No. 867,127. PATENTED SEPT. 24, 1907.

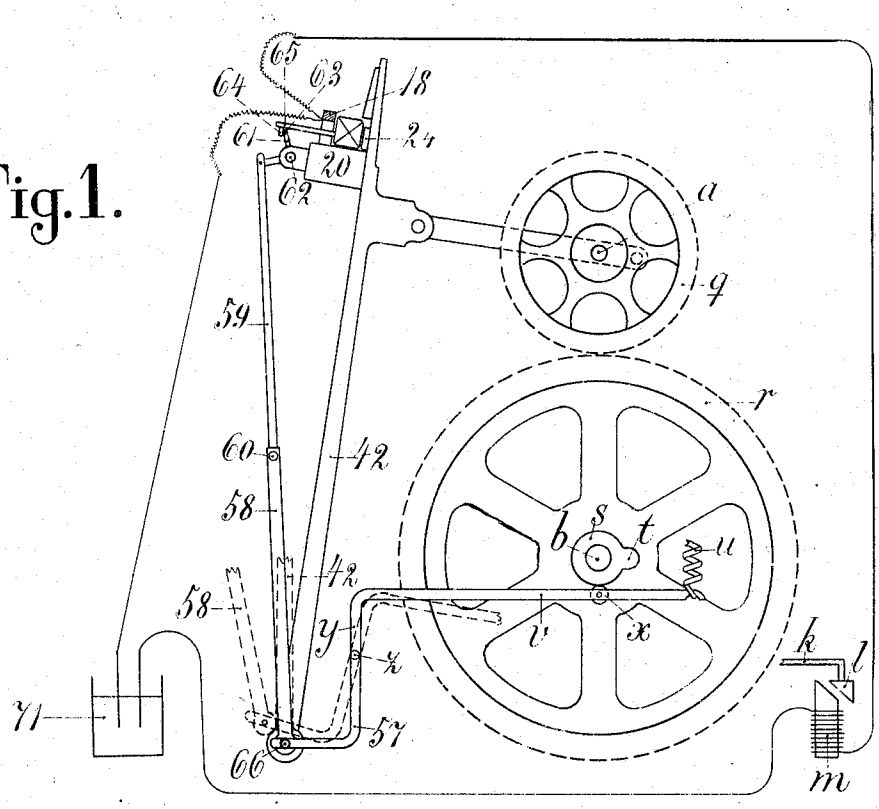
C. M. HANSEN, C. V. MULLER & J. C. E. CARLSSON.

WEFT REPLENISHING LOOM.

APPLICATION FILED MAR. 29, 1905.

6 SHEETS—SHEET 1.

Fig. 1.



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6 SHEETS—SHEET 2.

Fig. 2.

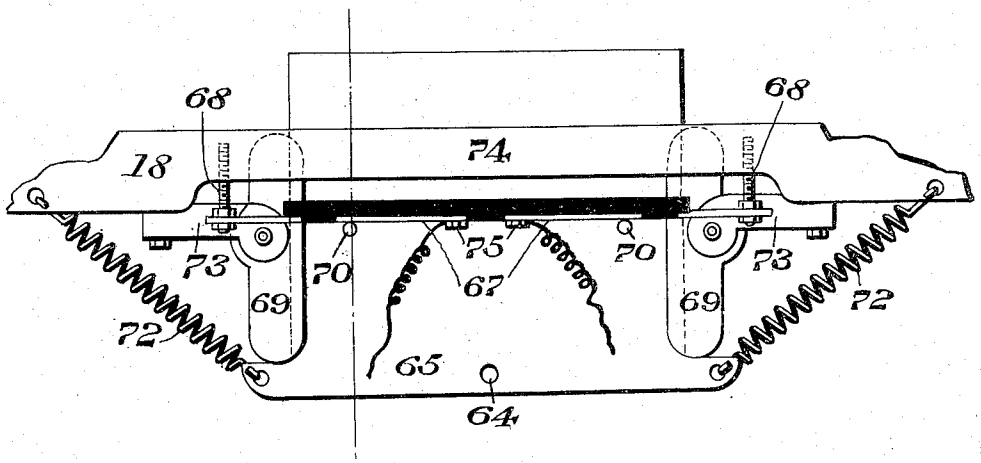
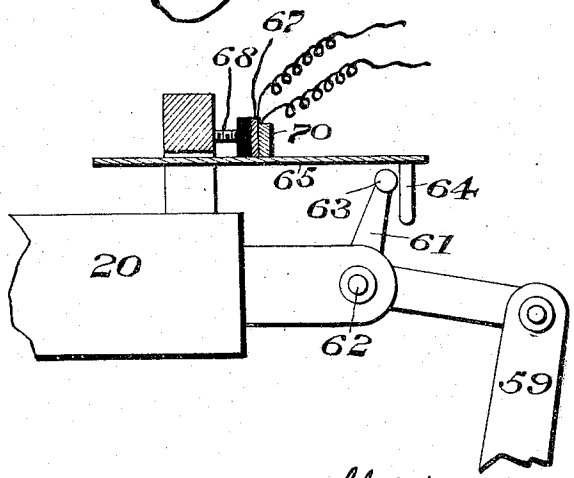


Fig. 9.



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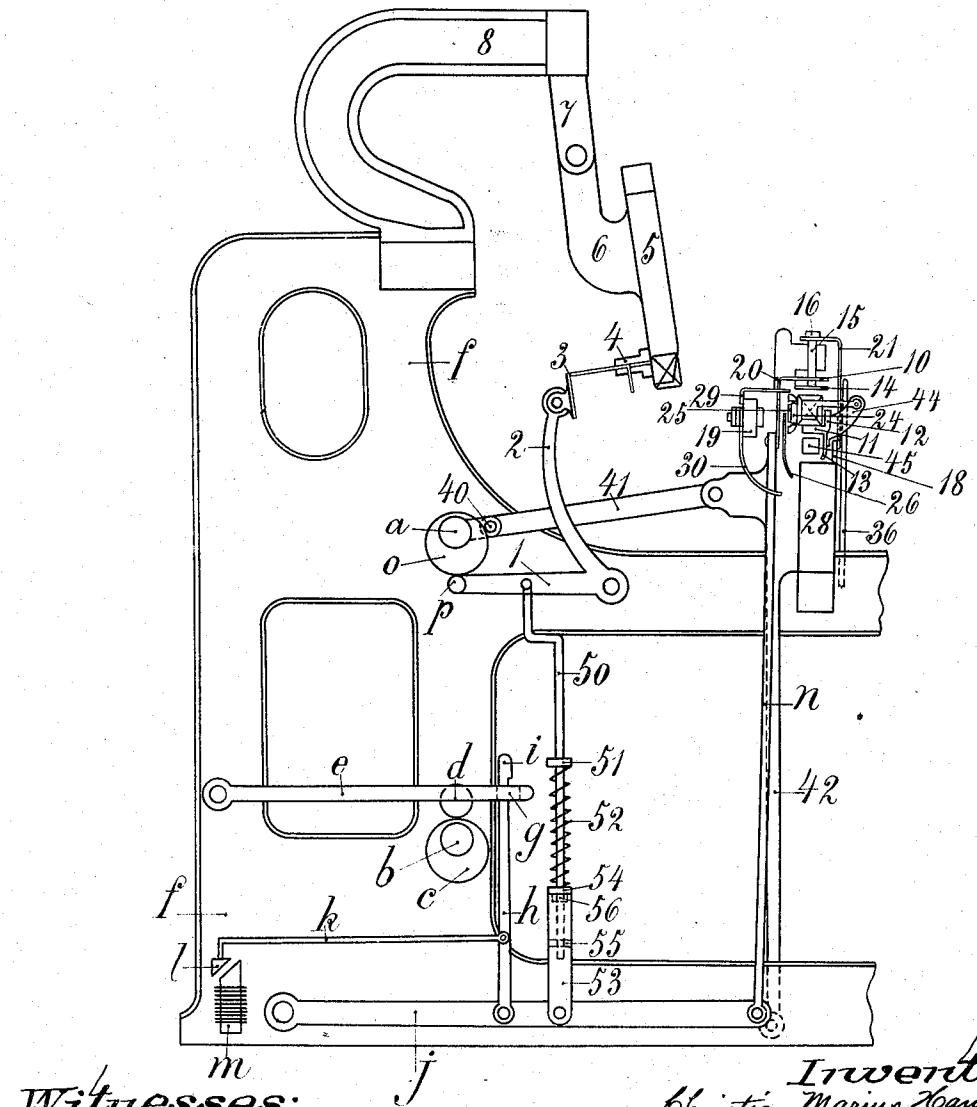
6 SHEETS—SHEET 3.

Fig.3.



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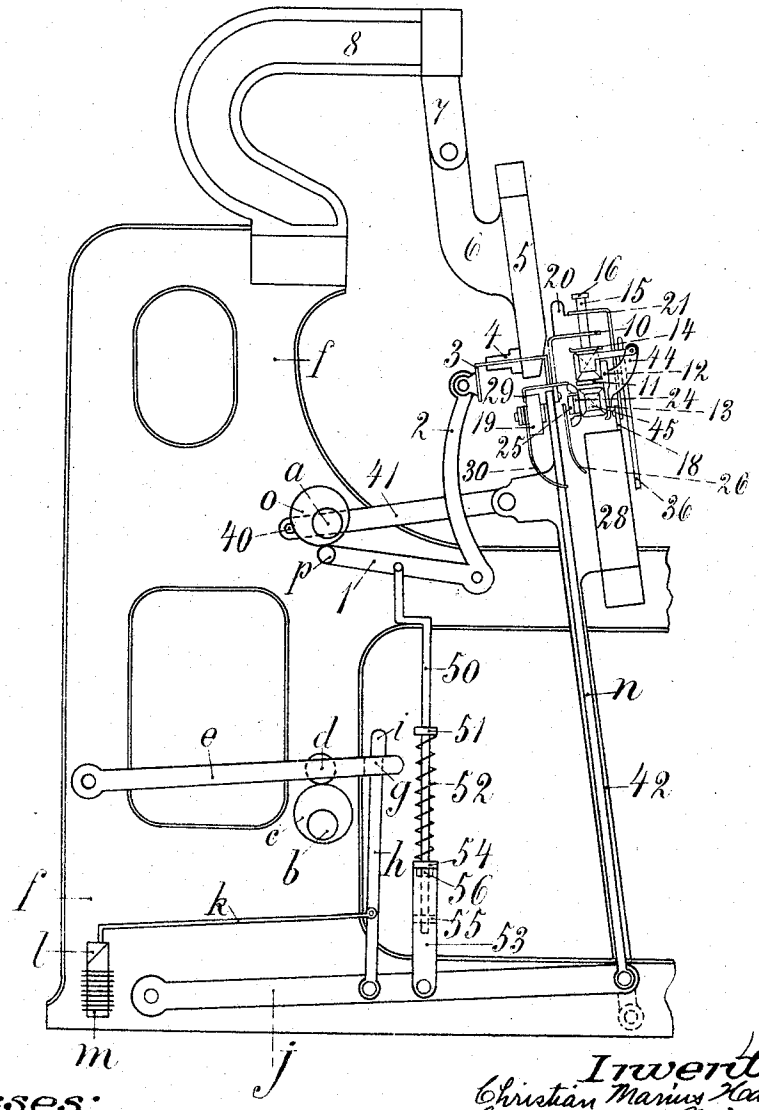
6 SHEETS—SHEET 4.

Fig. 4.



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6 SHEETS—SHEET 5.

Fig. 7.

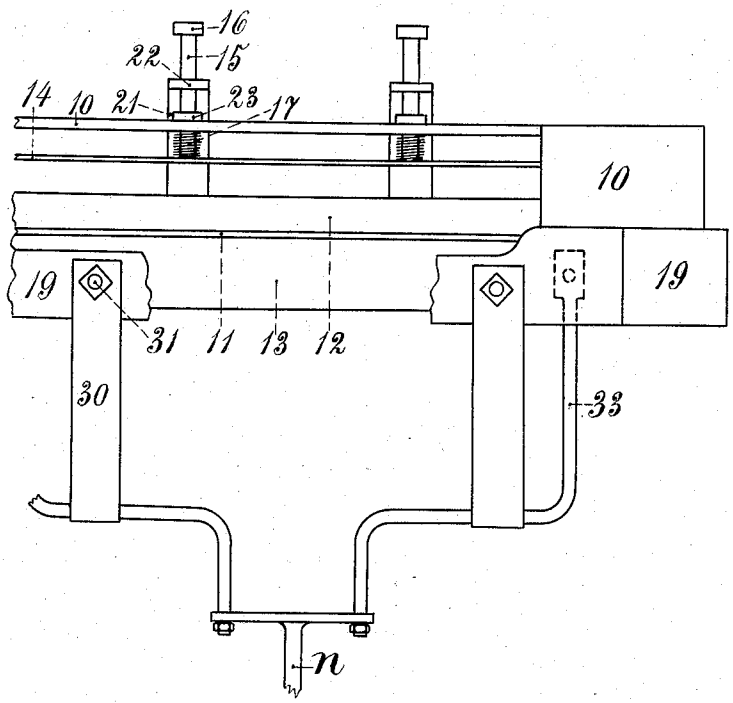
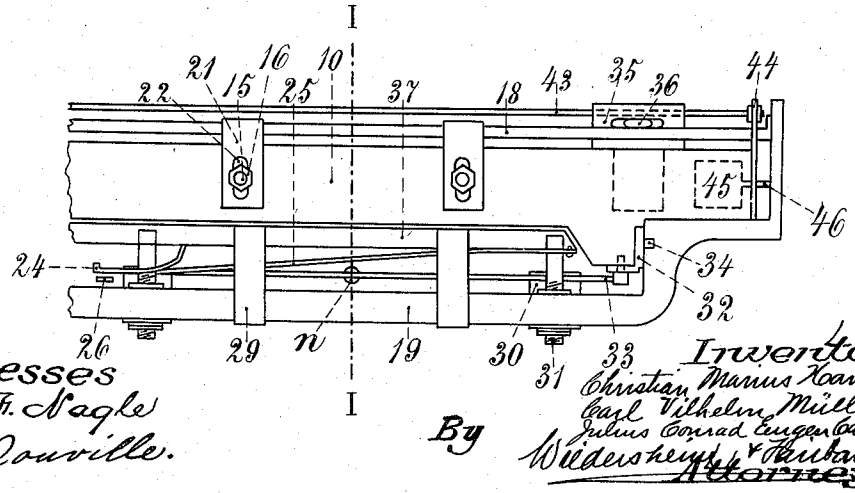


Fig. 5.



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WEFT REPLENISHING LOOM.

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6 SHEETS—SHEET 6.

Fig.6.

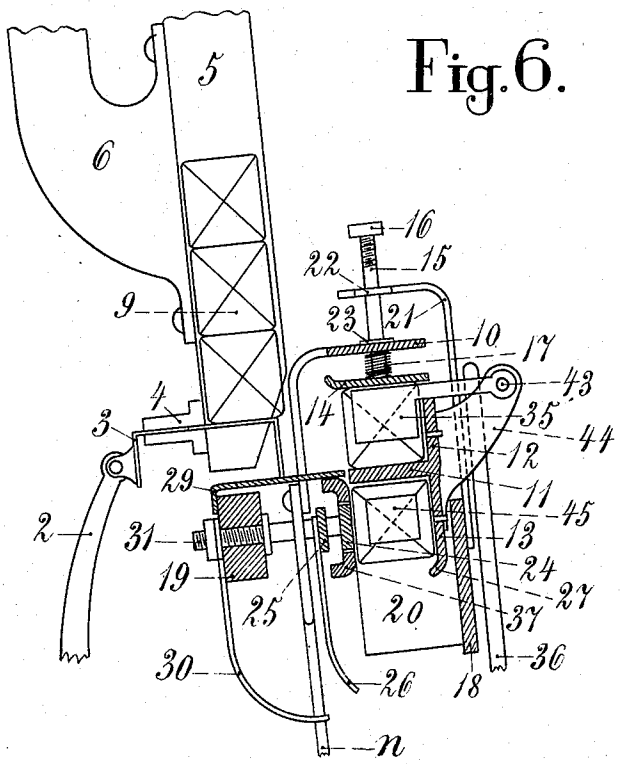
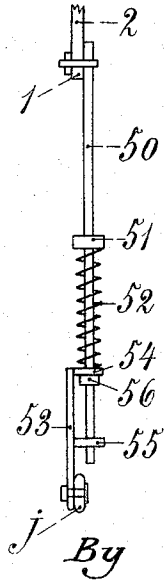


Fig.8.



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UNITED STATES PATENT OFFICE

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WEFT-REPLENISHING LOOM.

No. 867,127. Specification of Letters Patent. Patented Sept. 24, 1907.

Application filed March 29, 1905. Serial No. 252,726.

To all whom it may concern:

Be it known that we, CHRISTIAN MARIUS HANSEN, a citizen of the Kingdom of Denmark, residing at Havnegade 6, Vejle, Denmark, CARL VILHELM MÜLLER, a citizen of the Kingdom of Denmark, residing at "Nörrehus," Vejle, and JULIUS CONRAD EUGEN CARLSSON a citizen of the Kingdom of Denmark, residing at Havnegade 14, Vejle, have invented certain new and useful Improvements in Weft-Replenishing Looms, of which the following is a specification.

Our present invention relates to weft replenishing looms by means of which the shuttle exchange automatically takes place when the weft on the spool is nearly used up, without stopping the loom.

The main feature of the contrivances is a "feeler" and an exchange-box, which is moving up and down and at the same time act as a shuttle-box while the shuttle-box tongue during this motion remains stationary and works as such for both the shuttles which are exchanged.

In the annexed drawing is shown an execution of the invention, which must however be regarded as a specimen only as it is possible to apply the improvements with minor alterations to any loom.

Figure 1 is a diagrammatic side elevation of the machine from the one end showing our improvements. Fig. 2 is a plan view of the "feeler", Fig. 3 shows the machine seen from the other end, the end-piece of the shuttle-box having been removed, the parts being shown in one of the positions they occupy during the ordinary working of the machine that is to say when a shuttle-exchange is not taking place. Fig. 4 shows the same at the moment the shuttle-exchange is taking place. Fig. 5 shows the shuttle-box seen from above, Fig. 6 a section of the same on the line I—I. Fig. 7 part of the exchange-box seen from behind with the hind-wall of the shuttle-box partly removed and Fig. 8 a detail. Fig. 9 is a cross section on the line 9—9 of Fig. 2.

Referring now to Fig. 1, *a* signifies the driving-shaft, *q* a cog-wheel on the same in mesh with a cog-wheel *r* on the axle *b*. The cog-wheel *r* has double the number of teeth as the cog-wheel *q*, thereby causing the axle *b* to make half the number of revolutions as the shaft *a*.

On the axle *b* is placed a disk *s* with a tooth *t* and against said disk is pressed by the spring *u* a lever *v* carrying the roller *x* which rolls on the disk. The lever *v* has a bent arm *y*, which turns around the bolt *z*, the lever-arm portion 57 of said lever being connected as at 66 with the arm 58. To the latter an adjustable rod 59 is affixed by means of a screw 60. At its free end the rod 59 is in jointed connection with the angular lever 61, which turns on the pivot 62 of the lay 20; the angular lever 61 has on its upper arm a horizontal pin 63 arranged in front of a vertical pin 64 on the feeler-plate 65 which latter hereinafter described is controlled by springs tending to draw it into the shuttle-box.

The lever connection described above will on the contrary keep the plate out of the box, but when the tooth *t* forces the lever-arm *r* down, the upper end of the rod 59 will move upwards thereby causing the pin 63 to move to the right (Fig. 1) and the feeler-plate 65 will then be drawn forth by the springs. This will consequently happen once for every two revolutions of the shaft *a*.

The lay 20 is placed on the arm 42 which turns on the axle 66, situated in line with the connection between the lever-arms 57 and 58, but which is not in connection with the bolt on which the rod 58 turns, as shown in dotted lines in Fig. 1, which shows the position of the arms 42 and 58, when the lay 20 is carried forward and the feeler-plate 65 is inside of the shuttle-box, while the axle of rotation for the arms 42 and 58 remain in the prolongation of each other when the lay 20 at every second revolution is moving forward and the feeler-plate 65 is not to be carried into the shuttle-box.

At the ends of the lay a shuttle-box is arranged the back of which consists of a spring controlled shuttle-box tongue 24. On the left front-wall 18 of the shuttle-box (Fig. 2) is placed a contact-plate 67 secured by two screws 68. By the aid of these two screws a different position may be imparted to this plate in relation to the shuttle-race as will be seen from Fig. 9, which is of great importance as it is thereby made possible to use for the weft any spool of pasteboard, wood, zinc, or the like, of a cylindric or conical shape as the contact-plate by the aid of the screws can be placed parallel with that generator on the spool, which is nearest. It is also possible to place the plate nearer or farther away from the spool thus making it possible to adjust the device to work according to the thickness of the spool, when there is a single or a couple of windings of yarn on it at the moment the shuttle is changed. The plate 65 which, as will be more particularly described hereinafter, is movable in flanges 69, that can be turned sidewise to touch the layer of yarn with the whole of its front edge thus approximately placing itself parallel with the contact-plate 67 if the layer of yarn is rounded off evenly. If this is not the case the aforesaid edge of the plate 65 will not be parallel with the contact-plate 67; it will then be possible for one, not both, of the contact points 70 to touch the plate 67, thus preventing the circuit from being closed. 75 are screws carried by said contact plate. To the screws 75 are attached conductors to the electric generator 71 and the electromagnets *m*, to the armature *l* of which is fastened a rod *k*, by the aid of which the shuttle exchange is effected, when the circuit is closed and the armature *l* therefore is drawn to the poles of the electromagnets *m*.

The feeler (Fig. 2) is mounted on the front wall 18 of the shuttle-box. It consists of the plate 65 with a downwardly projecting pin 64. To each of its ends are fastened springs 72 which tend to keep it in the shuttle-box. The plate is guided in two movable flanges 69, which may be turned on pins in mounting 73, and carries two upwardly projecting contact-points 70. The front-wall 18 of the shuttle-box is cut away at 74 which must be a little more than the width of the plate 65. In front of this cutting the contact-plate 67 is fixed. This consists of four parts insulated from each other and from the front-wall, the two middle ones each carrying a screw 75 to which conductors as aforesaid are led from the battery and the electromagnets. The plate consists of four pieces as the circuit would otherwise continually be closed through the screws 75 and the parts lying behind them.

As long as there is sufficient weft on the spool the plate 65 will touch it thus preventing the pins 70 from touching the contact-plate 67. Not until a single or a couple of windings of weft are left on the spool will the pins touch the contact-plate 67 and cause the circuit to be closed. By this the armature *l* is drawn to the poles of the electromagnets *m*, the rod *k* will then, through the hereinafter described improvement, effect the shuttle-exchange.

In order to permit the plate to come in contact with the weft on the spool an oblong incision in proportion to the size of the plate must of course be made in one of the sides of the shuttle.

Now referring to Fig. 3—8, *a* signifies as above described the driving shaft of the machine (Fig. 3 and 4) and *b* the lower shaft which is made to turn with half the speed of the former. On the shaft *a* is as usual a crank 40 which by the rod 41 drives the lay 20 which is carried by the rod 42. On the shaft *b* is an eccentric *c* on which a roller *d* is sliding on the one armed lever *e* pivoted on the machine-frame *f*. The rod *e* has in its free end a slit *g* up through which another one armed lever *h* is carried; this is at its free end supplied with a hook *i* and is connected at its other end to a horizontal lever *j* pivoted to the frame of the machine. To the lever *h* is fixed the aforesaid rod *k* which is in firm connection with the armature *l* of the electromagnets *m*. This latter will in known manner attract the armature *l* by which the rod *k* will carry the lever *h* to the right the moment the feeler closes the electric current when the weft on the spool is nearly used up. When this takes place the hook *i* will consequently be engaged by the lever *e* and thereby be forced to follow its upward movement. When on the contrary the current is not closed, that is, during the ordinary working when no shuttle-exchange is to take place the hook *i* will not be thus engaged and the rod *h* will remain immovable in the slit *g* on the rod *e*. Around the outer end of the lever *j* turns another lever *n* which on top carries the exchange-box which will be described later on. When the rod *h* as formerly mentioned is drawn upwards when the current closes, the rod *j* is simultaneously drawn upward and with it the rod *n* and the exchange-box. When the shuttle-exchange has been accomplished the whole of said lever system will move downward by the proper weight of the system, the eccentric having at the same time turned to such a position that its smallest radius is nearest the roller *d*.

The driving shaft *a* carries an eccentric *o* on which the roller *p* on the short arm 1 of the angular lever 1—2 slides. The arm 1 is in connection with a rod 50 which is supplied with a stopclog 51 and guided in hoops 54 and 55 on the piece 53 which is fixed to the lever *j*. Encircling the rod 50, between the hoop 54 and the stopclog 51 is an expansion spring 52 which holds the stopclog 56 in engagement with the lower side of the hoop 54. When the lever *j* is in its lower position, consequently in the position it occupies during the common motion of the machine when shuttle-exchange is not to take place, the rod 50 will keep the lever-arm 1 down and thus prevent the arm 2 from moving forward and carrying a fresh shuttle into the magazine. When on the contrary the rod *j* moves upward, that is when shuttle-exchange is to take place, the piece 53 will also move upwards together with the spring 52 and the rod 50, when the eccentric *o* turns from the position with the larger radius downward to the position with the smaller radius downward. The arm 1 will then turn upward the arm 2 forward and the shuttle will then be pushed in. By the aid of this mechanism all parts appertaining to the mechanism for pushing in the shuttle are perfectly stationary when shuttle exchange does not take place.

Should the shuttle have been placed wrongly in the magazine the plate 3 will not be able to carry this shuttle out of the magazine as a transverse section of it is not square. The plate 3 will then not be able to move into the magazine, the spring 52 will be pressed together and no rupture of any part of the machine will happen on that account. The protector tongue 26 (Fig. 6) will in known manner stop the loom. The purpose of the magazine 5 being pivotally connected with the hoops 8 is to prevent break on the machine when a shuttle by an accident should fall down between the magazine and the lay as in such case the joint 6 will then give way.

The rod *n* carries the exchange-box (Fig. 5 and 6); this consists of a top-plate 10 and a middle-plate as a shuttle race 11 which are connected with each other. The middle-plate has in front two perpendicular walls one 12 over the plate and another 13 under it by which a bed for a shuttle is made over and under the plate respectively. Under the top-plate 10 is a movable pressure-plate 14 fastened to two bolts 15 with nuts 16; between the plates 10 and 14 around the bolt 15 is placed a spiral spring 17 which tends to press the plate 14 down against the upper plane of the shuttle when the exchange-box is in its upper-most position. 18 and 19 are respectively the foremost and hindmost fixed walls of the shuttle-box; these walls are in fixed connection with the lay 20 and consequently immovable in relation to the upward and downward motion of the movable exchange-box. To the plate 18 are screwed two hoops 21 which in their horizontal part have slits 22 through which the bolts 15 are carried. The bolts 15 have a pin 23 which prevents the plate 14 being forced further down than is necessary for permitting the shuttle to pass in between the plates 14 and 11. As soon as the shuttle, when the exchange-box has attained its upper position, is carried into it, as formerly explained, by the aid of the plate 3 the plate 14 will keep the shuttle in its bed which is necessary on account of the centrifugal force produced by

the swinging of the lay. When on the contrary as formerly explained the rod *n* and with it the whole exchange-box goes downward the nut 16 will strike the hoop 21 and the spiral spring 17 thereby be compressed so that the plate 14 will place itself close against the plate 10 by which the shuttle under the ordinary working of the loom will get sufficient room for free motion in the space formed between the plates 14 and 11 which forms a prolongation of the shuttle-race on the lay 20. At the same time that a new shuttle is carried from the magazine into the space between the plates 11 and 14 the empty shuttle will from the opposite end of the loom in usual manner be thrown into the space which is formed by the plates 11, 13 and the shuttle-box tongue 24, which in known manner is influenced by the spring 25 and the protector tongue 26. The plate 13 is bent a little inward at 27 so that the empty shuttle will force the shuttle-box tongue 24 inward so much that the fresh shuttle at the downward movement of the exchange-box easily can pass in before the shuttle-box tongue. While the shuttle is in the lower space (the exchange mechanism at this time being in its elevated position) it is prevented from falling out by the bent edge 27 on the lower part of the plate 13, but when the exchange-box is going downward the empty shuttle will fall down into the channel 28 as soon as it is no longer controlled by the shuttle-box tongue 24 and from here the shuttle is carried down into a receiver-box. When the exchange-box has completed its downward movement the upper plane of the plate 11 will as already known be on a level with the shuttle-race on the lay 20 and remain so under the ordinary working of the loom until the next shuttle-exchange is to take place.

To facilitate the insertion of the shuttle from the magazine to the exchange-box two sliding plates 29 which are on the same level as the plate 11 when the exchange-box is in its upper position are fastened to the hindwall of the shuttle-box. On the same wall is also an adjustable stopping hoop 30 which prevents the exchange-box from being carried too far down, that is farther down than is sufficient to bring the plate 11 on a level with the shuttle-race of the lay 20. The hoop 30 will accomplish this by catching about the bent branches 33 of the rod *n*. The bed 37 of the shuttle-box tongue 24 is by a screw 31 fixed in adjustable connection with the fixed wall 19 of the shuttle-box.

The hoop 32 by which the exchange-box is fixed to the bent branches 33 of the rod *n* is supplied with a list 34 which is in mesh with a corresponding perpendicular groove in the wall 19.

35 is the shuttle-driver and 36 the kicking-stick which in known manner moves the shuttle from one end of the machine to the other.. The guiding-shaft for the shuttle-driver is signified by 43. The latter was formerly always fixed to the lay, here it is fixed to the exchange-box by the iron work 44. When therefore the exchange-box is moving up and down the shuttle-driver 35 will by the guiding-shaft 43 be lifted up along the driving-shaft 36 and consequently always be in the upper cell of the exchange-box and thus never get to form any obstacle to the free movement of the exchange-box. When the shuttle-driver during the upper position of the exchange-box formerly was in the lower cell of the box it formed a buffer for the shuttle which was carried into this room to be exchanged. By degrees a larger deepening was thereby made in the driver into which the shuttle was carried and from which it sometimes on account of the great velocity of the machine had difficulty in being extricated; this drawback is now removed by a piece of leather 45 which serves as a buffer for the empty shuttle being fixed on an elastic rod 46 in the lower cell of the exchange-box. By the above specified construction the shuttle-driver can be shifted more easily than hitherto.

The contrivance works in the following manner: During the ordinary working of the loom the exchange-box is in its lowest position so that the upper plane of the plate 11 is in the prolongation of the shuttle race of the lay 20, and the upper cell of the exchange-box is consequently acting as a shuttle-box. All the different mechanical parts which serve for moving the exchange-box and the feeding mechanism are at the same time stationary with exception of the lever *e* which is moved upwards and downwards by the eccentric *o*. At the moment when there is only a small quantity of weft on the spool the electric circuit will be closed; the rod *k* will then move to the right and the exchange-box will now be lifted so that the plate 11 is level with the sliding pieces 29; at that moment the rod 1 will go upwards and thereby cause the plate 3 to carry the bottom shuttle of the magazine into the upper cell of the exchange-box, while the empty shuttle from the opposite shuttle-box at the same time will be thrown into the lower cell of the exchange-box. In the meantime the eccentric has turned and the current has been cut off which causes the exchange-box to sink down to its lower position after which the empty shuttle falls down through the conducting channel 28 into the receiver box while the shuttle in the upper cell in ordinary manner by the picking-staff is thrown into the opposite shuttle-box of the loom after which the working of the loom is continued in ordinary manner. The whole of the exchange described is accomplished without any interruption in the motion of the loom.

Having thus described our invention, we claim as new and desire to secure by Letters Patent:

1. In a weft replenishing loom, a lay, guiding flanges carried thereby, a feeler-plate engaging said flanges, contact pins carried by said plate, a shuttle box, a contact plate thereon, yielding means for normally maintaining said contacts out of engagement, a driving shaft and means coacting therewith for causing said plate to engage the spool once for every two revolutions of the driving shaft and thereby closing the circuit when there is still a certain amount of weft on the spool.

2. In a weft replenishing loom, an exchange box consisting of two normally stationary cells, one of said cells normally acting as a shuttle box, means for raising said box when a shuttle exchange is to take place in order that the lower cell may receive the empty shuttle and the upper cell a fresh shuttle, spring means for forcing the shuttle downward when the exchange box is in its raised position, means for afterward lowering said box, and means for causing the empty shuttle to pass from the lower cell as the box is lowered.

3. In a weft replenishing loom, a lay, a shuttle box tongue in fixed relation therewith, an exchange box, means for raising and lowering said box and means for preventing said shuttle box tongue from following the box and spring means for forcing the shuttle downward when the exchange box is in its raised position.

4. In a weft replenishing loom, an exchange box consisting of two cells open at their back, the lower of said cells being open on its under side, a spring controlled plate for forcing the shuttle downward when the exchange box is in its raised position, and means for pressing said plate upwards so that it does not impede the free movement of the shuttle during the ordinary motion of the machine when the shuttle box is in its lowered position.

5. In a weft replenishing loom, a shuttle box tongue, and an exchange box consisting of two cells, the front wall of the lower cell being deflected inwardly at its lower end to retain the empty shuttle until it is clear of the tongue, and whereby said tongue is pressed in to permit the downward movement of the upper shuttle.

6. In a weft replenishing loom, a picking stick, a shuttle driver, a guiding shaft therefor and an exchange box having an upper and a lower cell and in firm connection with said shaft, whereby during the raising and lowering of said exchange box, said driver is permitted to move up and down along the picking stick and thus be always in the upper cell of said box.

7. In a weft replenishing loom, a driving shaft, a shaft driven thereby, an eccentric on said driven shaft, a lever actuated thereby, a second lever coacting therewith, a rod in pivotal relation with said second lever, and an exchange box carried by said rod, an electric circuit, said first lever coacting with said second lever when the weft on the spool is nearly used up and the circuit closed, whereby the exchange box will be raised when a shuttle exchange is to take place while on the contrary all of said mechanism remains stationary during the ordinary movement of the machine,

8. In a weft replenishing loom, a magazine, an exchange box having an upper and a lower cell, a shuttle being carried from said magazine into said upper cell subsequent to said box being raised, a bent lever, yielding means for controlling said lever, a vertical push rod acted on by said yielding means, and a cam-controlled lever connected with said push rod, whereby the mechanisms for pushing in the shuttle are stationary when the shuttle-exchange does not take place.

In witness whereof we have hereunto set our hands in presence of two witnesses.

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JULIUS CONRAD EUGEN CARLSSON.

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