No. 782,570. PATENTED FEB. 14, 1905.

F. LACEY.

SHEDDING MECHANISM FOR LOOMS.

APPLICATION FILED AUG. 12, 1904.

2 SHEETS—SHEET 1.

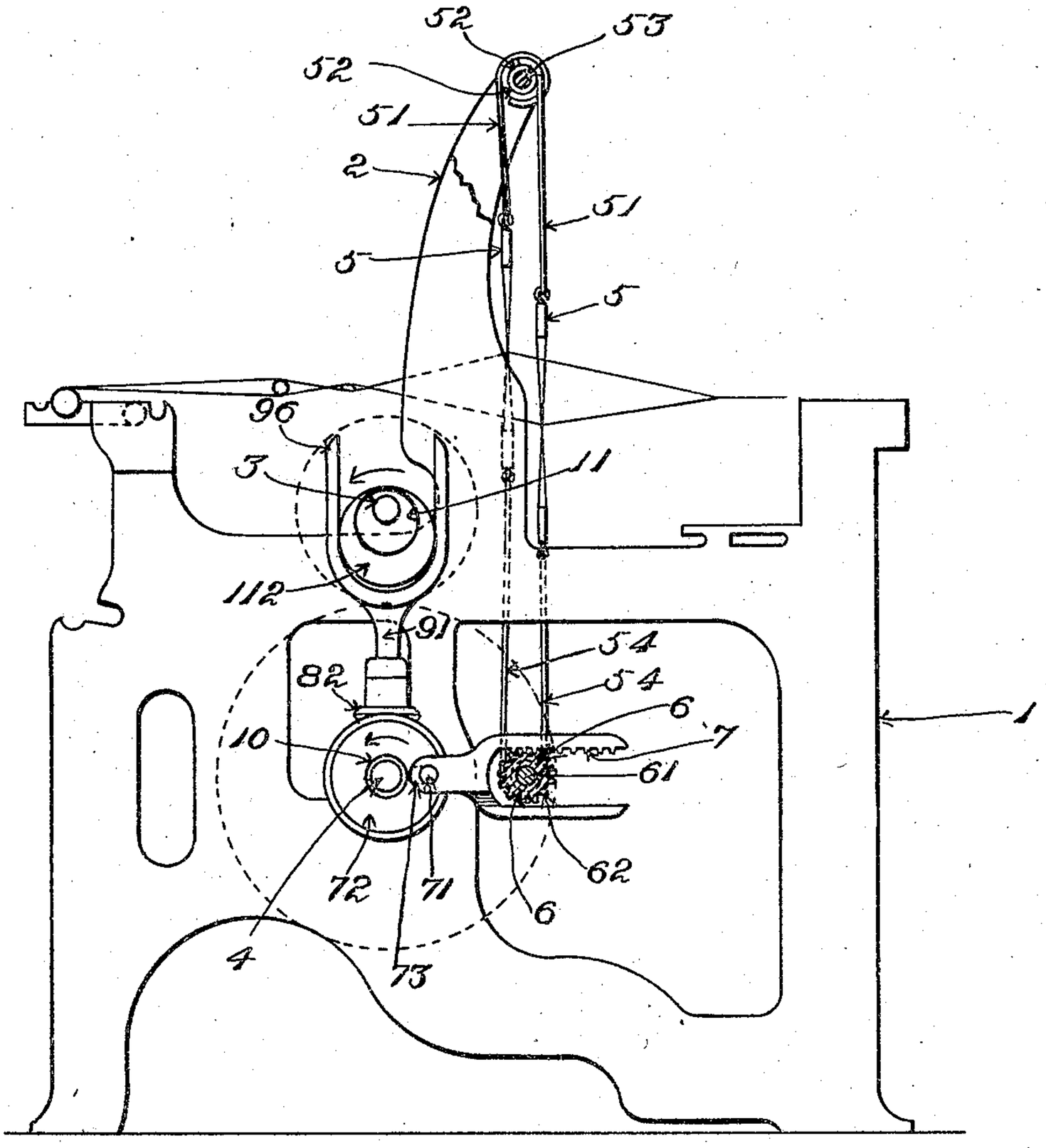

Fig. 1.

Witnesses:
Oscar F. Hill
Edith J. Anderson.

Inventor:
Fred Lacey
by Macleod Calver & Randall
Attorneys.

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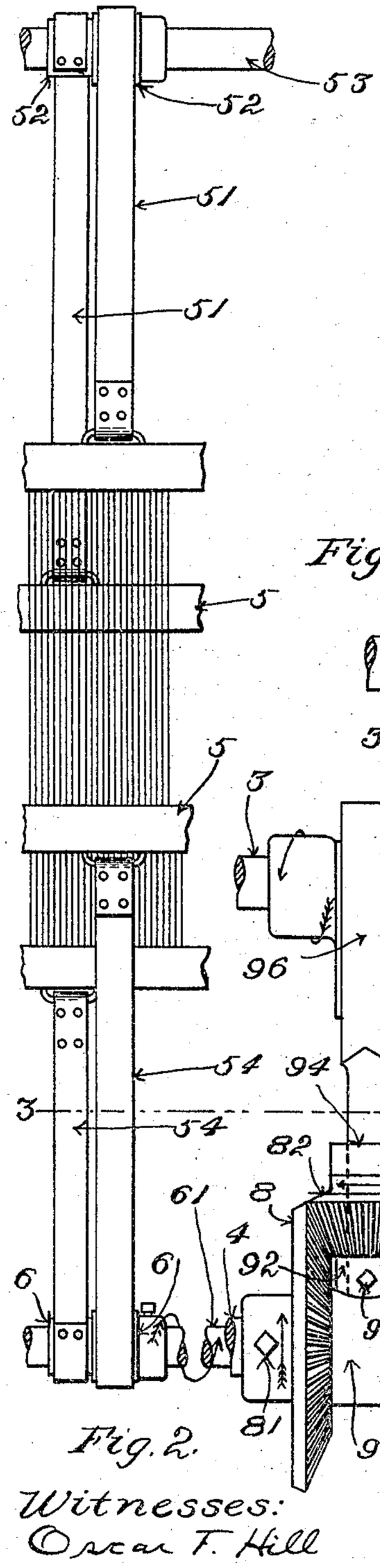

Fig. 2.

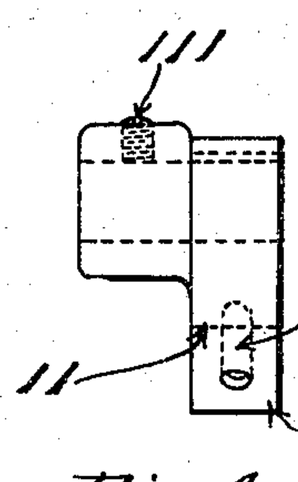

Fig. 4.

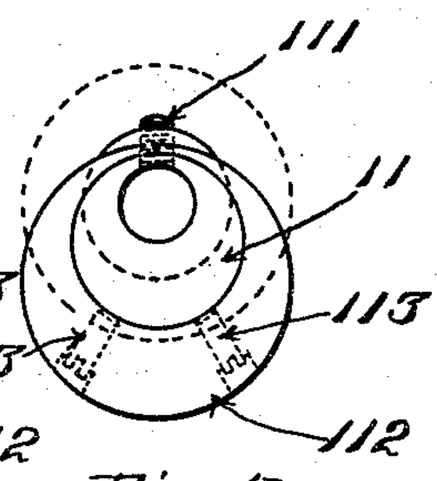

Fig. 5.

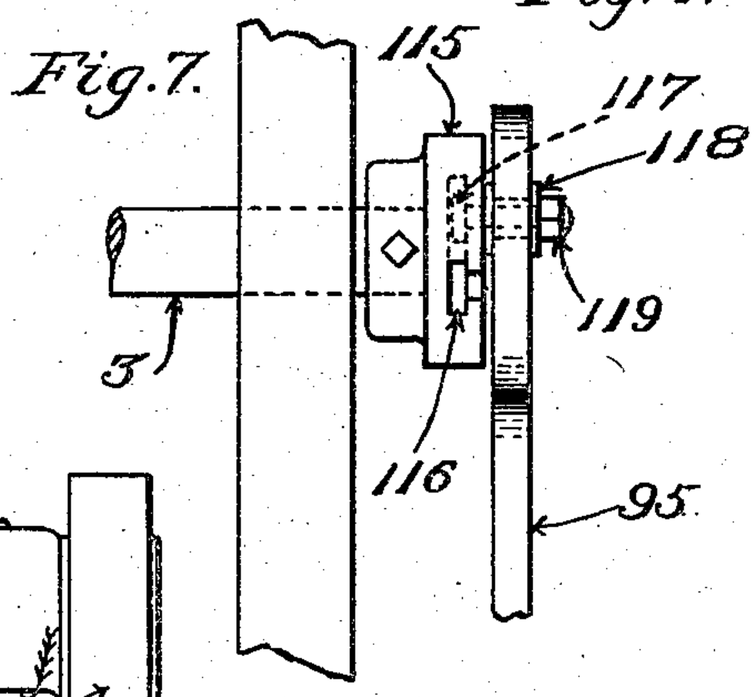

Fig. 7.

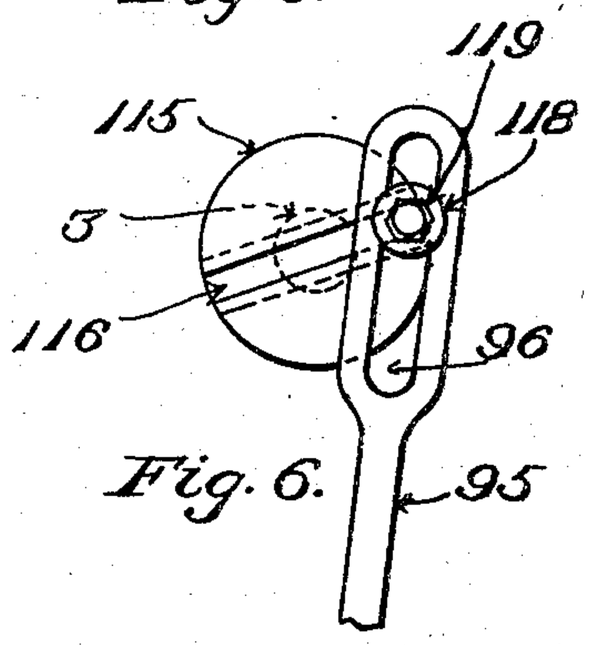

Fig. 6.

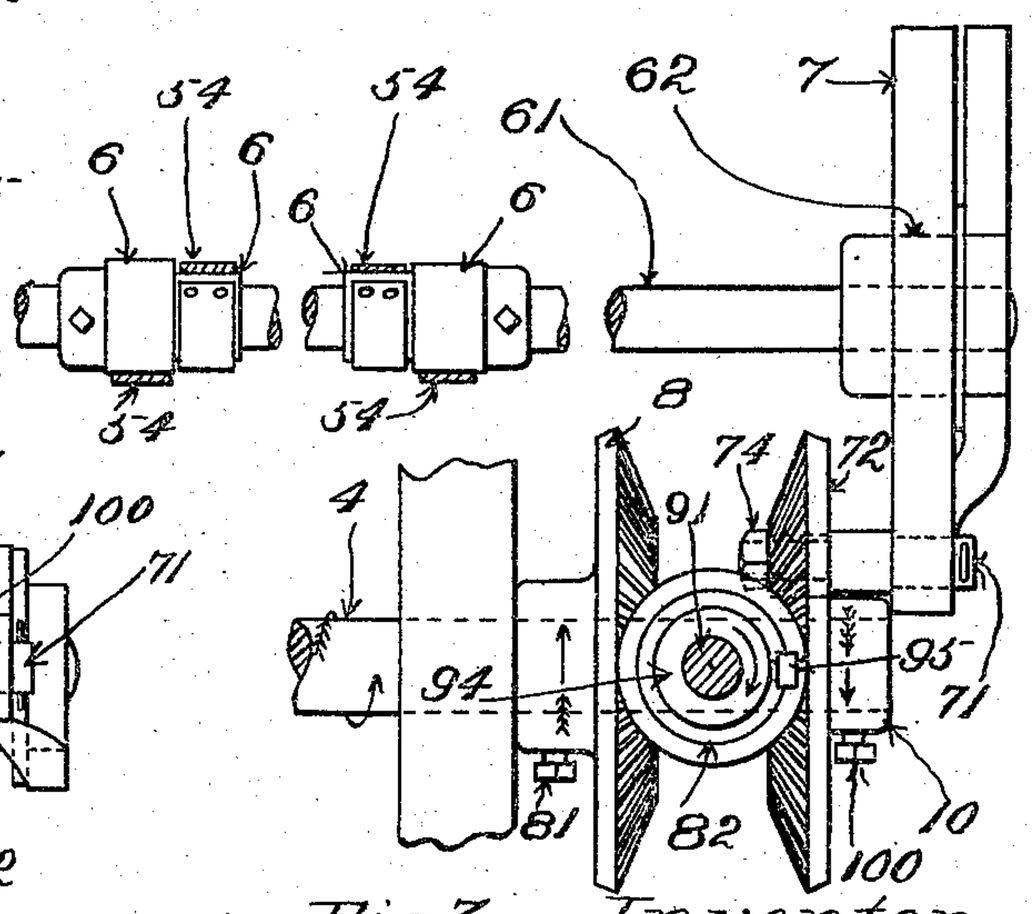

Fig. 3.

Witnesses:
Oscar F. Hill
Edith J. Anderson.

Inventor
Fred Lacey
By Macleod Calver & Randall
Attorneys.

No. 782,570. Patented February 14, 1905.

UNITED STATES PATENT OFFICE.

FRED LACEY, OF VALLEYFIELD, CANADA.

SHEDDING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 782,570, dated February 14, 1905.

Original application filed August 1, 1904, Serial No. 218,990. Divided and this application filed August 12, 1904. Serial No. 220,492.

To all whom it may concern:

Be it known that I, FRED LACEY, a citizen of the United States, residing at Valleyfield, in the county of Beauharnois, Province of Quebec, Dominion of Canada, have invented a certain new and useful Improvement in Shedding Mechanisms for Looms, of which the following is a specification, reference being had therein to the accompanying drawings.

As is well understood by those who are skilled in the art, in the operation of power-looms the shedding action requires to be varied to suit the different weights of the goods which it is desired to produce. For instance, a loom for weaving a lawn, which is made from fine yarns and is a very light cloth, should have the shed-forming mechanism thereof arranged to move the harness steadily and slowly when changing from one shed to another in order to prevent breakage of warp-yarns and to give to the harness when the shed is fully open only sufficient dwell to allow of a clear passage for the shuttle. When weaving cloth of a medium quality which is a little heavier than lawns, using yarns a little coarser than are used in the latter, it is necessary that the shed should be opened to its full extent a little earlier in the cycle of movements of the loom and should be caused to dwell a little longer in such condition, affording a somewhat clearer shed for the shuttle, a clearer shed being required when weaving coarser yarns, inasmuch as these last are somewhat closer together in the reed than in the case of lawns. When weaving sheeting, duck, or any other heavy fabric, the warp-yarns must be crossed over the previous pick of weft prior to the beating up of the latter. In addition the shed must be fully open still earlier than with medium goods, and the dwell of the open shed must be longer. In weaving such goods it is requisite to cross the warp-yarns back of each pick before the latter is struck up to the cloth-making line by the reed of the lay in order that the pick may not spring back as the lay and reed move away from the said line. Heavy cloths cannot be woven in ordinary light looms without the crossing of the warp-yarns behind the pick that is being beaten up. Although an ordinary loom provided with properly timed and operating harness mechanism can be made to weave reasonably-heavy cloth, a heavy loom with improperly timed and operating harness mechanism cannot weave heavy cloth. In many instances, in addition, the size or depth of the shed must vary to suit the cloth which is to be produced. It heretofore has been usual in mills to run looms steadily on goods of the same weight. At the present time it is desirable in order to meet the varying requirements of trade to be able from time to time to vary the product of a loom from cloth of one weight to cloth of a different weight.

One general object of the invention is to enable the harness-operating mechanism of a loom to be adjusted quickly and conveniently to adapt the loom to the production of cloths of different weights without replacing parts or otherwise reconstructing the said mechanism.

The present invention has relation more especially to harness-operating mechanism of that class in which the harness-frames are connected by straps or cording with rolls upon a shaft having operative connections with a rotating crank or its equivalent, the said shaft being oscillated to occasion the working of the harness-frames.

The invention consists, essentially, in the combination, in a loom, with harness-operating mechanism normally adapted to operate in shedding the warp-yarns in manner suited to the production of goods of a given weight and embracing a roll-shaft, crank or equivalent therefor, and operative connections joining said roll-shaft to said crank or its equivalent, of automatic devices which may be rendered inoperative to affect or vary the normal working of the said harness-operating mechanism when such normal working is desired, but which may be rendered operative when it is desired to adapt the loom for the production of goods of a given different weight to modify the normal action of the harness so as to vary the length of dwell of the open shed, and, when desired, the size or depth of such shed also to suit the latter weight of goods. The

said devices preferably are adjustable to provide for the production of a variety of weights of goods.

The invention is illustrated by the accompanying drawings, in which—

Figure 1 shows portion of a loom in end elevation, partly broken away, having applied thereto an embodiment of the invention. Fig. 2 is a partial rear elevation of the devices of Fig. 1, the parts being broken away. Fig. 3 is a partial plan thereof, partly in section, on the horizontal plane that is indicated by the dotted line 3 3 in Fig. 2. Fig. 4 shows in rear elevation the double or compound eccentric of Figs. 1, 2, and 3 detached. Fig. 5 shows the said double or compound eccentric in side elevation. Fig. 6 shows in side elevation a crank of adjustable throw which in some instances I contemplate employing as an actuator for the carrier and a portion of the carrier which is engaged by the said crank. Fig. 7 shows in rear elevation the parts which are represented in Fig. 6.

Having reference to the drawings, portion of one side frame of a loom is designated at 1, Fig. 1, and portion of the arch is shown at 2.

3 is the crank-shaft of the loom, and 4 is the cam-shaft thereof, the latter rotating, as usual, at one-half the rate of speed of the former.

5 5, Figs. 1 and 2, are harness-frames, 51 51, Fig. 1, being straps by means of which the said harness-frames are suspended from the top rolls 52 52, carried by the upper roll-shaft 53, which latter is mounted upon the said arch 2. 54 54 are harness-straps extending down from said harness-frames to rolls 6 6 on the lower roll-shaft 61, which last is supported in bearings that are carried by the lower portion of the loom-frame. For the actuation of the harness-frames the lower roll-shaft 61 has fast upon one end thereof the pinion 62, and with the teeth of the said pinion are caused to engage the teeth of a rack 7, the latter being connected pivotally with a crank-pin 71, which is carried by a rotating wheel 72. In this instance the wheel 72 is mounted upon and concentrically with cam-shaft 4, although it is free to turn independently with relation to the cam-shaft. The wheel 72 is provided with driving connections, presently to be described, by means of which it is rotated. In the rotation of the wheel 72 reciprocating movement is communicated to the rack in consequence of the crank connection, and through the engagement of the rack with the pinion 62 the lower roll-shaft 61 is oscillated, whereby the harness-frames are raised and lowered in alternation with each other as heretofore in the production of sheds in the warp-yarns. For the purpose of enabling the depth of shed to be varied when found necessary or desirable in practice, the throw of the actuating-crank is made variable or adjustable by mounting the crank-pin 71 in a radial slot 73 in the wheel 72, which enables the crank-pin to be set closer to or farther from the axis of rotation of the wheel, the portion of the crank-pin which extends through the said slot being screw-threaded and receiving upon its threaded extremity at one side of the wheel a nut 74, between which and a shoulder on the crank-pin bearing against the opposite face of the wheel the wheel is clamped, thereby securing the crank-pin in its position of adjustment. Other and equivalent devices comprising a crank or its equivalent in operative connection with a roll-shaft for the harness are known and in some instances may be employed in lieu of the crank and rack thus far described without involving departure from the spirit of my invention.

In the operation of the illustrated form of harness-operating mechanism as thus far described a certain amount of dwell of the open shed, suitable for light-weight goods, is caused to occur in the normal working of the parts as the crank passes the opposite centers in its rotation.

For the actuation of the wheel 72 it is placed, in the present instance, in operative connection with the cam-shaft 4. In Figs. 12 and 13 it constitutes or is connected with the terminal element of gear-train that is driven by the cam-shaft For the purposes of the invention the said gear-train forms portion of a differential mechanism. The character and arrangement of the gear-train may vary without involving departure from the spirit of the invention. In the present instance it comprises a bevel-gear 8, which is made fast upon the cam-shaft 4 by a clamping or binding screw 81, an intermediate or carrier bevel-gear 82, which is mounted as presently will be described, and the wheel 72 aforesaid, which latter is formed as a bevel-gear and is engaged by the said intermediate or carrier bevel-gear 82, as shown. The intermediate or carrier bevel-gear 82 is supported by a swinging carrier comprising a swivel 9 and an arm 91, extending therefrom. The said swivel consists of a sleeve that is fitted upon the cam-shaft 4 between the bevel-gears 8 and 72, so as to hold the latter at the requisite distance apart from each other, the said sleeve having a radial socket 92, in which the inner extremity of the arm 91 is received and secured by a clamping or binding screw 93. The intermediate or carrier bevel-gear 82 is journaled upon the stem of the said arm and is stepped upon the outer end of the socketed portion of the swivel. It is held in proper engagement with the bevel-gears 8 and 72 by means of a collar 94, that is fitted upon the stem of the arm and secured in place thereon by means of a clamping or binding screw 95. The bevel-gear 72 is confined between the swivel 9 and a collar 10 upon the corresponding extremity of the cam-

shaft 4, the said collar being secured in place upon the cam-shaft by means of a clamping or binding screw 100.

In the working of the loom the normal action of the harness mechanism is secured by causing the carrier 9 91 to remain in a given position. So long as the said carrier is held fixed in one position the crank from which the lower roll-shaft is actuated will be rotated at the normal rate of speed, and the harness-frames will be caused to operate as usual in the production of goods of the weight which the harness mechanism is designed to coöperate in producing by its normal action. In conformity with the present invention, for the purpose of modifying the action of the harness mechanism to suit the production of goods of a different weight, a differential movement is communicated to the crank. This movement is occasioned by communicating to the said carrier a complete oscillation or vibration for each shed formation. In the present instance the carrier is in operative connection with the crank-shaft through the medium of an actuator that is applied to the latter. The said actuator in Figs. 1 to 5 is constituted by an eccentric of adjustable throw. It consists of a compound eccentric comprising the inner eccentric member 11, sleeved upon the crank-shaft and made fast thereto by means of a clamping or binding screw 111, and the outer eccentric member 112 fitting around the eccentric body of the member 11 and secured in the desired position upon the said body by clamping or binding screws 113 113.

The described construction of the compound eccentric enables the periphery of the outer member 112 to be adjusted either into concentricity with the crank-shaft, as shown by dotted lines in Fig. 5, or into position to secure any desired extent of throw within the capacity of the device. Fig. 5 shows in full lines the double or compound eccentric adjusted as required in order to secure the full or maximum throw thereof, which is also the adjustment thereof in Fig. 1. For engagement with the actuator the arm 91 of the swinging carrier is furnished with a fork or yoke 96, embracing the actuator. When the compound or double eccentric is set or adjusted, as indicated by the dotted lines of Fig. 4, so that the exterior of the same is concentric, it serves to hold the carrier in its stationary or fixed position, the result of which is, as indicated above, to secure the rotation of the crank at a uniform rate of speed. When the said double or compound eccentric is set or adjusted so that its periphery is disposed eccentrically with relation to the crank-shaft, it imparts to the carrier the swinging movement which is instrumental in producing the differential movement of rotation of the crank. This differential movement by imposing upon the rotation of the crank alternate acceleration and retardation secures the different length of dwell of the open shed that is necessary to suit a difference in the weight of the goods to be produced. The adjustability of the actuator provides for a range of variations in the length of dwell of the open shed to suit a variety of weights of goods.

Having reference now to Figs. 1 to 3, in which the directions of rotation of the crank-shaft, cam-shaft, and crank, respectively, are indicated by the arrows, the action is substantially as follows: As the carrier and the gear 82, mounted thereon, are caused by the actuator to move in the direction from left to right in Fig. 1, a retardation of the rotation of the harness-actuating crank is occasioned or a retardation, dwell, and retardation, prolonging the dwell of the open shed. In Fig. 1 the eccentric-actuator, carrier, and gear on the carrier are shown advanced through half of their stroke, the positions being those corresponding with the middle point of the retardation or dwell. When the carrier begins its stroke from right to left, the movement of the carrier and the carrier-gear in the latter direction serves to accelerate the rotation of the harness-actuating crank and the action of the parts which are operated therefrom in completing the closing of the old shed and the crossing of the warp-yarns in opening the succeeding shed. By this acceleration, in addition, the new shed is fully opened at an earlier instant in the cycle of movements of the loom than in the normal working of the harness-operating mechanism. The acceleration of the rotation of the crank gradually dies out as the carrier nears the end of its stroke from right to left until as the carrier pauses at such end the crank rotates at normal speed, after which as the carrier moves from left to right a retardation or retardation, dwell, and retardation of the crank occurs, operating to delay the closing of the shed, as before. If the actuator be adjusted to occasion a different length of stroke of the carrier, a different length of dwell of the open shed may be secured.

Figs. 6 and 7 illustrate an actuator consisting of a crank of adjustable throw which may be employed instead of the compound or adjustable eccentric 10. In Figs. 6 and 7 the crank-disk 115, fast upon the crank-shaft 3, is formed in its outer face with a diametrically-extending undercut slot 116, receiving the head portion of the crank-pin 117. Upon the stem of the said crank-pin is fitted the sleeve 118, and to the threaded outer portion of the said stem is applied the clamping-nut 119, taking against the outer end of the sleeve. By adjustment of the crank-pin along the slot 116 any desired throw of the crank within its limit may be secured or the crank-pin may be fixed at the center of motion of the crank-shaft, so that it will not operate as a crank, in which case the carrier will be held in fixed position and the differential action will not take place.

The outer arm 95 of the carrier is slotted longitudinally, as at 96, and the crank-pin and sleeve 118 thereof work within the said slot to communicate a vibratory movement to the carrier. The pinion, rack, and crank and devices more immediately involving the invention comprising the differential gearing, carrier, and actuator may be located either at the end of the loom outside the end or side of the latter in conveniently accessible position or at some convenient place between the ends or sides of the loom-frame, as preferred by constructors or users.

While I have been careful to explain fully the particular construction which is shown in the drawings and the mode of operation thereof, I do not confine myself to the precise details shown and described. The devices for modifying the action of the harness-operating mechanism may be modified more or less in construction, arrangement, and mode of operation.

My present invention is a division of that set forth and claimed in a companion application filed by me August 1, 1904, Serial No. 218,990, in which the generic principles that are embodied in the devices herein shown and described are broadly claimed.

I claim as my invention—

1. In a shedding mechanism for looms, the combination with the harness, and the rotating crank, in operative connection with the harness and through which the latter is actuated, of devices by which the normal action of the said crank may be modified to vary the length of dwell of the open sheds.

2. In a shedding mechanism for looms, the combination with the harness, and the rotating crank, in operative connection with the harness and through which the latter is actuated, of differential-motion devices by which the normal action of said crank may be modified to vary the length of dwell of the open sheds.

3. In a shedding mechanism for looms, the combination with the harness, and the rotating crank, in operative connection with the harness and through which the latter is actuated, of mechanism to impart differential movement to the said crank, adjustable to vary the length of dwell of the open sheds.

4. In a shedding mechanism for looms, the combination with the harness, the crank, in operative connection with the harness and through which the latter is actuated, and means to rotate the said crank, of the differential-motion devices by which the rotary motion of the crank is modified, provided with an actuator adjustable to render the said devices operative or inoperative.

5. In a shedding mechanism for looms, the combination with the harness, and the crank, in operative connection with the harness and through which the latter is actuated, of operating means for the said crank, adjustable to vary the dwell of the open shed.

6. In a shedding mechanism for looms, the combination with the harness, the crank, in operative connection with the harness, and means to rotate the said crank, of means by which the normal action of the said crank may be modified to change the length of dwell of the open shed, adjustable to suit different lengths of dwell.

7. In a shedding mechanism for looms, the combination with the harness, and the rotating crank, in operative connection with the harness, of means by which the rotary movement of the crank may be modified to vary the length of dwell of the open shed.

8. In a shedding mechanism for looms, the combination with the harness, and the rotating crank, in operative connection with the harness, of means to vary the length of the dwell of the open shed adapted to be placed in and out of action as desired.

9. In a shedding mechanism for looms, the combination with the harness, and the crank, in operative connection with the harness, of the gear-train with which said crank is connected and by which it is rotated, the gear-carrier supporting a portion of the said train, and means by which the said gear-carrier is actuated.

10. In shedding mechanism for looms, the combination with the crank-shaft, the harness, and the crank, in operative connection with the harness, of the gear-train by which the crank is rotated, the gear-carrier supporting a portion of the said train, and the actuator for said gear-carrier, actuated by the crank-shaft.

11. In shedding mechanism for looms, the combination with the crank-shaft, the harness, and the crank, in operative connection with the harness, of the gear-train by which the crank is rotated, the gear-carrier supporting a portion of the train, and the actuator for said gear-carrier, actuated by the crank-shaft, and adjustable to vary the length of dwell of the open shed.

12. In a shedding mechanism for looms, the combination with the harness, and the crank, in operative connection with the harness and through which the latter is actuated, of operating means for the said crank, adjustable to vary the length of dwell of the open shed, and means to vary the size or depth of the shed.

13. In a shedding mechanism for looms, the combination with the harness, and the rotating crank, in operative connection with the harness and through which the latter is actuated, of devices by which the normal action of the said crank is modified to vary the length of dwell of the open shed, and means to adjust the size or depth of the shed.

14. In a shedding mechanism for looms, the combination with the harness, and the rotat-

ing crank, in operative connection with the harness and through which the latter is actuated, and means to vary the size or depth of the shed, of differential-motion devices by which the normal action of said crank is modified to vary the length of dwell of the open shed.

15. In a shedding mechanism for looms, the combination with the harness, and the rotating crank, in operative connection with the harness, of means to vary the size or depth of the shed, and means by which the rotary movement of the crank may be modified to vary the length of dwell of the open shed.

16. In a shedding mechanism for looms, the combination with the harness, and the crank, in operative connection with the harness, of the gear-train with which the said crank is connected and by which it is rotated, the gear-carrier supporting a portion of the said train, means by which the said gear-carrier is actuated, and means to vary the size or depth of the open shed.

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

FRED LACEY.

Witnesses:
CHAS. F. RANDALL,
R. WALLACE.