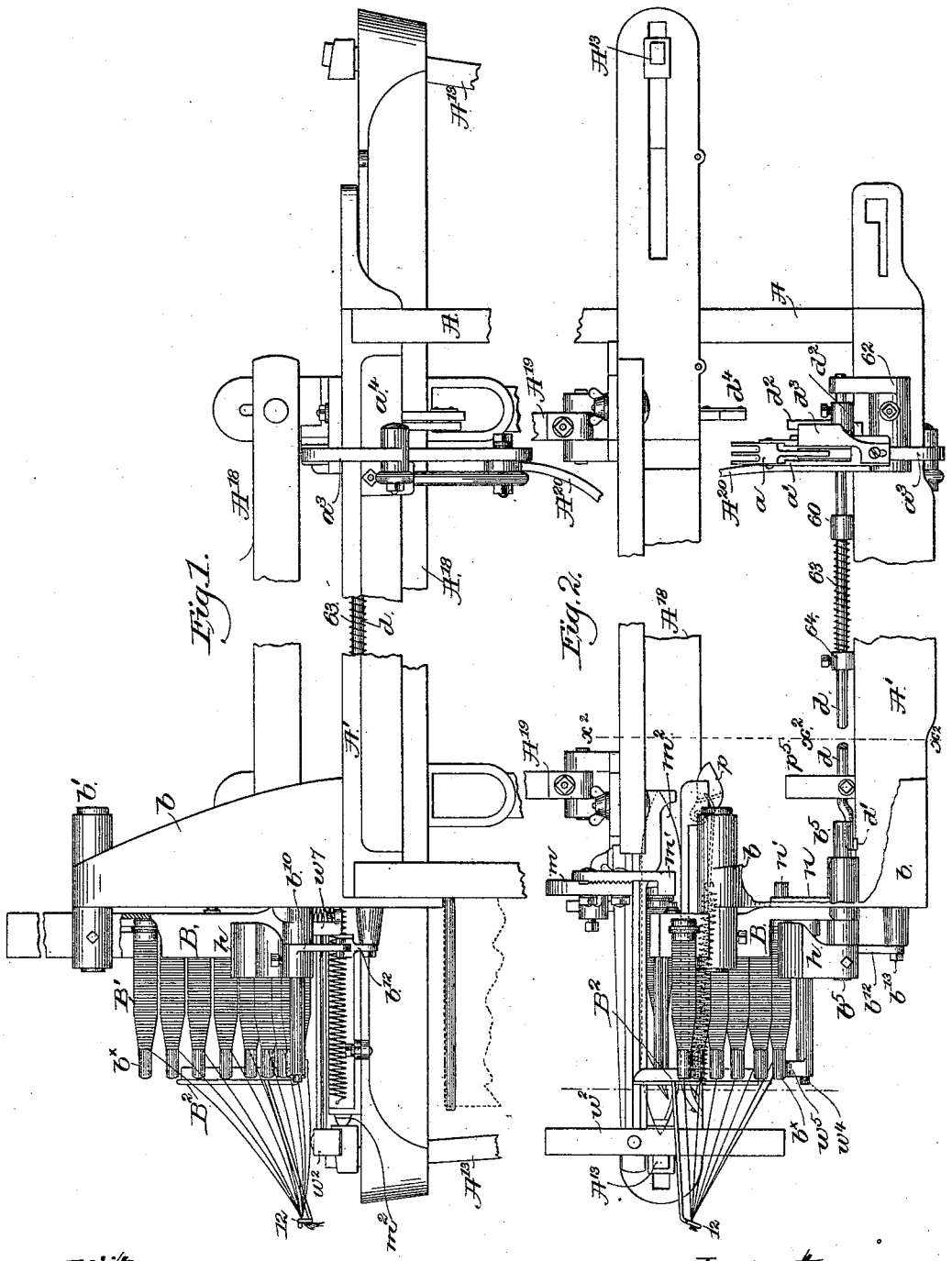


Fig. 1.

Fig. 2.

Witnesses.
Fred. L. Emery
Frederick L. Emery

Inventor:
James H. Northrop,
by Crosby & Gregory
attys.

(No Model.) 4 Sheets—Sheet 2.

J. H. NORTHROP.

LOOM.

No. 454,808. Patented June 23, 1891.

Fig. 3.

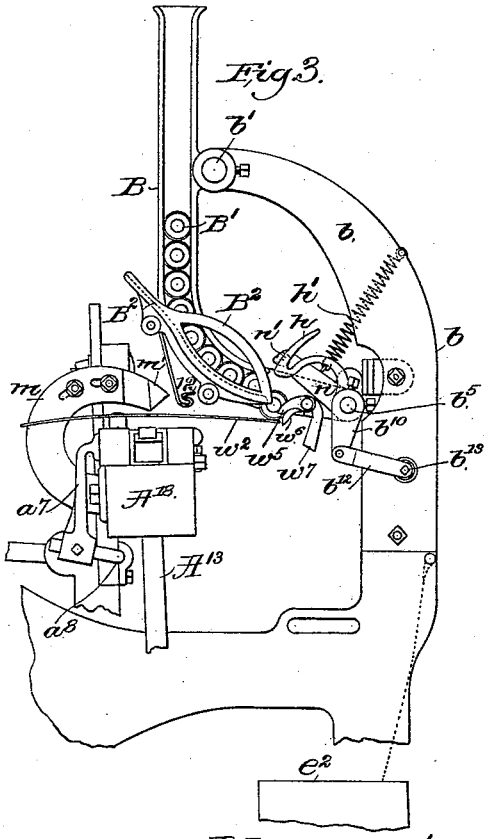


Fig. 4.

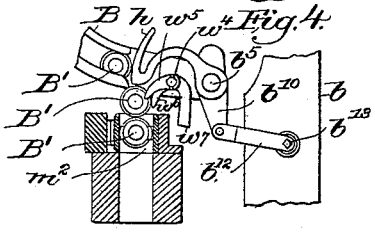


Fig. 5.

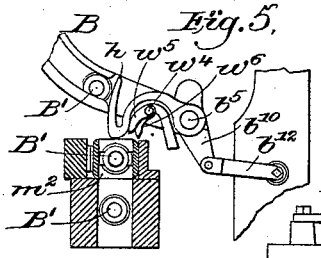


Fig. 6.

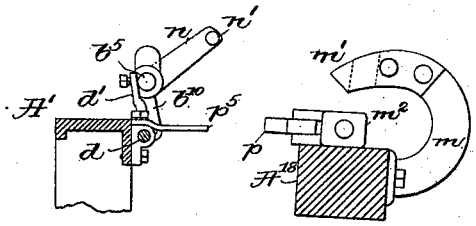


Fig. 7.

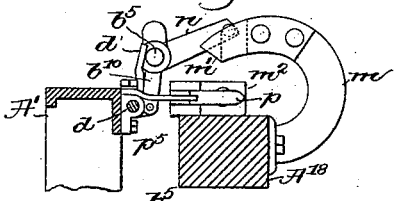


Fig. 8.

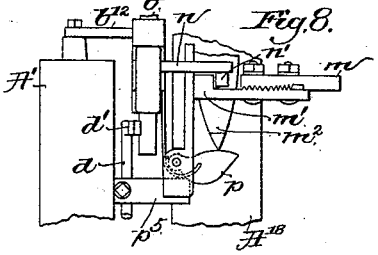


Fig. 9.

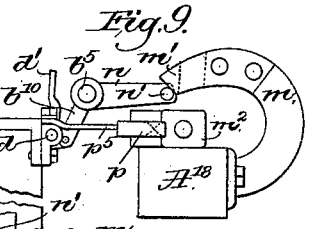
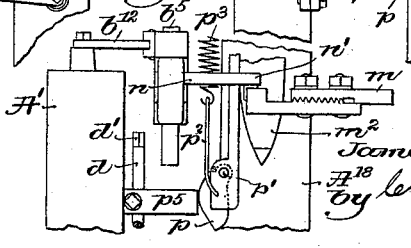


Fig. 10.



Witnesses.
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J. H. NORTHROP.

LOOM.

No. 454,808. Patented June 23, 1891.

Fig. 11.

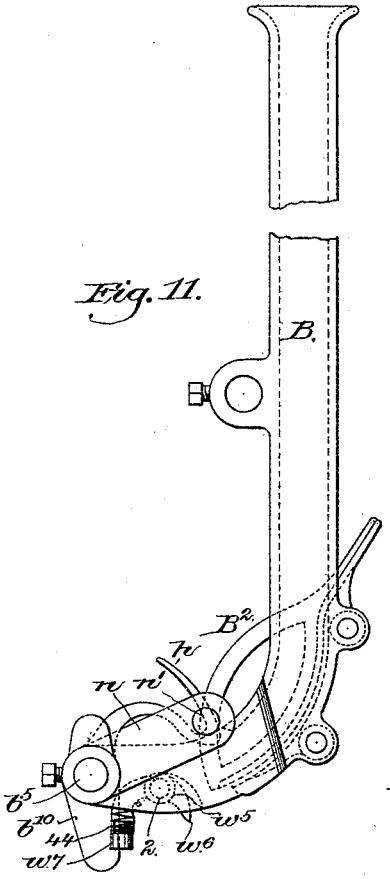


Fig. 12.

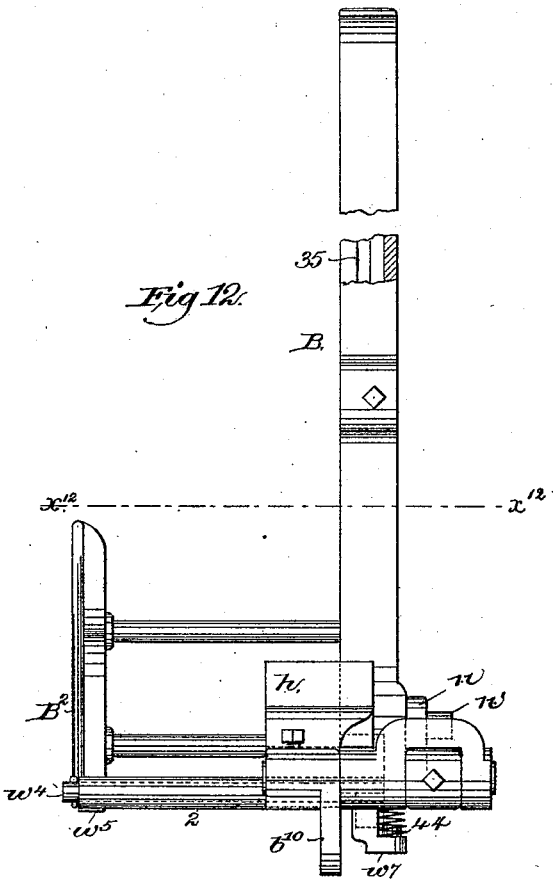


Fig. 13.

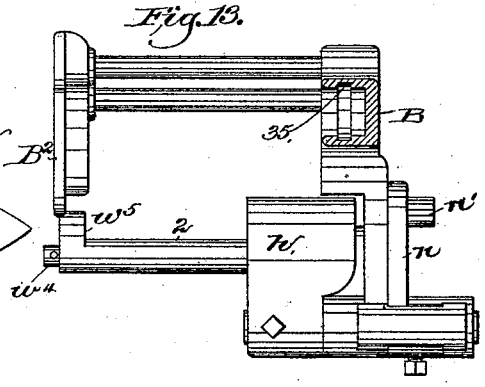


Fig. 14.

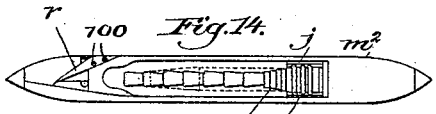


Fig. 15.

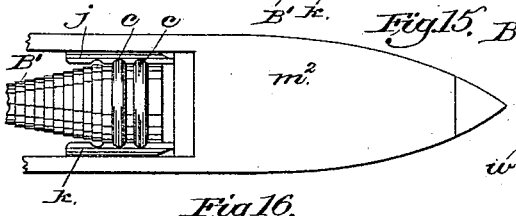
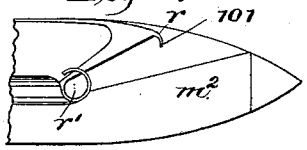


Fig. 16.



Witnesses.
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(No Model.)

4 Sheets—Sheet 4.

J. H. NORTHROP.

LOOM.

No. 454,808.

Patented June 23, 1891.

Fig:17.

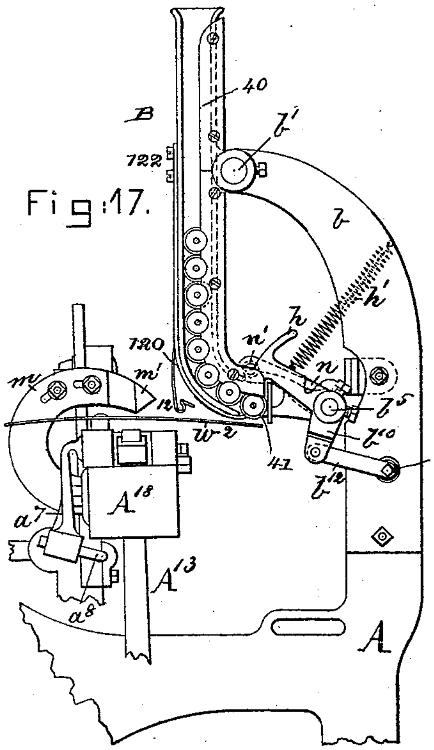


Fig:18.

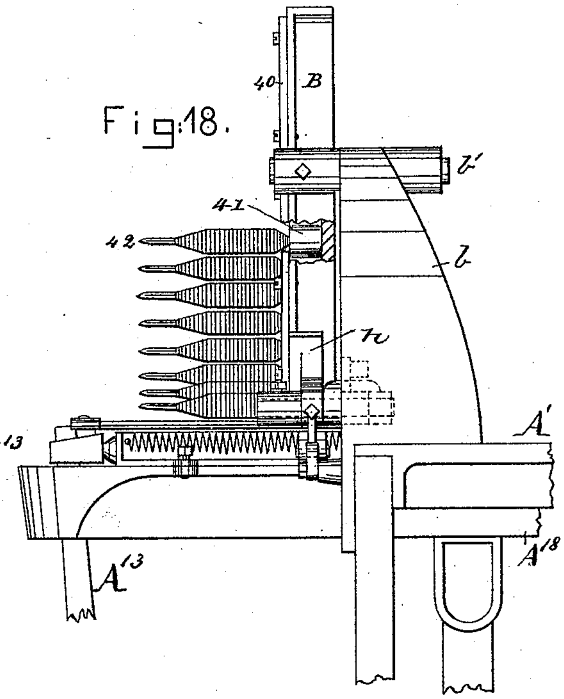


Fig:19.

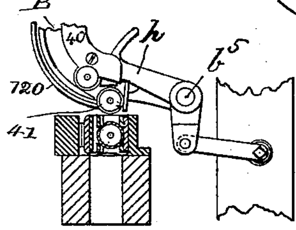


Fig:20.

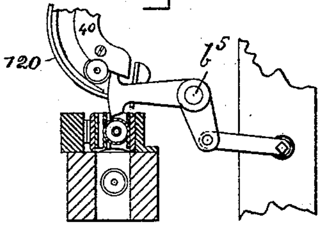


Fig:21.

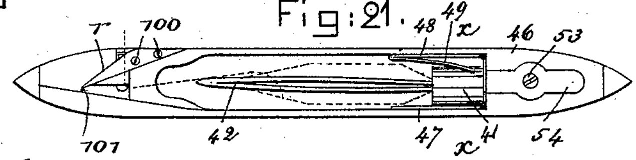


Fig:22:

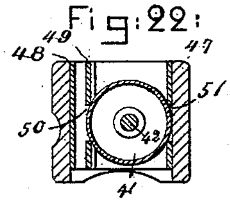
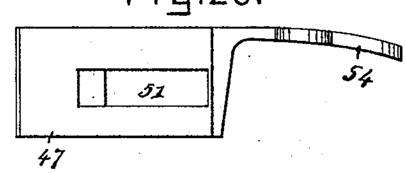


Fig:23.



Witnesses.

Fred. S. Greenleaf

Frederick L. Emery

Inventor.

James H. Northrop,

by Crosby & Gregory attys.

UNITED STATES PATENT OFFICE.

JAMES H. NORTHROP, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO GEORGE DRAPER & SONS, OF SAME PLACE.

LOOM.

SPECIFICATION forming part of Letters Patent No. 454,808, dated June 23, 1891.

Application filed May 10, 1890. Serial No. 351,228. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. NORTHROP, a subject of the Queen of Great Britain, but at present residing at Hopedale, county of Worcester, State of Massachusetts, have invented an Improvement in Looms, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

Application Serial No. 334,873, filed December 24, 1889, shows and describes a loom in which one shuttle after another is automatically taken from a movable hopper and transferred into a shuttle-box of the lay, this happening whenever the weft breaks or fails for any reason, the change being effected while the loom is in motion and without any cessation of its operation. In the loom referred to a pusher mounted upon a rock-shaft connected with the swinging hopper acts upon the shuttles to transfer them into the shuttle-box, each shuttle coming into a shuttle-box ejecting a spent shuttle therefrom.

Being desirous of improving the loom referred to, so that the employment of a great number of shuttles might be avoided, I have so shaped the hopper as to receive and guide the heads of a series of bobbins or spindles carrying the weft or filling, and the pusher has been adapted to act directly upon the bobbins or spindles and transfer them in succession whenever the weft fails into a single shuttle then in the shuttle-box, the bobbin or spindle being inserted in the shuttle striking against and ejecting the bobbin or spindle contained in the shuttle when the weft failed.

The shuttle employed herein is open at its opposite sides for the reception of a bobbin at one side after the discharge of the bobbin at the other side thereof, the shuttle-box being open also to permit the bobbin to pass through it. I have also shown the shuttle as so constructed that it will be self-threading, or so that the thread of a bobbin put in the shuttle by the pusher will be automatically threaded into the delivery-eye of the shuttle.

The shuttle referred to and its combination, broadly, with the pusher and with a hopper irrespective of the construction of the hopper is not herein broadly claimed, as such, broadly, in combination constitute features of claim in the specification of application Serial No. 380,494, filed on the 6th day of February, 1891, the invention contained in this application, in so far as the devices are common to the application last referred to, being tributary to that of the said application.

One part of my invention consists, essentially, in a loom containing the following instrumentalities, viz: a lay having a shuttle-box, a shuttle open at one side for the reception and at another side for the discharge of a filling-carrier and a movable hopper, and a pusher to push a filling-carrier from the hopper into the shuttle in the shuttle-box of the lay.

Other features of invention will be described, and specified in the claims.

Figure 1 is a partial front elevation of a sufficient portion of a loom taken, in connection with the loom shown in my application, Serial No. 334,873, to enable my present invention to be understood, the breast-beam and lay being broken out to shorten the figure upon the drawings. Fig. 2 is a top or plan view of the parts shown in Fig. 1, but with the support *b* broken out to show the parts below it. Fig. 3 is a left-hand end elevation of the parts shown in Fig. 1. Figs. 4 and 5 are details showing the lower end of the hopper or guide and part of the bracket *b*, the said figures in section showing the shuttle-box of the lay and a shuttle therein, the devices represented in Figs. 4 and 5 being, however, in different positions. Fig. 6 is a partial section in the line x^2 of Fig. 2, looking to the left, chiefly to show the lug device carried by the lay, and which is to be engaged by an arm connected with the transferrer rock-shaft carried by the hopper to move the same when the hopper is to be moved in unison with the lay, and also the devices for putting the shuttle into position to receive a bobbin or spindle. Fig. 7 is a view of the same parts shown in Fig. 6, but in different positions. Fig. 8 is a top or plan view of the parts shown in Fig. 7. Fig. 9 is a view similar to Figs. 6 and 7, but with the lay in a different position. Fig. 10 is a top view of the parts shown in Fig. 9; Fig. 11, an enlarged side elevation of the

hopper; Fig. 12, an enlarged front elevation of the hopper; Fig. 13, a section in the line x^{12} of Fig. 12. Fig. 14 represents in top view a shuttle adapted to receive the bobbin contained in the hopper represented in Figs. 1, 2, and 3. Fig. 15 represents the holding devices in the shuttle and the head of the bobbin therein enlarged; Fig. 16, an enlarged detail showing the slotted delivery or self-threading eye in the shuttle; Fig. 17, a modification of my invention in which the cop is shown as carried on a spindle having an enlarged head adapted to travel in a guideway of the hopper and to be held at its head by holding devices in the shuttle; Fig. 18, a view of the parts shown in Fig. 17, looking from the right; Figs. 19 and 20, details showing the pusher in different positions occupied by it during the operation of delivering a cop into the shuttle shown in Fig. 21 and removing a spindle from which the weft has been exhausted; Fig. 21, a top or plan view, somewhat enlarged, of a shuttle such as used in the modification Figs. 17 and 18; Fig. 22, a section, as the line x, Fig. 21, but enlarged; and Fig. 23 shows the holding device removed from the shuttle.

Referring to the drawings, A represents the frame-work of a loom of suitable shape to support the working parts; A^{18}, the lay, it having in practice at each end a suitable shuttle-box having any usual binder, but one shuttle-box being herein shown—viz., that at the left-hand end of the loom—A^{19}, the lay connecting-rods which in practice will be joined to the usual lay or crank-shaft. (Not shown.)

A^{20} represents part of the weft-hammer adapted to be actuated by a suitable cam to engage the usual weft-fork a, pivoted in the slide a', whenever the weft-fork is not tilted by the weft.

A^{13} represents the picker-sticks; a^3, a lever, which acts against one end of the slide a'.

b is a stand erected upon the breast-beam A'.

d represents a shaft having bearings at 60 and 62, the said shaft having at one end a substantially upright finger d' and at its opposite end a finger d^2, and 64 represents a collar fast upon the shaft d and acted upon by a spring 63, one end of which rests against the bearing 60.

b^5 represents a rock-shaft mounted in the lower end of a hopper or guide, to be described, the said rock-shaft having an arm b^{10}, to which is jointed a link b^{12}, pivoted at b^{13} on the stand b.

a^7 represents a finger attached to an arm a^8 of a binder-shaft, (partially shown in Fig. 3,) the said finger acting upon or against the usual binder.

The parts so far described are substantially the same as in my said application Serial No. 334,873, wherein they are designated by like letters, so herein need not be more specifically described.

The stand b, erected on the breast-beam, has at its upper end a pivot-bearing b', which supports a hopper or guide B, herein represented as having a channel or way to receive and embrace the heads of the bobbins B', to be described, the lower end of the hopper or guide turned toward the breast-beam having suitable bearings for the rock-shaft b^5.

The hopper herein shown and described is so constructed that it receives and guides the heads of the bobbins or spindles as they roll or travel downwardly therein, the lowermost bobbin or spindle always coming unerringly into position to be struck by the pusher and be transferred directly from the hopper into the shuttle in the shuttle-box, and the incoming bobbin ejects the spent bobbin.

Whenever for any reason the weft is not properly laid or presented in front of the usual reed to be acted upon by the fingers of the weft-fork a, the weft-fork will not be tilted and the weft-hammer A^{20} will catch the fork, push back the slide a', and cause its inclined side acting on the arm d^2 to move the rod d longitudinally far enough to place said arm in the line of the bunter d^4, which moves with the lay, so that during the forward movement of the lay the said shaft d will be rocked so as to cause its finger d' to act against the pusher rock-shaft b^5, mounted in the said hopper, and move the said rock-shaft and hopper forward or toward the lay for a short distance, as described in my said application.

The hopper B, as shown, has a lip or extension B^2, upon which may rest the outer ends of the series of bobbins B', and near its lower end the hopper has attached to it a yielding stop consisting, essentially, of a sleeve or tube 2, having near its ends lips w^5 w^6, (see Figs. 3, 11, and 13,) the said tube being mounted on a stud w^4, fast on the hopper, the lip w^5 supporting the small end, and the lip w^6 the head end, of the lowermost bobbin of the series of bobbins in the hopper. The tube 2 has an arm w^7, which is acted upon by a spring 44, located, as shown, between the said arm and the hopper, so that the stop is free to be turned somewhat about the said rod w^4 as a center when the bobbin is being pushed out from the hopper into the shuttle by the pusher, to be described. Figs. 3 and 4 show the lips in their different positions.

The hopper is shown as having connected to it a suitable pin or catch 12, to which are joined the ends of the yarns coming from the several cops contained in the hopper, as best represented in Figs. 1 and 2. (See also Figs. 3 and 17.) The rock-shaft b^5 has attached to it a suitable pusher h, and also an arm n, having a pin or projection n'. A spiral spring h', connected to the arm n (see Fig. 3) and to the bracket b, serves normally to keep the pusher in its elevated position, Fig. 3, and the hopper in position with the rock-shaft b^5 at its lower end close to the bracket b and breast-beam.

The lay A^{18} has fixed or connected to it at its rear side a lug device, (shown as an arm m,)

herein represented as bolted to the rear side of the lay and extended rearwardly and forward toward the breast-beam, and notched at one side to leave a lug m'. The shuttle-box of the lay has within it a shuttle m^2, and below the shuttle-box and in the lay is a slot of sufficient size and of proper shape to permit a bobbin to be discharged from the shuttle through it. The form of shuttle shown in Figs. 14 and 15, it being fully shown and described in application Serial No. 351,227, has holding devices, (shown as jaws j k,) the inner faces of which are notched or corrugated to receive between them and hold securely, and preferably frictionally, the head of the bobbin B', the said head having in the form shown a series of projections c c, preferably annular rings or pieces of wire, to enter notches of the said jaws and aid in keeping the bobbin in horizontal position and prevent it from moving longitudinally in the shuttle; but it will be obvious that the reverse of this construction—viz., projections on the jaws to enter notches in the head of the bobbin—would be an equivalent.

The shuttle is open at two sides, herein shown as the top and bottom sides, for the entrance of the bobbin at one side and its discharge at the other side, the bobbin being passed into the jaws from the top side of the shuttle, where it is held so long as the weft holds out, and thereafter the spent bobbin is passed on through the jaws and out from the shuttle and shuttle-box. The shuttle-wall is slotted or cut away at one side and has applied to it by screws 100 (see Figs. 14 and 21) a horn r, having a lip 101, the shuttle at the base of the said slot receiving a block or delivery-eye having a point r', so that the weft-yarn of each bobbin attached to the stud or catch 12 will be threaded automatically into the said slot under said horn and into said eye during the first two shots of the shuttle after the bobbin has been pushed from the hopper into the jaws of the shuttle, the weft-yarn being led from the bobbin out through the said eye.

I do not desire to limit my invention to the specific form shown for the slotted or self-threading delivery-eye in the shuttle, as prior to my invention I am not aware that a bobbin or spindle containing yarn was ever automatically put into a shuttle having any sort of slotted delivery-eye and threaded therein by the motion of the shuttle in the loom.

In operation let it be supposed that the yarn upon the bobbin B' in the shuttle has been exhausted or broken. Immediately thereafter the filling-fork a will be operated in usual manner, and through the means provided it will cause the rock-shaft d to be turned to bring the finger d' thereof against the rock-shaft b^5 and push it, together with the hopper, slightly toward the lay, such movement of the rock-shaft and hopper being sufficient to, through the arm b^{10} and link b^{12}, turn the rock-shaft and its connected arm n from the position Figs. 3 and 6 just far enough to place the pin n' of the arm n in the notch of the arm m behind the lug m', as in Fig. 7, this happening, preferably while the lay is moving forward and is almost at the end of its forward stroke, and thereafter as the lay is on its back-stroke and the said pin n' is in the slot of the arm m and against the projection m' the lug device will cause the hopper and rock-shaft to be moved in unison with the lay for a part of its back-stoke, during which time the rock-shaft b^5 will be yet further rotated through the arm b^{10} and link b^{12} and cause the pusher h to act upon the endmost bobbin at the lower end of the series of bobbins B' in the hopper, (see Figs. 3 and 4,) and by a movement, as indicated by the said figures and Fig. 5, push and deliver the said endmost bobbin against the bobbin then in the shuttle, (see Fig. 4,) the pusher continuing its movement and pressure until the said bobbin, acted upon directly by it, pushes the bobbin then in the shuttle out from the holding device, letting the spent bobbin, as represented in Figs. 4 and 5, drop out from the bottom of the shuttle, the full bobbin being left in the holding device, the shuttle so supplied with a bobbin-containing weft being then ready to be shot across the loom through the shed. This change of bobbin, as herein shown, takes place during part of one forward and return stroke of the lay without any intermission in the movement of the loom. During this operation of supplying the shuttle with a bobbin the lip w^5 is pushed back, as represented in Fig. 3, into the position Fig. 4.

As soon as the full bobbin has been inserted into the shuttle, as in Fig. 5, the roller or other stud n' of the arm n passes below the lug m', and being released from the lug device the spring h' immediately assumes control of the hopper and throws it back into the position Fig. 3, raising the pusher into the position therein shown.

While the pusher acts to push a bobbin from the hopper into the shuttle, it also acts as a stop for the bobbin next back of the one being taken from the hopper, as represented in Figs. 4 and 5.

It is essential that the shuttle be in the proper position to receive the bobbin when the new bobbin is to be delivered into it and to accomplish this and prevent any accidental misplacement of the shuttle by reason of rebound or other cause I have provided the lay at or near the inner end of the shuttle-box with a shuttle-positioning device p, pivoted at p', and having connected to it a strap p^2, to which in turn is connected a spring p^3, the other end of which is attached to a suitable projection forming part of the shuttle-box, the normal tendency of the said spring being to keep the said shuttle-positioning device in the position shown in Figs. 2, 6, 9, and 10; but just as the lay is about completing its forward stroke the said positioning device meets, as herein shown, a projection p^5, con-

nected to the inner side of the breast-beam a', the said projection serving to turn the shuttle-positioning device from the position Fig. 10 into the position Fig. 8, the said positioning device coming against the inner point of the shuttle and pushing it back, if it is out of place, so that the opening in the shuttle and the holding device therein shall be in the proper position to receive the bobbin. The arm or finger p^5 for actuating the positioning device is herein shown as occupying a position to strike the positioning device each time the lay moves forward.

To prevent the ends of the weft-threads between the cops in the hopper and the catch 12 from being entangled by the moving lay or by the picker-stick, I have attached to the lay a thread-rest w^2, shown as a thin spring-plate.

As specifically illustrated in Figs. 1 to 16, inclusive, the bobbin shown is supposed to be of wood; but I do not intend to limit this invention to a bobbin of wood, as it is obvious that the bobbin may be composed of other material than wood and be of any suitable shape, so long as it has a head to enter and be guided by the hopper, the blade part of the bobbin, or that part on which the cop of yarn is placed, being prevented from longitudinal movement by the contact of a part of the said head with a suitable lip or flange on or forming part of the hopper.

As one modification of my invention I may employ, instead of the ordinary bobbin such as shown in Fig. 14, a metallic blade or spindle inserted in a head, the cop of yarn being applied to the said blade or spindle, the head being suitably shaped to enter and be guided by the said hopper. I have hereinbefore referred to this modification by the term "spindle," and I will now describe my invention in connection with one form of such spindle, and in doing so will refer to Figs. 17 to 23, first stating, however, that the shaft d, having the finger d' to act against the rock-shaft d^5 and give an initial forward movement to the hopper when the weft fails, has been omitted from the drawings to avoid confusion; but it will be understood that such parts will be employed.

In Figs. 17 to 20 the hopper or guideway B, shaped substantially as in Figs. 1 and 2, receives and embraces the heads 41, to which are attached the blades or spindles 42, the heads being retained in the guiding-groove or raceway of the hopper against longitudinal movement, or a movement in the direction of the length of the spindle, by a lip or flange 40 along one side of the hopper, the lower end of the hopper having a yielding stop-plate 120, (shown as a spring-plate,) connected by screws 122 to the hopper and against which rests the head 41 of the lowermost spindle, as shown in Figs. 17 and 19, so long as the weft is being properly supplied to the warp in the movement of the shuttle then in the shuttle-box.

The shuttle 46 to receive the head 41 of the spindle, as shown, has a holding device composed of two arms or jaws 47 48, the jaw 48 having an attached spring part or plate 49, the said part 49 and the part 47 being each notched or slotted, as at 50 51, to receive part of the head 41, as best shown in Fig. 22, the said notches entered by the head enabling the bobbin to be kept in proper horizontal position in the said shuttle. As shown, the spindle-holding device is secured to the shuttle-body by a screw 53 in the shank 54 of the said holding device. The shuttle shown in Fig. 21 has its delivery-eye slotted to thus make it self-threading, as described of the shuttle m^2. (Shown in Figs. 14 to 16.) The shuttles shown in these Figs. 14 to 16, as well as in Fig. 21, are made the subject of claim in applications Serial Nos. 351,227 and 352,960, to which reference may be had for a more full description.

The pusher h, shown in Fig. 17 as connected with the rock-shaft b^5, is shaped somewhat differently from the pusher shown in Figs. 1 to 5; but, like that pusher, it acts upon one of the spindles, as in Fig. 19, whenever the hopper is given its initial forward movement by the action of the finger d', referred to, on the said rock-shaft b^5, the pin or projection n' of the arm n at such times passing the lug m' of the lug device, as described in connection with Figs. 7 and 8, so that as the lay continues its movement back from the breast-beam the rock-shaft and hopper will move in unison with the lay until the pusher is brought into the position Fig. 20, during which time the pusher pushes before it from the end of the hopper the spindle then under it, the incoming spindle striking against the spent spindle shown in Fig. 19 and ejecting it from the under side of the shuttle, as in Fig. 20, the spent spindle passing through a slot in the lay and into a suitable receptacle. While pushing the spindle from the hopper (see Fig. 19) into the bobbin-holding device of the shuttle, as in Fig. 20, the head of the pusher acts as a stop for the spindle next back of it in the hopper. One side of the groove 35 in the hopper B, Figs. 12 and 13, leaves a lip or flange to contact with a projection on the head of the spindle, and so also the inner end of the head 41 contacts with the lip or flange 40, both constructions acting to prevent the escape of the spindle from the hopper by a longitudinal movement, which is an important feature of this invention, as thereby it is not necessary to form an abutment for the tip end of the spindle, or that end thereof from which weft-yarn is unwound, such construction enabling the delivery ends of the spindles to travel in free space, as shown in Fig. 18.

From the foregoing description it will be obvious that my invention will be substantially the same whether the cop used is carried by a bobbin or by a spindle, and in the term "bobbin," as used in the claims for

brevity, I mean to include such a spindle or cop-carrying device.

I do not intend to limit my invention to the form and shape of the holding device in the shuttle to receive and hold the head of the bobbin or spindle in such manner as to enable the head of the bobbin to be pushed into place through one side of the shuttle and be discharged as a spent bobbin or spindle from the other side of the shuttle, as described and shown, as it is obvious that many different forms of holding devices might be devised yet all be within the scope of my invention; nor do I limit my invention to the specific details of the hopper and co-operating mechanism, whereby in the operation of the loom the essential devices to which I have referred are enabled to position the shuttle and automatically deliver into it a new cop in place of a spent bobbin or spindle. The bobbin or spindle may be of any form adapted to carry a cop, and different forms thereof may be used interchangeably without departing from my invention.

I do not intend to limit myself to the use of the stud or catch for holding the ends of the weft, as I have found in practice that if the ends are not so secured they may be threaded in the shuttle by catching in the warp on the first shot of the shuttle.

Having described my invention, I desire to state that I do not herein claim anything shown in my application Serial No. 380,494, filed February 6, 1891; but, on the contrary, the claims herein made are limited and intended to be limited to that class of looms wherein the hopper is movable, the bobbin or spindle being put into the shuttle while the hopper and lay are moving in unison, rather than from a stationary hopper while the lay is in its forward position.

I claim—

1. A loom containing the following instrumentalities, viz: a lay having a shuttle-box, a movable hopper constructed to receive and guide the heads of bobbins or spindles containing weft or filling, a shuttle open at two of its sides, one for the reception and the other for the discharge of said bobbins or spindles, and a pusher to push the said bobbins or spindles from the hopper into the shuttle in the shuttle-box of the lay, substantially as described.

2. A loom containing the following instrumentalities, viz: a lay having a shuttle-box, a movable hopper constructed internally to receive and guide the heads of bobbins or spindles, a shuttle open at two of its sides, one for the reception and the other for the discharge of a bobbin or spindle, a pusher mounted on the movable hopper and adapted to engage the bobbin or spindle and push it into the shuttle in the shuttle-box, and means to move the hopper to put it into operative position with relation to the lay, substantially as described.

3. A loom containing the following instrumentalities, viz: a lay having a shuttle-box, a shuttle open at one side for the reception and at another side for the discharge of filling and having a slotted delivery-eye, a movable hopper, and a pusher to push filling from the hopper into the shuttle in the shuttle-box of the lay, substantially as described.

4. A lay having a shuttle-box, a movable hopper constructed to receive and guide a series of bobbins or spindles, a shuttle open at opposite sides for the reception and discharge, respectively, of a bobbin or spindle, and a pusher, combined with means to couple the lay and hopper together while the pusher acts to transfer the bobbin or spindle from the hopper into the shuttle, substantially as described.

5. A loom containing the following instrumentalities, viz: a movable hopper to contain a series of bobbins or spindles, a pusher, a lay having a shuttle-box provided with an opening for the passage through it of a bobbin or spindle, and a shuttle in the said shuttle-box having two of its sides open, one for the entrance and the other for the exit of a bobbin or spindle, combined with means under the control of the weft fork or feeler, whereby upon fault in the filling the said hopper has given to it a movement toward the lay, means to connect the hopper and lay that they may thereafter move in unison, and means to move the pusher to push a bobbin or spindle from the hopper into the shuttle, substantially as described.

6. In a loom, the following instrumentalities, viz: a lay having a shuttle-box slotted for the exit of a bobbin or spindle, a shuttle open at its opposite sides to receive a bobbin or spindle at one side thereof and permit it to be ejected from the other side thereof, and having a slotted delivery-eye in which the weft or filling may be laid automatically, a movable hopper to contain a series of bobbins or spindles, a pusher to push a bobbin or spindle from the hopper into the shuttles in the shuttle-box, means to give to the hoppers an initial movement and to couple the lay and hopper to move in unison, and means to actuate the pusher as it is made to travel with the hopper, whereby the pusher acts to push a bobbin or spindle from the hopper into the shuttle while the lay and hopper are moving in unison, substantially as described.

7. A shuttle having within it at one end jaws to grasp the head of and hold a bobbin or spindle therein, the said shuttle being open at one side for the reception and at its other side for the discharge of the said bobbin or spindle, combined with a lay, a shuttle-box, and devices to put a bobbin or spindle into the said shuttle while the lay is in motion and on its backward stroke, substantially as described.

8. A loom containing the following instrumentalities, viz: a lay having a shuttle-box, a shuttle open at one side for the reception and at another side for the discharge of fill-

ing, a movable hopper to contain bobbins or spindles, a yielding stop for said bobbins or spindles, a movable pusher carried by the said hopper, and devices to move the hopper and cause the pusher to act and push a bobbin or spindle from the hopper into a shuttle in the shuttle-box, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES H. NORTHROP.

Witnesses
F. J. DUTCHER,
H. W. BEATTY.