No. 636,707. Patented Nov. 7, 1899.

W. H. BAKER & F. E. KIP.

WEFT SUPPLY MECHANISM FOR LOOMS.

(Application filed Aug. 14, 1899.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 6.

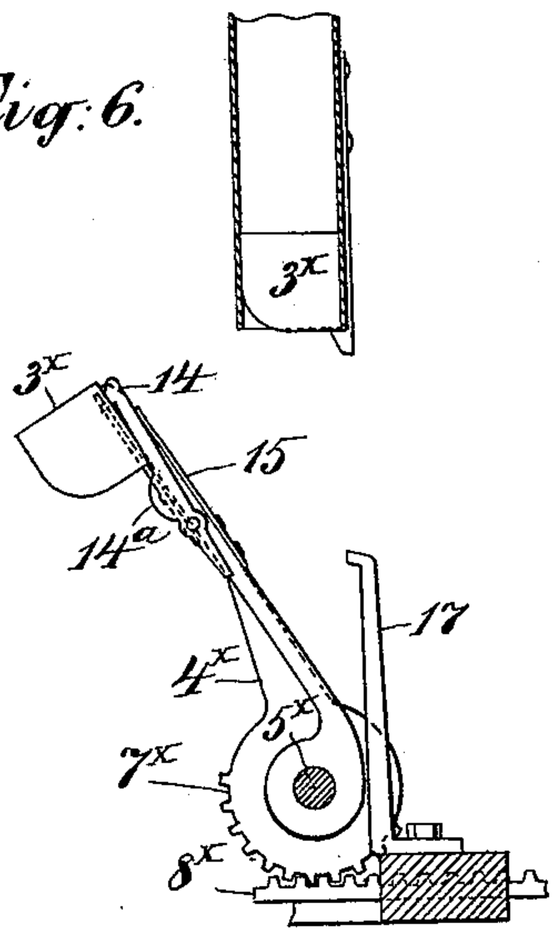

Fig. 1.

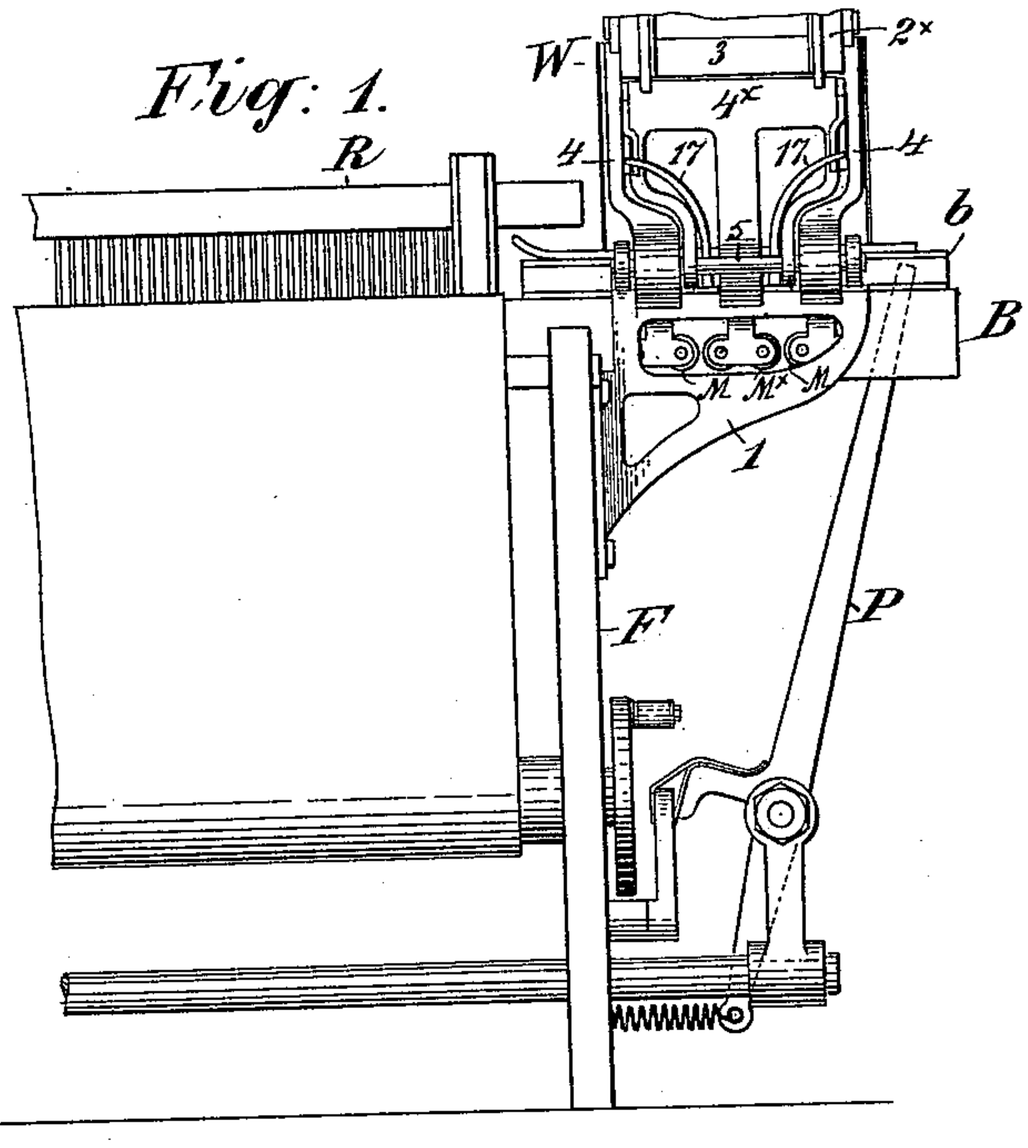

Fig. 2.

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(No Model.) (Application filed Aug. 14, 1899.)

4 Sheets—Sheet 2.

Fig. 3.

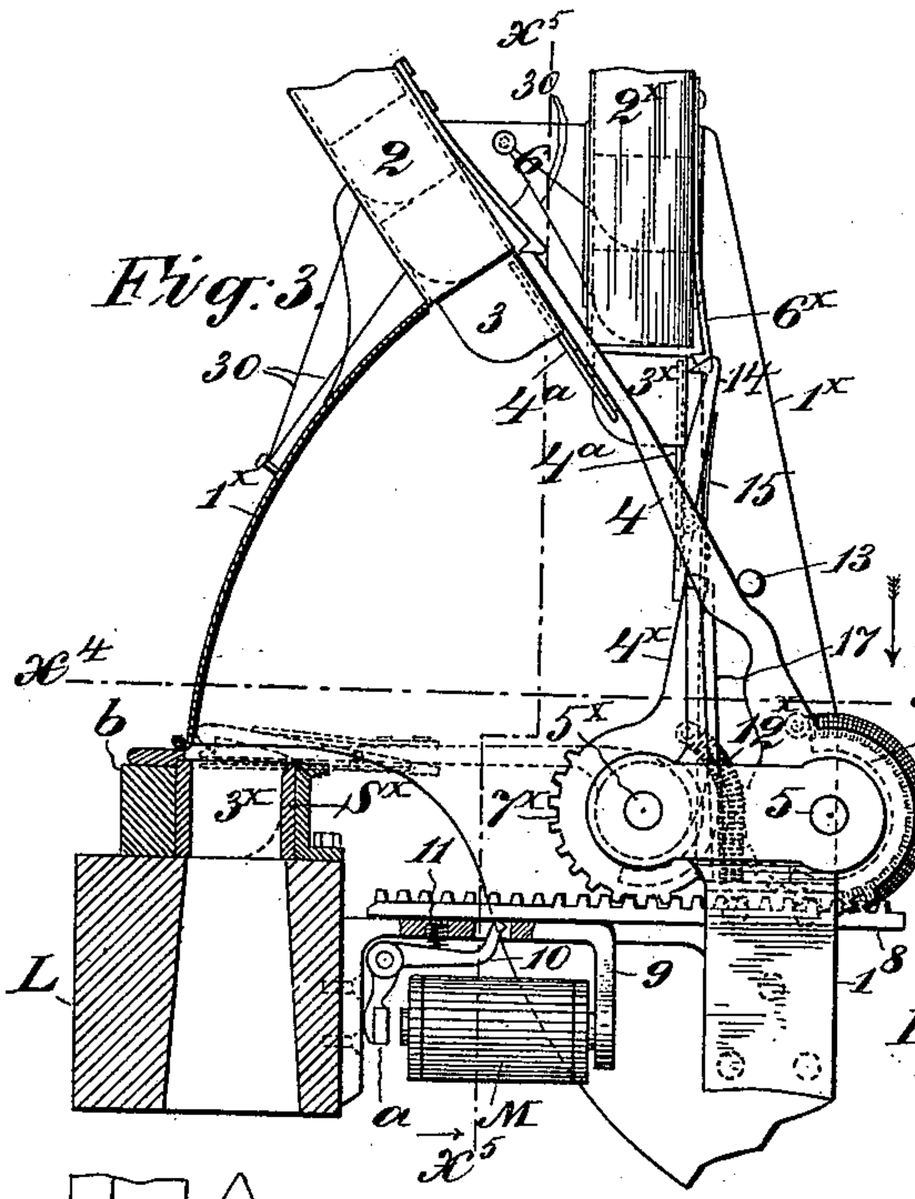


Fig. 3a.

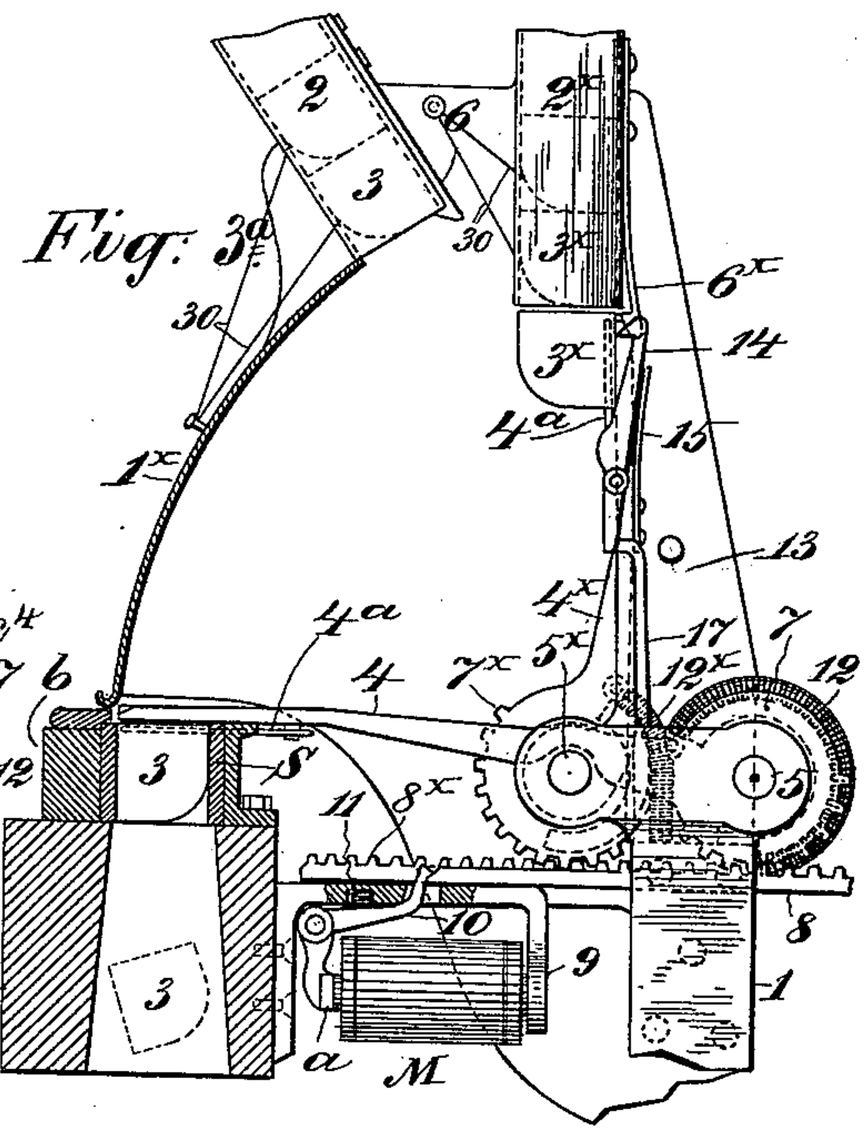


Fig. 4.

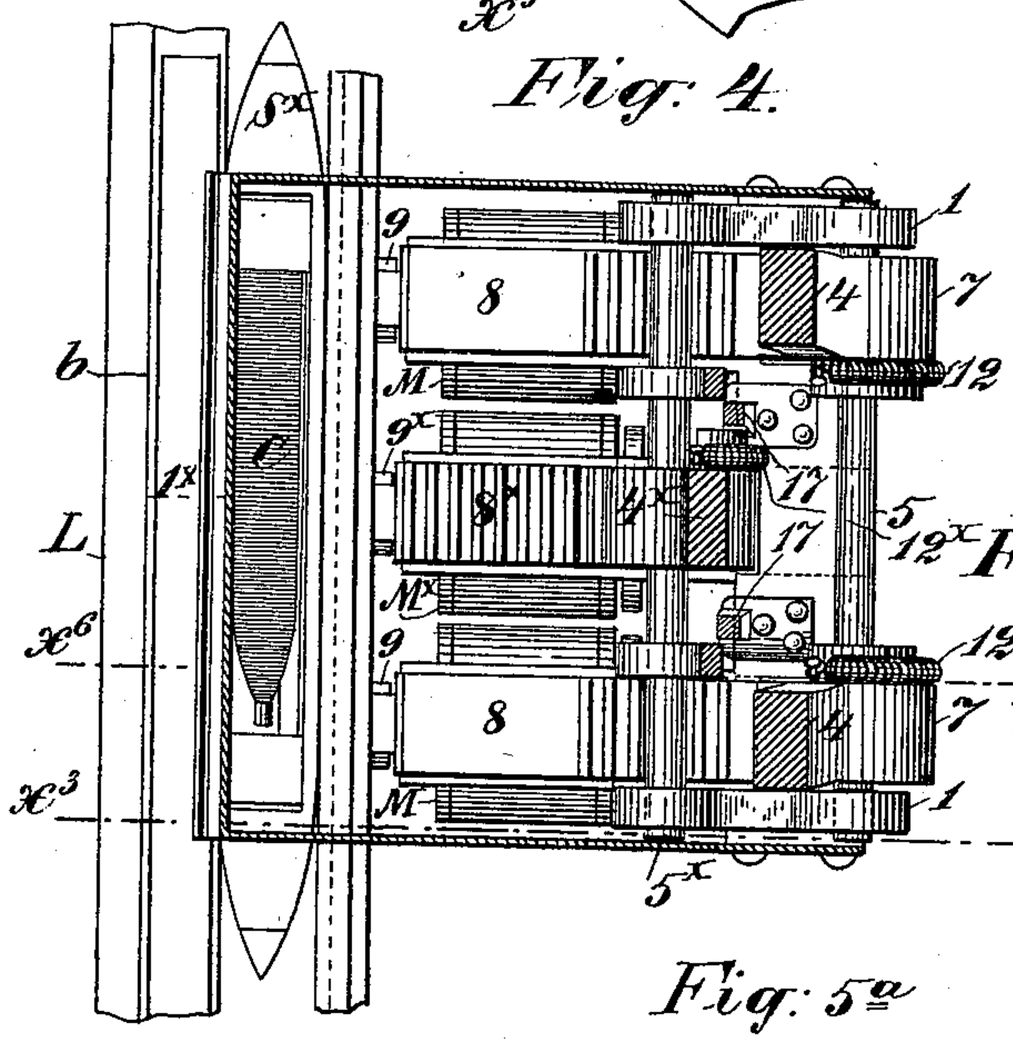


Fig. 5.

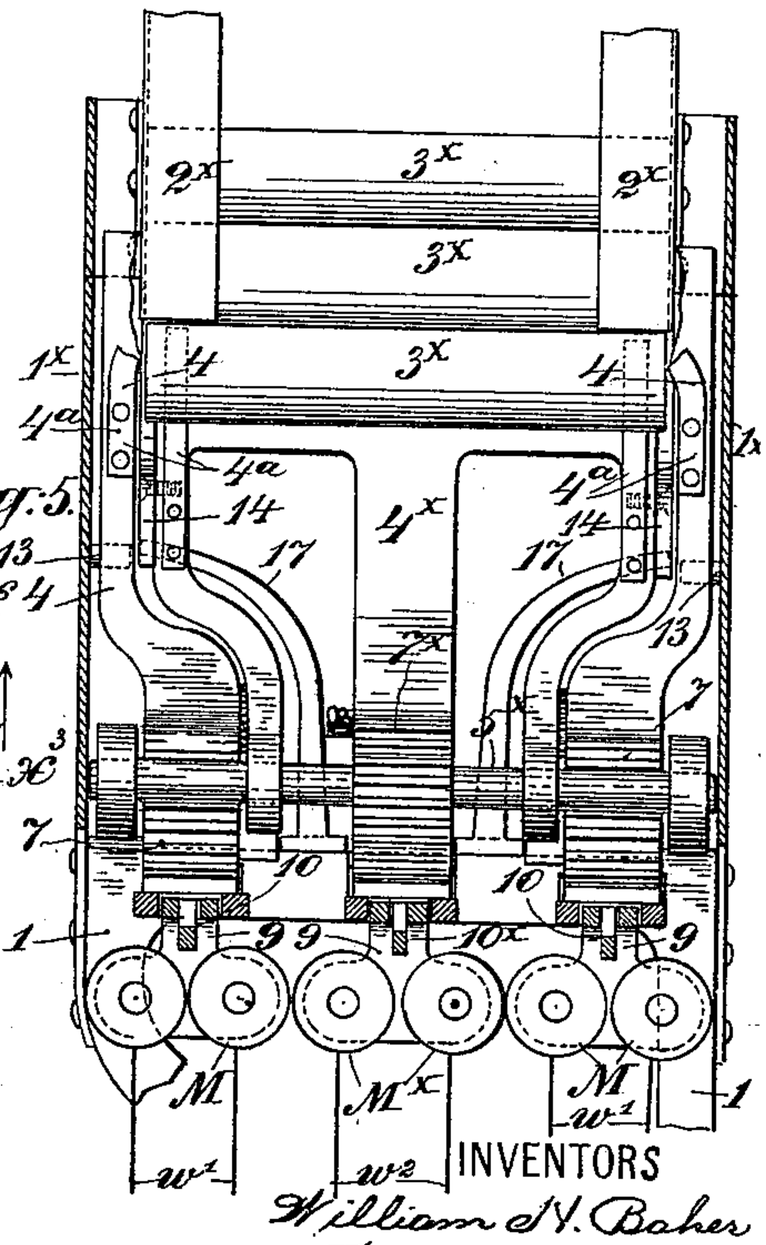
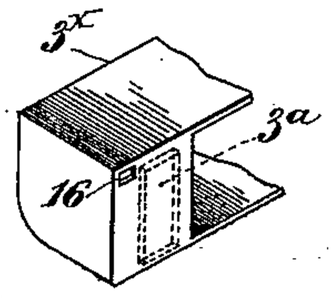


Fig. 5a.



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(No Model.) (Application filed Aug. 14, 1899.)

4 Sheets—Sheet 3.

Fig. 7.

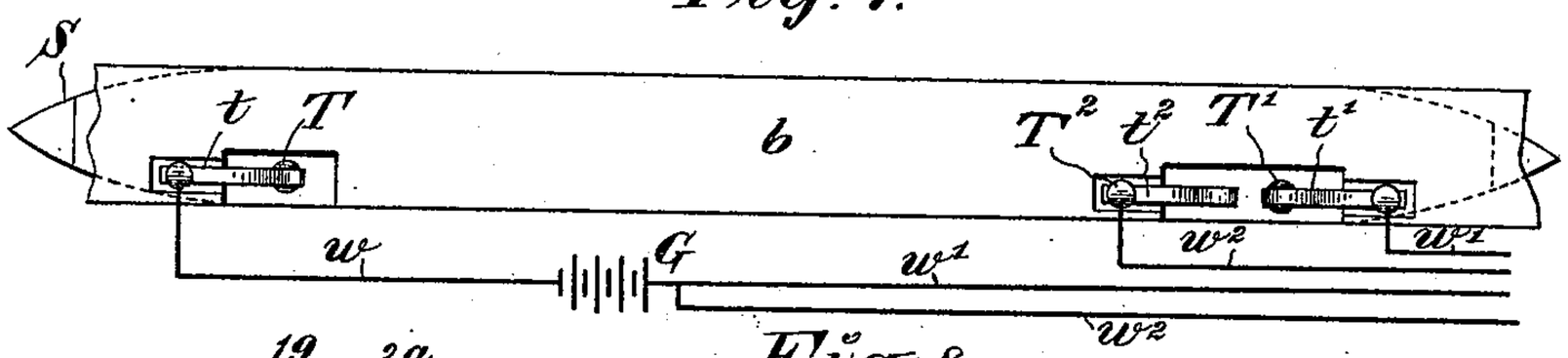


Fig. 8.

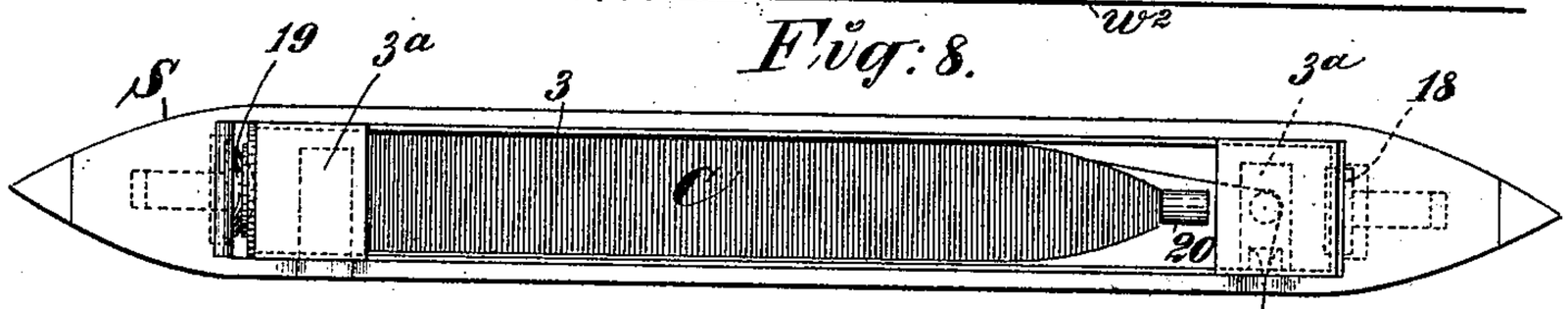


Fig. 9.

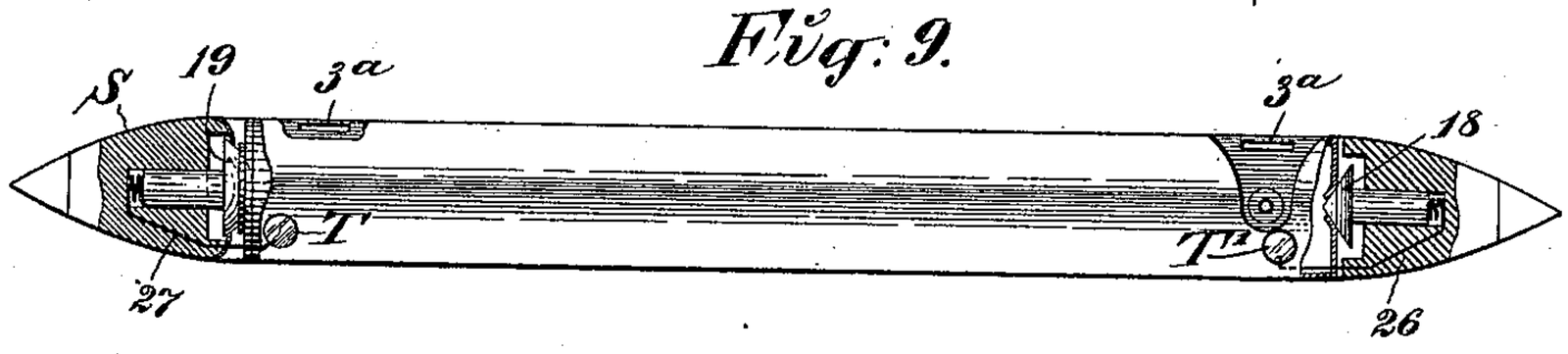


Fig. 12.

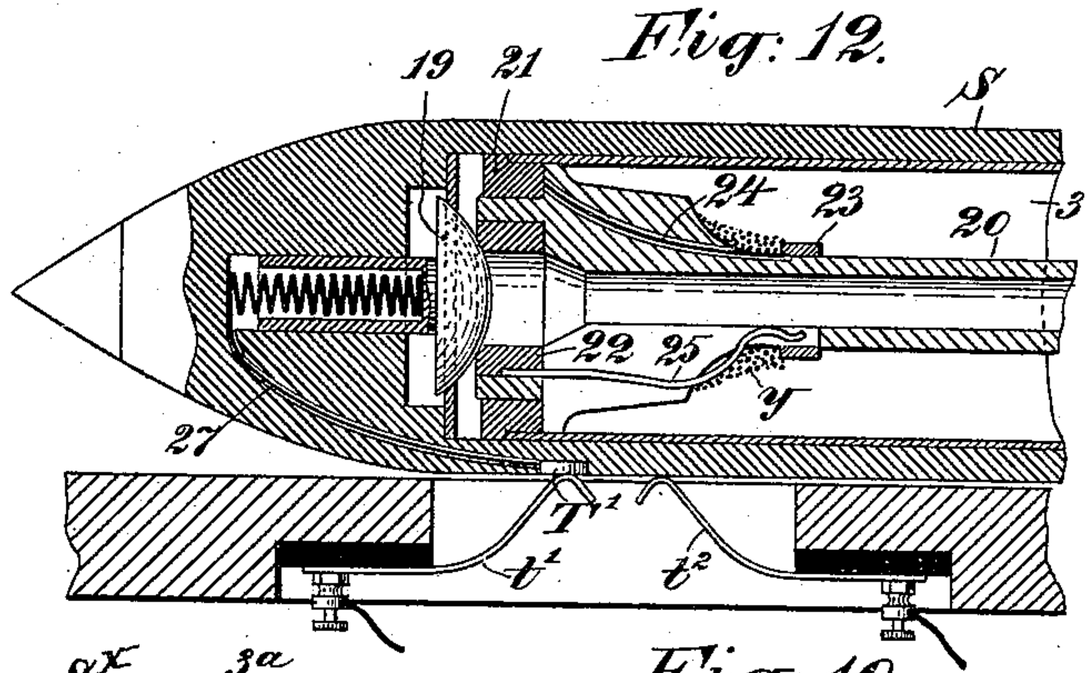


Fig. 13.

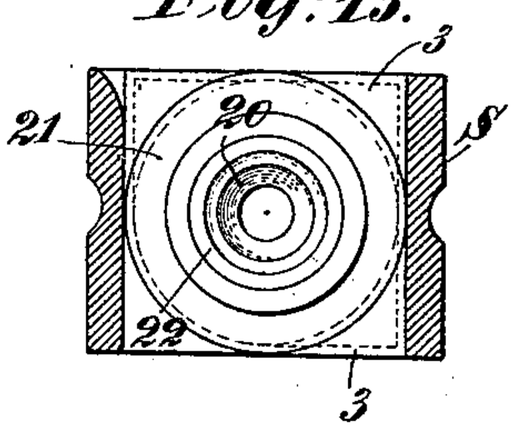


Fig. 10.

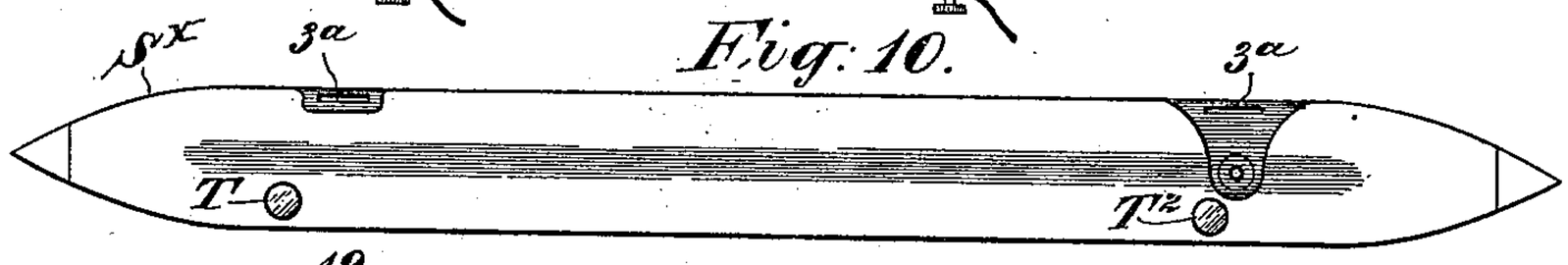
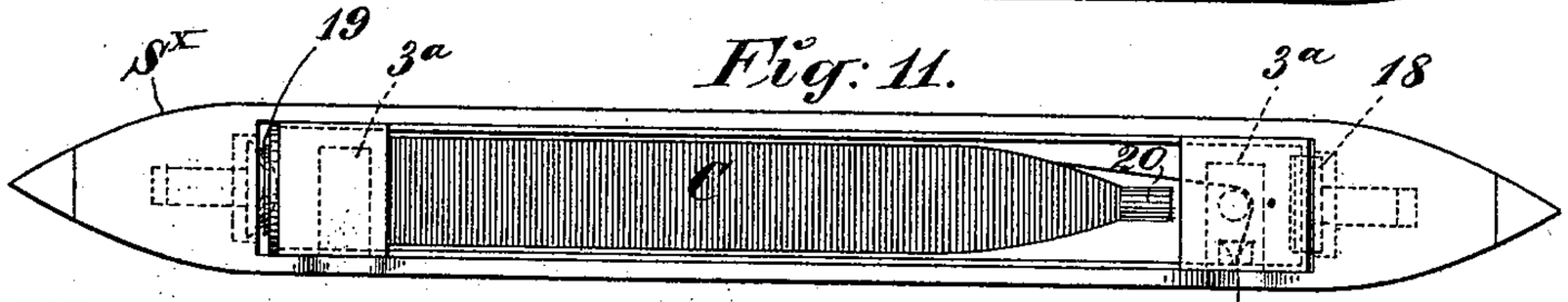


Fig. 11.



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WEFT SUPPLY MECHANISM FOR LOOMS.

(Application filed Aug. 14, 1899.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 14.

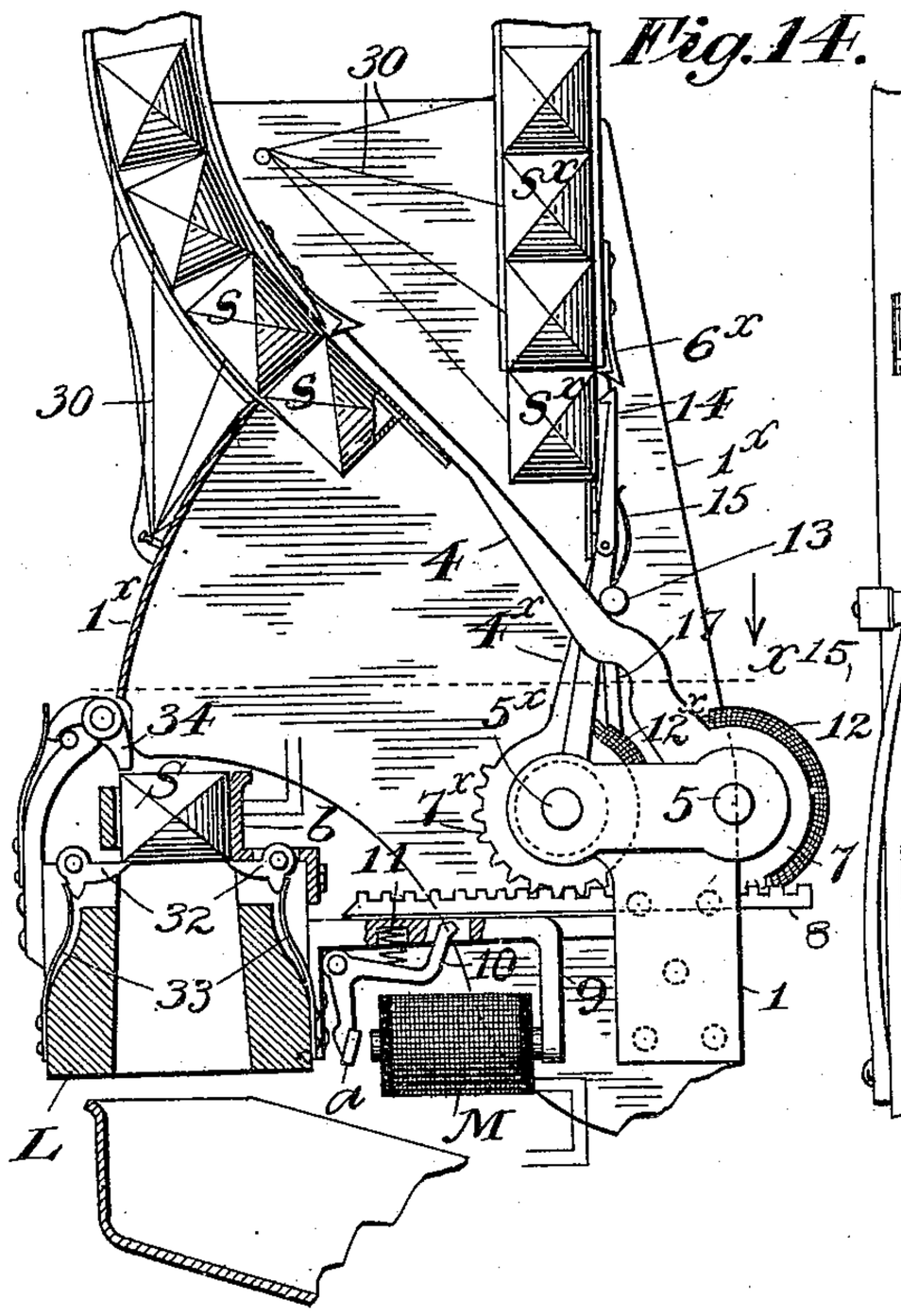


Fig. 15.

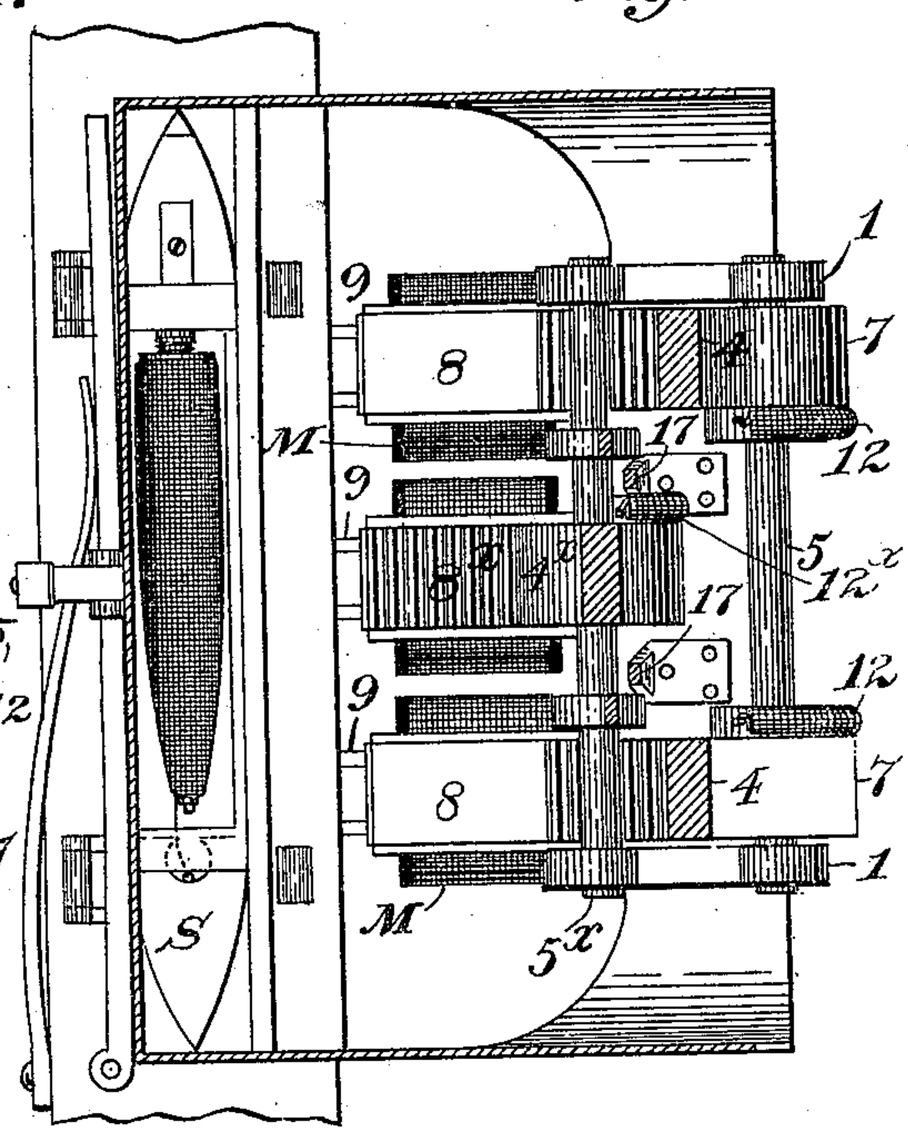
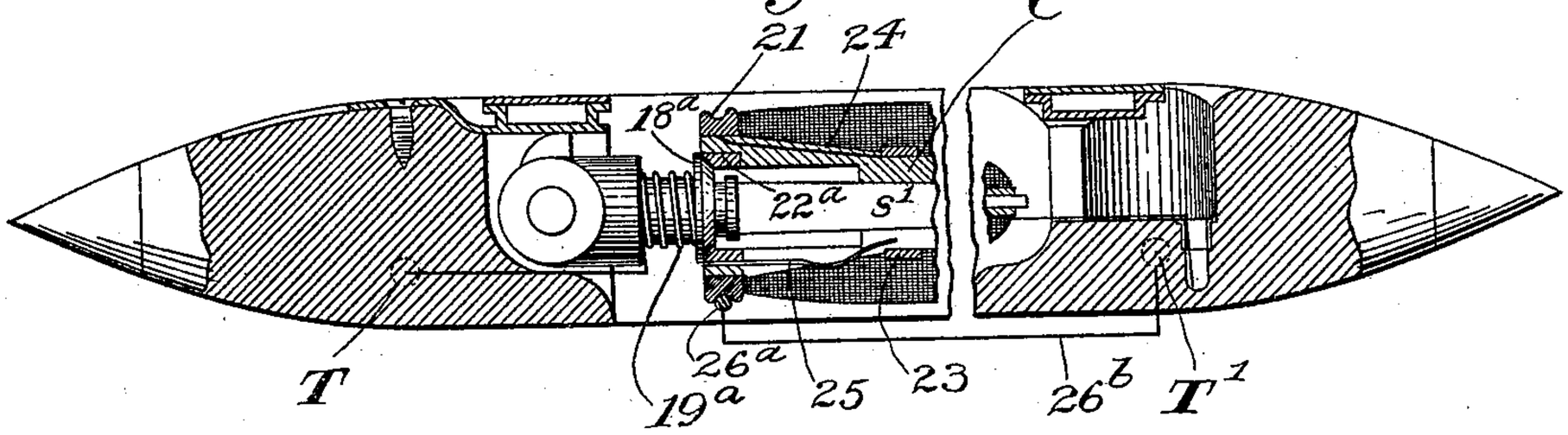


Fig. 16.



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UNITED STATES PATENT OFFICE.

WILLIAM H. BAKER, OF CENTRAL FALLS, RHODE ISLAND, AND FREDERIC E. KIP, OF MONTCLAIR, NEW JERSEY.

WEFT-SUPPLY MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 636,707, dated November 7, 1899.

Application filed August 14, 1899. Serial No. 727,101. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM H. BAKER, residing at Central Falls, Providence county, Rhode Island, and FREDERIC E. KIP, residing at Montclair, Essex county, New Jersey, citizens of the United States, have invented certain new and useful Improvements in Weft-Supply Mechanisms for Looms, of which the following is a specification.

This invention relates to the class of mechanisms designed to automatically supply to a loom a full shuttle, cop, bobbin, or other holder for the weft or filling when the holder in the loom shall have been wholly or nearly exhausted; and it has for its object to provide for supplying weft of different colors or kinds to looms in that class where a plurality of shuttles are employed and brought into play to weave in fillings of different colors or kinds at the proper times by known mechanisms.

In our pending application, Serial No. 707,772, filed March 4, 1899, we have shown a weft-supplying mechanism controlled by electromagnetic means and adapted to operate on an ordinary loom using a single shuttle, and in the present application we show a somewhat similarly constructed mechanism, but so changed and adapted as to supply weft or filling of more than one color or kind to looms which employ a plurality of shuttles.

In the accompanying drawings, which illustrate an embodiment of the invention, Figure 1 is an elevation, on a relatively small scale, of one side of a loom, showing the weft-supply mechanism mounted thereon. Figs. 2, 3, 3^a, 4, 5, 5^a, and 6 are views of the weft-supplying mechanism on a larger scale. Fig. 2 is a rear view. Fig. 3 is a vertical section at line x^3 in Fig. 4. Fig. 3^a is a sectional view similar to Fig. 3, but showing the parts in a different position. Fig. 4 is a horizonal section at line x^4 in Fig. 3. Fig. 5 is a sectional front view taken at line x^5 in Fig. 3. Fig. 5^a is a fragmentary detail view of the bobbin-box, and Fig. 6 is a fragmentary vertical section at line x^6 in Fig. 4. Fig. 7 is a side view of the shuttle-box, showing the electrical contacts with the shuttle therein; and Figs. 8 and 9 are respectively a plan and side elevation, partly broken away at the ends, of one of the shuttles, as the "blue" shuttle, for example. Figs. 10 and 11 are respectively a side elevation and plan of the other shuttle, as the "red" shuttle, for example. Figs. 12 and 13 are sectional views, on a larger scale, illustrating generally the electrical connections in the shuttle, the bobbin-box, &c. The above views show the invention applied to feeding a bobbin or similar weft-carrier to a shuttle. Fig. 14 is a view similar to Fig. 3, showing the invention applied to feeding the shuttles themselves to the shuttle-box; and Fig. 15 is a horizontal section similar to Fig. 4, taken at line x^{15} in Fig. 14. Fig. 16 is a sectional view of the shuttle, showing the electrical connections.

Before proceeding to describe the mechanisms in detail it will be of advantage to state that in carrying out one application of this invention the bobbin, cop, or other weft-holder is mounted in a bobbin-box, which is adapted to be placed in a shuttle, and that magazines are provided for these bobbin-boxes, one for each kind or color of weft to be used. As herein shown, two magazines are employed—one, say, for red and the other for blue weft, yarn, or filling. Obviously the particular colors or kinds of weft are not important; but for simplicity of description the two kinds will be herein denominated "red" and "blue." Each magazine has operating in connection with it a vibrating carrier adapted to take a bobbin-box from its magazine and deliver it into the shuttle, the incoming box displacing that formerly in the shuttle. The carriers have independent intermediate operative devices through which the vibrating lay in beating up acts to operate the respective carriers, the operation of the carriers and the selection being controlled by electrical means which will be hereinafter fully described.

Fig. 1 is merely an illustrative general view showing the position of the weft-supplying device on the loom-frame. W in this view is the weft-supplying mechanism as a whole. It is mounted on a suitable supporting-bracket 1 on the loom-frame F. In this and other figures, B is the breast-beam. L is the vibrating batten or lay. R is the reed thereon. P is the picker-stick, and *b* is the

shuttle-box on the lay. At the opposite side of the loom (not shown herein) there will be a series of shuttle-boxes for shuttles containing weft of different colors or kinds, these boxes to be raised or lowered in a known way, so as to bring the respective shuttles therein into play.

In the weft-supplying mechanism illustrated in the principal views, 2 and $2^{\times}$ are the bobbin-magazines, the former for the red weft and the latter for the blue weft. These magazines contain, superposed, the bobbin-boxes 3 and $3^{\times}$, respectively, each of which contains a bobbin or other weft-holder. Operating in connection with the respective magazines 2 and $2^{\times}$ are vibrating carriers 4 and $4^{\times}$, each adapted to receive a box from the bottom of its magazine and transfer it to the shuttle in the shuttle-box *b*, the incoming bobbin-box displacing and knocking out that one in the shuttle. The magazines 2 and $2^{\times}$ are suitably supported in the positions indicated by a frame $1^{\times}$ on the bracket 1.

The specific construction of the devices for supplying the red weft will be first described.

The carrier 4 is mounted on a rock-shaft 5, mounted in bearings on the bracket 1 and so as to take position under the magazine 2. The magazine may consist merely of two upright end pieces or keepers. It may be well to explain that the bobbin-box as here shown is of elongated form and of stiff thin sheet metal, and it is of such size and proportions as to fit into the hollow in the shuttle S, which latter is open at the bottom, so that the incoming bobbin-box may knock the empty one out, as seen in Fig. 3^{a}. Each box has formed in it a mortise or socket 3^{a} near each end thereof, Figs. 9 and 10, to receive carrying pins or fingers 4^{a} on the carrier 4. As the lowermost box 3 descends from the magazine 2, these fingers 4^{a} enter the respective mortises or sockets 3^{a} in the box, and the latter is then ready to be transferred to the shuttle S. On the magazine are two spring-latches 6, which are so placed as to be pressed back by the carrier 4 when the latter takes position under the magazine, as seen in Fig. 3, so that the lower bobbin-box 3 may drop by gravity to the position seen in this figure, and when the carrier moves down to the position seen in Fig. 3^{a} to deliver its box to the shuttle the latches 6 spring in under the bobbin-boxes in the magazine and uphold them. The box 3 is kept from being thrown off from the fingers 4^{a} by the curved portion of the frame $1^{\times}$. Any other suitable retaining devices may be employed to effect these objects.

The carrier 4 consists mainly of two like arms or uprights, and these have each a toothed segment 7, concentric with the rock-shaft 5. Mounted to slide in keeper-guides in the bracket 1 are racks 8, which gear with the respective segments or wheels 7, and when these racks are moved forcibly to the right, as the parts are represented in Figs. 3 and 3^{a}, the carrier 4 will be brought down forcibly to the position seen in Fig. 3^{a}, thus delivering its box 3 into the shuttle S. The movement of the racks 8 is effected by electromagnets and their armatures carried by the lay L. Preferably there are two segments 7, one on each arm of the carrier 4, two racks 8, and two like magnets and their armatures, or, in other words, duplicate devices for operating the carrier 4. M M are the two magnets, mounted in suitable brackets 9 9 on the lay. Each magnet has an armature-lever carrying an armature *a*, the upper arm 10 of the lever being backed by a suitable spring 11. The free end of the arm 10 is turned up to form a nose, which occupies normally a position under the rack 8, Fig. 3; but when the magnet M is excited and attracts its armature the nose on the arm 10 is thrown upward into the plane of the rack 8, and as the lay beats up this nose engages the end of the rack 8 and moves it back to the position seen in Fig. 3^{a}. When the lay returns or moves back again, the box 3 in the shuttle is drawn off from the fingers 4^{a} on the carrier and a spring or springs 12 return the carrier 4 to its elevated position and up to a stop 13, when it will receive another bobbin-box 3.

The device for supplying the shuttles $S^{\times}$ with bobbin-boxes $3^{\times}$ from the magazine $2^{\times}$ is similar in principle to that already described and will therefore require only a brief description to show the points of difference. In this case the carrier $4^{\times}$ has but one upright arm, provided with one toothed segment $7^{\times}$, gearing with a rack $8^{\times}$, which is actuated by the armature-lever $10^{\times}$ of a magnet, Figs. 2 and 5, $M^{\times}$. The magazine $2^{\times}$ has a spring detent-latch $6^{\times}$ in all respects similar to the latch 6; but as this carrier $4^{\times}$ does not play closely under the curved casing $1^{\times}$ a special detent device is employed to prevent the box $3^{\times}$ from being thrown off from the fingers 4^{a} of the carrier while said box is being carried down to the shuttle. This device is best illustrated in Figs. 3, 3^{a}, 5^{a}, and 6. Pivotally mounted on the carrier $4^{\times}$ is a detent-lever 14, backed by a spring 15. The hooked head on this lever is adapted under some conditions to engage a hole or recess 16 (see Fig. 5^{a}) in the box $3^{\times}$ and hold it from flying off the fingers 4^{a}; but normally when the carrier $4^{\times}$ occupies the upright position (seen in Figs. 3 and 3^{a}) the lower arm of the lever 14 presses on an upright fixed abutment 17, (best seen in Fig. 6,) which holds the hooked head of the lever out of engagement with the bobbin-box. When the carrier moves down, however, as seen in Fig. 6, the pressure is removed from the lever 14, and its hooked head engages the box, as shown. As the bobbin-box enters the shuttle a projection 14^{a} on the lever 14 impinges on the shuttle-box *b*, as seen in dotted lines in Fig. 3, and this frees its hooked head from the box.

To control the above-described bobbin-changing and weft-supplying mechanism, electrical means are employed, which are fully

illustrated in Figs. 7 to 13. In substance these means comprise a partial branched exterior electric circuit including a generator of any kind and also, in its respective branches, the electromagnets M and $M^{\times}$. This branched external circuit has terminals at the shuttle-box *b*. In the shuttles S and $S^{\times}$ are other partial circuits, which close with the respective branches of the external circuit when they are in the shuttle-box, and in the bobbin-box and the bobbin therein is also a partial circuit, which closes with that in the shuttle when the box is in place therein. In this bobbin-circuit there is a break, which break is held open by the weft, but closes automatically and completes the circuit when the weft is nearly or quite exhausted. It is not material to the present invention just how this circuit-completing device in the shuttle is constructed; but herein we have shown the construction illustrated in our before-mentioned application, and this construction will now be briefly described.

The outer partial circuit comprises the main return-conductor *w*, having a spring-terminal *t* on the shuttle-box *b*, adapted to contact with a terminal-plate T on the shuttle, which may be in the box, as seen in Fig. 7, and two branch conductors *w'* and w^2, the former including the magnets M and having a spring-terminal *t'* on the shuttle-box, which contacts with a terminal-plate T' on any shuttle S that may be in the shuttle-box. The branch conductor w^2 includes the magnet $M^{\times}$ and has a spring-terminal t^2 on the shuttle-box, which contacts with a terminal-plate T^2 on any shuttle $S^{\times}$ that may be in the shuttle-box. Figs. 10 and 11 show the shuttle $S^{\times}$.

G is a generator, Fig. 7, which supplies the circuit.

Figs. 9, 12, and 13 best show the internal arrangements of the shuttle, and as these are in substance the same for both shuttles S and $S^{\times}$ a description of the shuttle S will suffice. The bobbin-box 3 fits into the hollow or cavity of the shuttle and is held at its ends by spring-holders, which permit it to be knocked out and another box snapped into its place. At the right in Fig. 9 is seen the spring-holder 18, of a wedge or V shape, engaging a suitable recess in the end of the box 3, and at the left in said figure, but best illustrated in Fig. 12, is seen the other convex spring-holder 19. The weft-carrier or bobbin (C in Fig. 8) is pushed into the open end of the box 3 and comprises a wooden spindle 20, having on its enlarged hollow butt two metal rings 21 and 22, insulated from each other by the material of the spindle. On the narrower part of the spindle is a metal ring 23, connected electrically with the outer ring 21 by a conductor 24, and the inner ring 22, on which the convex metal head of the holder 19 finds a bearing, has connected electrically with it a spring contact-piece 25, which tends normally to make contact with the inner surface of the ring 23. This contact-piece 25 occupies a slot in the spindle and is so bent that the weft on the spindle (*y* in Fig. 12) bears on a projecting part of the same and holds it out of contact with the ring 23 until the weft is nearly or wholly exhausted, when it springs outwardly automatically into contact with the said ring and closes the break in the circuit. Now when a shuttle S enters the box *b* the circuit is completed through the magnets M, and the latter act on their respective armatures and armature-levers to operate the shifting and feeding mechanism of the bobbin-boxes 3, as before fully explained. When the circuit is completed, as above described, the current flows from one pole of the generator by the branch conductor *w'* to and through the coils of the magnets M, thence to the terminal *t'*, thence to the shuttle-terminal T', thence to the metal bobbin-box 3 in the shuttle, as shown at the right in Fig. 9, by way of a conductor 26, to and through the spring-holder 18 to said box 3, thence to the ring 21 and conductor 24 to the ring 23, thence to and through the spring-contact 25 to the ring 22, thence to the holder 19 and through a conductor 27 to the terminal T, thence to the spring-terminal *t*, and thence by the conductor *w* to the other pole of the generator G. If a shuttle $S^{\times}$ enters the shuttle-box *b* and the break in the partial circuit of the weft-holder thereof shall have been closed by the using up of the weft thereon, then the current will flow from the generator G by way of the branch conductor w^2 to and through the coil of the electromagnet $M^{\times}$, thence to the terminal t^2 on the shuttle-box *b*, thence to the contact-plate T^2, Fig. 10, on the shuttle $S^{\times}$, and thence through the same course as before described with respect to the shuttle S. It will be noted that while the shuttles S and $S^{\times}$ are alike, the contact-plates T' and T^2 thereon are located differently, thus causing the excitation of the magnets M in the one case and the excitation of the magnet $M^{\times}$ in the other case. Fig. 7 shows the spring-contacts *t'* and t^2 placed at the right, while in Fig. 12 they are shown placed at the left. Obviously it is not material at which point they are placed. The result will be the same in either case.

The carrier 4 is operated by two magnets M merely for mechanical convenience, and for the same reason the bobbin-boxes $3^{\times}$, which must pass between the two like arms of the carrier 4, are made a little shorter than the boxes 3, as seen by comparing Fig. 8 with Fig. 11; but the shuttles S and $S^{\times}$ are or may be of the same length. The abutments 17 are represented as bent outward from the points of support in opposite directions, so as to bring their operative upper ends into proper position to act on the respective levers 14.

As before stated, the devices herein named are in detail similar to those in our before-mentioned application and are not specifically claimed herein. The novel features herein claimed are those which adapt the weft-sup-

plying devices to supplying different kinds of weft.

The ends of the weft-threads 30, Figs. 3 and 3^a, from the bobbin-boxes in the magazines will be carried out and secured in a well-known way. This is a common feature in all of this class of mechanisms.

Obviously entire or full shuttles containing each a bobbin, cop, or other form of weft-holder may be supplied to the shuttle-box from a plurality of magazines in the same manner as the bobbin-boxes, provided the shuttle-box is so constructed as to receive and discharge the same. Indeed, in our pending application, Serial No. 724,745, filed July 22, 1899, we have shown a shuttle-box so constructed as to permit of this, and in Figs. 14 and 15 of the accompanying drawings we have shown substantially this same construction of the shuttle-box applied to the present invention, whereby shuttles containing weft of different colors or kinds may be supplied, precisely as in the case of the bobbin-boxes above described. In these views, Figs. 14 and 15, the magazines, the carriers, their operative mechanisms, and the electrical controlling features are substantially the same as those above described, except that the magazines are longer in order to take in the shuttles. The shuttle-box *b*, however, is provided with yielding supports for the shuttle similar to those illustrated and described in our before-mentioned pending application, Serial No. 724,745. The same reference characters are employed in Figs. 14 and 15 as in the other views for designating similar or like parts; but the features not found in the other figures will now be described. The opening in the lay below the shuttle-box *b* is wide enough to allow the shuttles to pass out freely, and the shuttle in the box rests on yielding supports 32, in the nature of hinged flaps, one at each side, backed by springs 33. When the carrier brings down a shuttle, it drives down the shuttle in the box, the supports 32 yielding to allow it to pass and then returning in time to form a support for the incoming shuttle. The fingers on the carrier enter mortises in the shuttle as in the other case they enter mortises in the bobbin-box, and the shuttle on entering the box wipes past a yielding latch-guard 34, which is pressed back by the shuttle and then springs in over the latter and prevents it from being lifted out of the box by the carrier, which latter seeks to return before the fingers thereon are withdrawn from the shuttle.

There may be cushion-strips of soft material on the carrier to interpose between the entering shuttle or bobbin-box and the shuttle being displaced—such as those illustrated in our pending application, Serial No. 724,745, for example; but as these are not deemed essential to the invention they have not been illustrated herein.

The electrical construction within the shuttle may be as illustrated in Fig. 16, which shows the latter in longitudinal vertical section. In this figure the bobbin C′ is slipped onto a spindle S′, hinged in the shuttle in a known way. The bobbin may be of wood or other non-conducting material, and when slipped onto the spindle a ring or piece of metal 22^a in the end of the bobbin makes electrical contact with a ring 18^a, loose on the spindle and backed by a spring 19^a, which is electrically connected with the terminal plate T on the shuttle. Connected electrically with the ring 22^a on the bobbin is the spring-contact 25, which tends, as in the construction before described, to make contact at its free end with a ring or piece 23 on the bobbin. This ring 23 is connected electrically through the conductor 24 with the outer ring 21 on the bobbin. This ring 21 is grooved, and when the spindle and bobbin are in place in the shuttle said ring 24 is in contact with a cross rod or pin 26^a, which is electrically connected by any suitable conductor 26^b with the other terminal contact-plate T′ or T^2, as the case may be. Obviously when the exhaustion of the weft allows the contact 25 to touch the contact ring or piece 23 the circuit will be completed between the two terminal contact-plates on the shuttle, as in the case before described.

The essential feature of the present invention resides in automatically supplying weft or filling of different kinds or colors to the loom as required, the selection and control of the same being effected by electrical means.

We being, as we believe, the first in this field of invention—viz., supplying weft either by supplying a weft-holder to the shuttle or an entire shuttle to the loom and controlled electrically—claim the same broadly and do not limit ourselves to any special means for accomplishing same with electrical control. We have herein shown one way of feeding weft-holders of different kinds or colors of weft to the shuttles of a loom, and one way of feeding full or entire shuttles containing different kinds or colors of weft or filling to the loom, and there are numerous other ways of doing the same. We would consider our invention practiced in a loom wherein weft or filling of different kinds or colors is automatically supplied to replace that substantially exhausted, with the means of electrical control.

We have illustrated a simple branched circuit with one generator for the two sets of mechanisms; but obviously there might be a distinct or separate circuit for each set of devices. This, however, is neither essential nor advisable.

It will be understood that by "supplying weft of different kinds or colors" is herein meant maintaining a supply as the various kinds of weft are exhausted and not merely supplying different kinds or colors as needed to produce the pattern. This invention relates to the class of looms which do the latter, and it has for its object to maintain such supply automatically.

Having thus described our invention, we claim—

1. An automatic weft-supply mechanism for looms, having mechanisms for furnishing weft of different kinds to replace that exhausted, and having electrical means, controlled by the weft of the shuttle in play, which controls the times of operation of the several supplying mechanisms, whereby the proper weft is selected and the supply thereof maintained, substantially as set forth.

2. An automatic weft-supply mechanism for looms, having mechanisms for furnishing weft of different kinds to the shuttles while the loom is running to replace weft exhausted, and having electrical means, controlled by the weft in the shuttle in play, which controls the time of operation of the several supplying mechanisms, whereby the proper weft is selected and the supply thereof maintained, substantially as set forth.

3. An automatic weft-supply mechanism for the class of looms using weft of different kinds or colors, said supply mechanism comprising a plurality of independently-operated, vibrating carriers for the holders of the different kinds of weft, a plurality of magazines to contain said weft-holders, mechanisms for operating said carriers independently and means controlled by the degree of exhaustion of the weft in the shuttle in play which sets in motion the supply mechanism at proper times while the loom is running.

4. An automatic weft-supply mechanism for the class of looms using weft of different kinds or colors, said supply mechanism comprising a plurality of independently-operated, vibrating carriers for the holders of the different kinds of weft, a plurality of magazines to contain said weft-holders, mechanisms for operating said carriers independently, and an open, operating electric circuit including a generator and electromagnets, said circuit controlling the times of operation of said supplying-carriers and having in it a break the closure of which is controlled by the weft in the shuttle in play while the loom is running.

5. An automatic, electrically-controlled weft-supply mechanism for the class of looms using weft of different kinds or colors, having independent mechanisms for supplying the different kinds of weft to replace that exhausted, electromagnetic mechanisms controlling and operating said supply mechanisms independently at proper times, and electrical devices, carried by each of the respective shuttles for setting in operation the particular mechanism for supplying the kind or color of weft pertaining to that shuttle.

6. In an automatic, electrically-controlled weft-supply mechanism for looms, the combination with a plurality of magazines to contain holders for the different kinds of weft required, and a plurality of carriers for transferring the weft-holders to the shuttle-box of the loom as needed, of a plurality of intermediate mechanisms for operating the respective carriers, and an operative, open electric circuit controlling the times of operation of the respective mechanisms, said circuit having a break the closure of which is controlled by the weft in the shuttle.

7. An automatic weft-supply mechanism for the class of looms using weft of different kinds or colors, said supply mechanism comprising a plurality of independently-operated vibrating carriers for bobbins, one for each color or kind of weft, a magazine to supply each carrier with bobbins, mechanisms for operating the respective carriers whereby each is made to transfer a bobbin from its magazine to the shuttle, and a normally-open, operative electric circuit including a generator and electromagnets, said circuit having in it a self-closing break, the closure of which is controlled by the weft in the shuttle.

8. In an automatic, electrically-controlled weft-supply mechanism for looms, the combination with a plurality of magazines to contain holders of the different kinds of weft, and a plurality of carriers for transferring said holders to the proper shuttles in the shuttle-box of the loom, of a plurality of electromagnetic intermediate mechanisms for operating the respective weft-carriers, a generator, exterior electric circuits including said generator and the respective intermediate magnets, said exterior circuits having terminals at the shuttle-box, the shuttles, each of which has in it a partial circuit adapted to be closed with the proper exterior circuit when the shuttle is in the box, and a series of weft-holders to go into the shuttles, said holders having each a partial circuit closed with that in the shuttle and having in it a break held open by the weft and adapted to close automatically when the weft on the holder is nearly or quite exhausted, substantially as set forth.

9. In an automatic, electrically-controlled weft-supply mechanism for looms, the combination with a plurality of magazines for the weft-holders, a plurality of carriers for the weft-holders, adapted to carry the holders from the respective magazines to a shuttle in the shuttle-box of a loom, electromagnetic devices controlling independently the operation of the respective weft-carriers, a generator, and an exterior electric circuit including the generator, said circuit having branches which each include one of said electromagnets and have separate terminals at the shuttle-box of the loom, and a return having also a terminal at the shuttle-box, of shuttles for the different kinds of weft, said shuttles having in them partial circuits with terminals on the exterior face of the shuttle so situated as to contact only with the proper terminals of the exterior circuit when the shuttle enters the box, and a series of weft-holders, each having means for closing a normally-open break in the controlling-circuit when the weft on the holder is nearly or quite exhausted, substantially as set forth.

10. In an automatic weft-supply mechan-

ism for looms, the combination with the stationary magazines, of the vibrating carriers, having their centers of oscillation in different vertical planes, and adapted to take bobbin-boxes from their respective magazines and deposit them at the same place, and means for operating said carriers, substantially as set forth.

11. In an automatic weft-supply mechanism, the combination with the stationary magazine $2^{\times}$, of the vibrating carrier $4^{\times}$, the latch $6^{\times}$ on the magazine, adapted to be displaced by the carrier, the spring-latch 14 on the carrier, adapted to engage the bobbin-box, and the fixed abutment 17, adapted to displace the latch 14, substantially as set forth.

12. An automatic weft-supply mechanism for looms, having mechanism for supplying weft or filling of different kinds or colors to replace that exhausted, and means for controlling the time of the operation of said supply mechanism, said means being actuated by an electric circuit including an electromagnet, said circuit being normally held open by the presence and adapted to close by the substantial absence of weft or filling in the shuttle in play.

13. An automatic weft-supply mechanism for looms, having mechanism for supplying weft of different kinds or colors to the shuttle of a loom to replace weft exhausted, and means for controlling the time of the operation of said supplying mechanism, said means being actuated by an electric circuit including an electromagnet, said circuit being normally held open by the presence and adapted to close by the substantial absence of weft or filling in the shuttle in play.

14. A weft-supply mechanism for looms, having mechanism for furnishing weft of different kinds to replace that exhausted, and having also electrical means, controlled by the shuttle in play, for controlling the operation of said supply mechanism, whereby the proper weft is selected and the supply thereof maintained.

15. A weft-supply mechanism for looms, having mechanism for furnishing weft-holders containing different kinds or colors of weft or filling to the shuttle of a loom to replace that exhausted, and having also electrical means controlled by the shuttle in play for controlling the operation of said supply mechanism, whereby the proper weft is selected and the supply thereof maintained.

16. A weft-supply mechanism for looms, having mechanism for supplying weft of different kinds or colors to replace that exhausted, and means for actuating said supplying mechanism, including a magnet and a circuit extending from the magnet to an automatic circuit-closing device, said circuit-closing device being controlled by the weft or filling in the shuttle in play.

17. A weft-supply mechanism for looms, having mechanism for supplying weft of different kinds or colors to the shuttle of a loom, to replace that exhausted, and means for actuating said supplying mechanism, including a magnet and a circuit extending from the magnet to an automatic circuit-closing device, said circuit-closing device being controlled by the weft or filling in the shuttle in play.

18. An automatic weft-supply mechanism for looms, having mechanism for supplying weft of different kinds or colors to replace that exhausted, and means for controlling the time of operation of said supplying mechanism, said means comprising a magnet connected with said supplying mechanism, and an electric circuit extending from said magnet and adapted to be opened or closed by the presence or absence of weft or filling in the shuttle.

19. An automatic weft-supply mechanism for looms, having mechanism for supplying a weft-holder containing different kinds or colors of weft or filling to the shuttle of a loom, to replace that exhausted, and means for controlling the time of operation of said supplying mechanism, said means comprising a magnet connected with said supplying mechanism, and an electric circuit extending from said magnet and adapted to be opened or closed by the presence or absence of weft or filling in the shuttle.

In witness whereof we have hereunto signed our names, this 31st day of July, 1899, in the presence of two subscribing witnesses.

WILLIAM H. BAKER.
FREDERIC E. KIP.

Witnesses:
PETER A. ROSS,
HERMAN PHILLIPS.