No. 871,448. PATENTED NOV. 19, 1907.

C. F. ROPER.

HARNESS MOTION FOR LOOMS.

APPLICATION FILED AUG. 27, 1906.

2 SHEETS—SHEET 1.

Fig. 1.

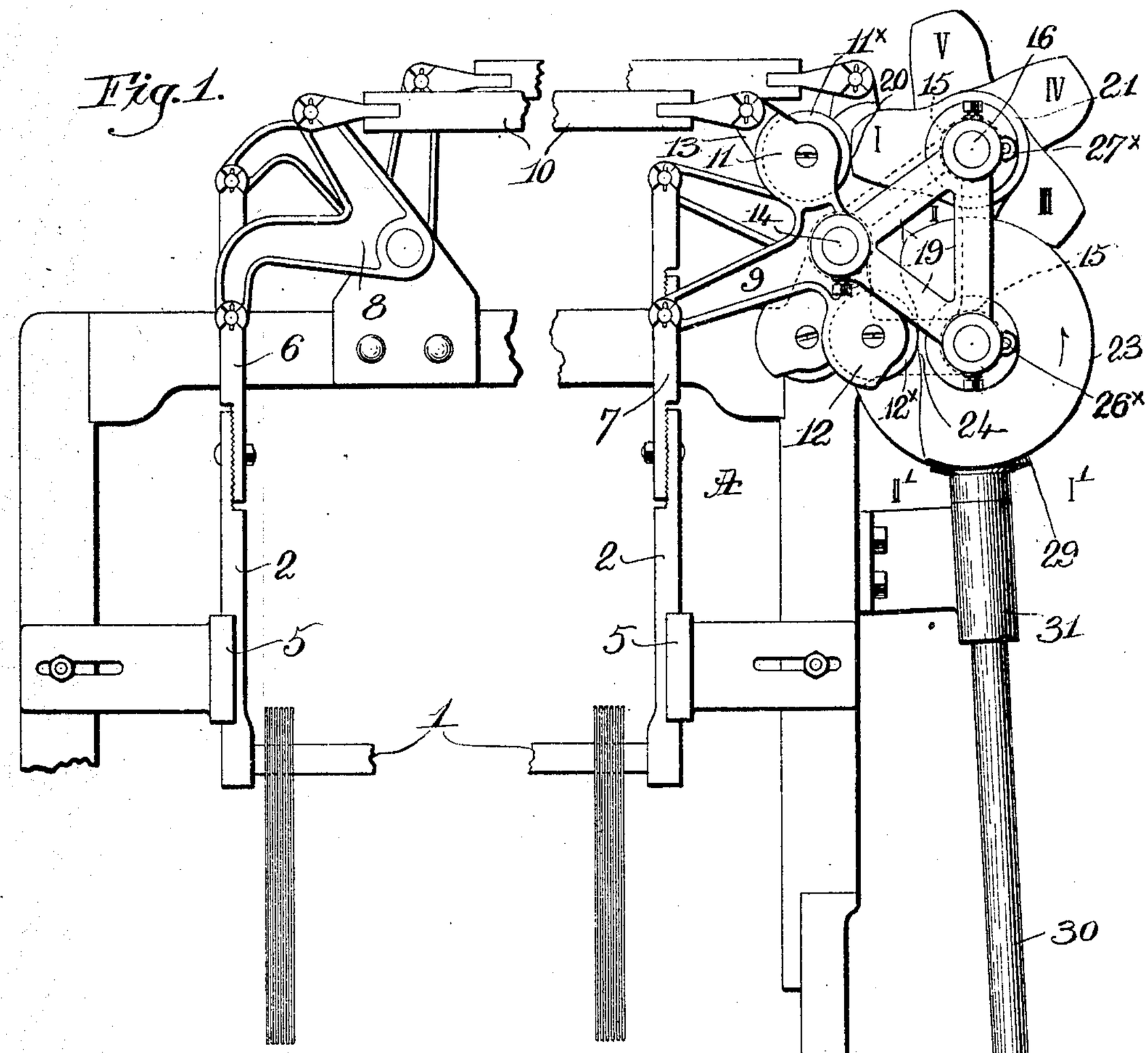
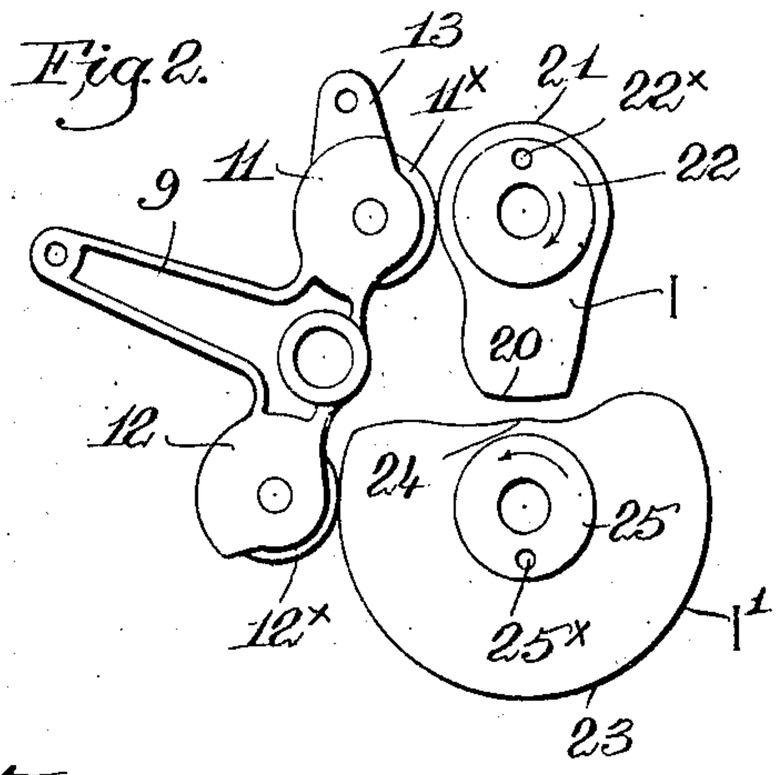


Fig. 2.



Witnesses:
Edward G. Allen
Joseph M. Ward

Inventor.
Charles F. Roper,
by Crosby Gregory
Atty's.

No. 871,448. PATENTED NOV. 19, 1907.

C. F. ROPER.

HARNESS MOTION FOR LOOMS.

APPLICATION FILED AUG. 27, 1906.

2 SHEETS—SHEET 2

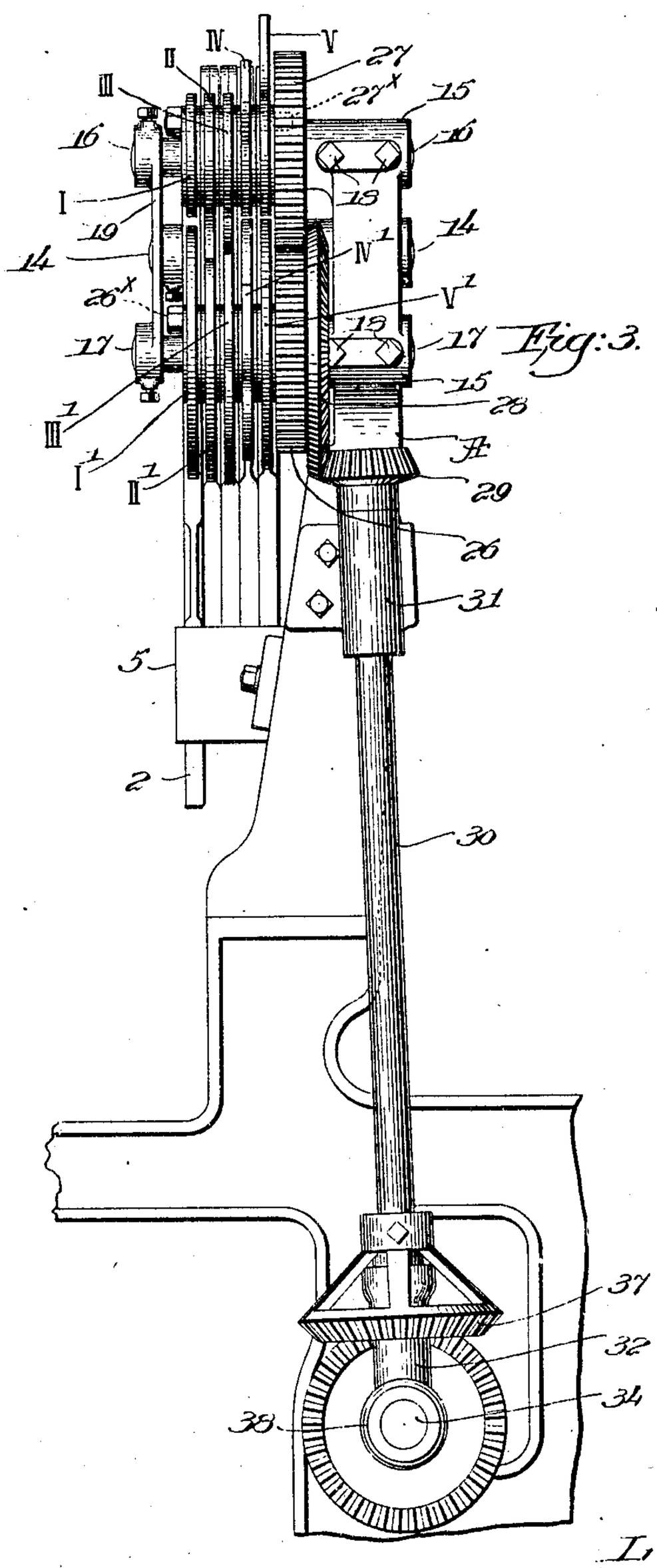


Fig: 3.

Witnesses,
Edward H. Allen
Joseph M. Ward

Inventor;
Charles F. Roper;
by Crosby Gregory.
Attys.

UNITED STATES PATENT OFFICE.

CHARLES F. ROPER, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO DRAPER COMPANY, OF HOPEDALE, MASSACHUSETTS, A CORPORATION OF MAINE.

HARNESS-MOTION FOR LOOMS.

No. 871,448. Specification of Letters Patent. Patented Nov. 19, 1907.

Application filed August 27, 1906. Serial No. 332,081.

To all whom it may concern:

Be it known that I, CHARLES F. ROPER, a citizen of the United States, and resident of Hopedale, county of Worcester, and State of Massachusetts, have invented an Improvement in Harness-Motion for Looms, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawing representing like parts.

This invention relates to harness-motions for looms, and it has for its object the production of a positive, compact and direct-acting harness-motion particularly adapted to looms employing more than two harnesses, though by no means restricted thereto, the construction being simple and accurate in operation.

In accordance with my invention the harnesses are actuated positively in both directions, the actuating means for each harness comprising two cams operatively connected therewith by a positive overhead connection, the cams being so constructed and arranged as to be of relatively small size, thereby obviating the large, unwieldy, heavy and expensive cams which have heretofore been used at times as harness actuators.

The various novel features of my present invention will be fully described in the subjoined specification, taken in connection with the accompanying drawings illustrating one practical embodiment of my invention, and such novel features will be more particularly pointed out in the claims appended hereto.

Figure 1 is a front elevation, centrally broken out, of a sufficient portion of a loom with one embodiment of my invention applied thereto, the nearest harness or heddle-frame being depressed. Fig. 2 is a detail showing the relative position of the actuating cams when the harness controlled thereby is raised. Fig. 3 is a right hand side elevation of the apparatus shown in Fig. 1.

In Figs. 1 and 3 I have shown a five-harness set, so far as the actuating cams are concerned, but to avoid confusion I have illustrated only one harness or heddle-frame in Fig. 1, and overhead connections for two harnesses, it being understood that as many harnesses may be employed, more or less than five, as may be necessary.

Referring to Fig. 1, the harness or heddle-frame comprises a cross-bar 1 and end bars 2 which slide in vertical guideways 5, the upper ends of the bars being connected by links 6 and 7 to bent or rocking levers 8 and 9 pivotally mounted upon the upper portion of the loom-frame, said levers 8 and 9 being connected by a link 10, substantially as in United States Patent No. 770,116 granted to me September 13, 1904. The levers 8 and 9 rock in unison and through the depending links 6 and 7 raise and lower the harness or heddle-frame suspended therefrom.

The levers 8 are made with two arms, connected respectively with the links 6 and 10, but each of the levers 9 has two arms 11, 12 extended oppositely from its fulcrum or pivot and provided with cam followers, herein shown as disks $11^{\times}$ $12^{\times}$ rotatably mounted thereon. An ear-like extension 13 on the arm 11 is pivotally connected with the link 10

The several levers 9 are mounted to rock on a stud 14 secured to the main frame of the loom, said levers serving as carriers for the cam-followers, as described, as well as transmitters, as they may be termed, inasmuch as they transmit motion from the actuators to reciprocate the harness.

The loom-arch A is shaped as shown by dotted lines Fig. 1 to provide supporting hubs 15, Fig. 3, for two parallel studs 16, 17 extended forward and rigidly held in the hubs by set-screws 18, a triangular brace 19 being fixedly secured to the front ends of the studs 16, 17 and to the fulcrum stud 14 on which the transmitters rock. Upon the studs 16 and 17 are rotatably mounted the actuators which act upon the transmitters and rock the same to raise or lower the harness-frames, the actuators being paired for each frame, one actuator of each pair serving as a lifter and the other as a depressor.

As all the lifters are alike, and all the depressors are alike, it will be necessary to describe in detail but one pair of actuators, it being understood that in practice the throw of the actuators is slightly increased for each harness-frame from the front, to provide for the proper shed opening.

I have for convenience indicated the several depressors in Figs. 1 and 3 at I, II, III, IV, and V, and the corresponding lifters by like characters primed, as I′, II′ etc., in Fig. 3.

The actuators are made as cams, and referring to Fig. 2 each of the depressor cams has a short high portion 20 and a long low portion 21, both portions being concentric circular arcs to give a dwell, circular hubs 22 being formed on the cams to laterally separate them when mounted on the stud 16, as shown in Fig. 3. Each of the lifter cams has a long high portion 23 and a short low portion 24, shown as circular arcs to give a dwell, and these cams have hubs 25, to laterally separate them when mounted on the stud 17. The depressor cam is somewhat like a tappet cam in shape, while the lifter cam is more nearly semi-circular, as will be manifest from an inspection of Fig. 2. A bevel-gear 28, Fig. 3, is rotatably mounted on the stud 17 adjacent the lower hub 15, and has secured to or forming part of it a spur gear 26 which meshes with a similar gear 27 rotatable on the stud 16. The depressor cams I, II, etc. are rotatably mounted side by side on the stud 16 between the gear 27 and the brace 19, and are rigidly connected with each other and with the said gear by a screw-bolt $27^{\times}$ passed through holes $22^{\times}$, Fig. 2, in the cam hubs and screwed into the gear. Thus all of the depressor cams and the gear 27 rotate as a unit upon the stud 16, it being understood that the holes $22^{\times}$ are so located that the several connected cams will be properly timed, these cams coöperating with the several followers $11^{\times}$ on the transmitters. In like manner the lifter cams I′, II′, etc., are connected with each other and with the gear 26 by a screw-bolt $26^{\times}$ passed through holes $25^{\times}$ in the cam hubs. As the gears 26, 27 are in mesh the several lifter cams will be rotated oppositely to the several depressor cams, and in unison therewith, the lifter cams coöperating with the followers $12^{\times}$. Regarding any pair of actuators, they are so set relatively to each other that the high portion of one will sweep by and close to the low portion of the other, and vice versa, as the actuators are rotated, the arrows in Fig. 2 showing the direction of rotation. When the high portion of a depressor cam is acting upon its follower $11^{\times}$ the harness-frame is held depressed, see Fig. 1, and the low portion of the corresponding lifter cam then is opposite the follower $12^{\times}$. As the cams rotate the rise of the lifter cam acts upon its follower $12^{\times}$ to swing the transmitter 9 upward on its fulcrum, to elevate the harness-frame, the fall of the depressor cam permitting its follower $11^{\times}$ to follow along toward the low portion 21.

Referring to Fig. 1 the high portion 23 of the lifter cam I′ is shown as sweeping past the low portion 21 of the depressor cam, while in Fig. 2 the high portion 20 of the depressor cam I is sweeping past the low portion 24 of its fellow lifter cam I′.

By the arrangement shown I am enabled to use two relatively small cams, placed close together, and obviating the use of the large and unwieldy side cams which have heretofore been used in some instances, the distance between the centers of any pair of cams being less than the combined radial length of their high portions. The axes of the two sets or series of cams, and the fulcrum of the series of transmitters, are located at the apices of a triangle, as will be manifest from an inspection of Fig. 1, the length of any one of the sides of the triangle being slightly greater than the radial length of the high portion of either cam of a pair, each pair acting upon the transmitter at one and the same side of the centers of rotation of the cams, and substantially opposite such centers. This gives a very compact structure, and the parts composing the actuating mechanism are relatively small, simple in form, and readily constructed at small cost.

It will be noted that the actuators of a pair act in alternation upon the corresponding transmitter to move the same in opposite directions, each movement of the connected harness-frame being positive. By properly shaping the cams of a pair there is practically no back-lash or lost motion, and the harness-frame is under absolute and positive control throughout its movement and at the dwell periods at top and bottom of its stroke.

The actuators are driven by a common driving member, herein shown as a shaft 30 having a bevel-pinion 29 in mesh with the bevel-gear 28, the said driving shaft being located at one side of the loom and supported at or near its upper end in a bearing 31 secured to the loom arch. At its lower end the said shaft is supported in a thrust-bearing 32 forming part of a sleeve 33 loosely mounted on the projecting end of the lower shaft 34 of the loom, the usual bearing-box 35 for such shaft being shown in Fig. 1. A bevel-gear 36 is secured to the shaft 34 between the bearing-box and the sleeve 33, and in mesh with a similar gear 37 secured to the driving member or shaft 30, to rotate the latter. The sleeve 33 is held in place on shaft 34 by a suitable collar 38.

My invention is not restricted to the precise construction and arrangement herein shown and described, as the same may be varied or modified in different particulars by those skilled in the art without departing from the spirit and scope of my invention, one practical embodiment of which is illustrated in the drawings and described in the specification hereof.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a harness-motion for looms, in combination, a harness-frame, a rocking transmitter operatively connected therewith and provided with cam-followers above and be-

low its fulcrum, respectively, and two actuating cams rotated in unison in opposite directions and coöperating with the followers to rock the transmitter and thereby effect reciprocation of the harness-frame, the followers being substantially opposite the axes of rotation of their coöperating cams and at the same side thereof.

2. In a harness-motion for looms, in combination, a harness-frame, a rocking transmitter operatively connected therewith and having arms oppositely extended from its fulcrum and provided with cam-followers, two actuating cams rotated in unison in opposite directions and respectively co-operating with the followers, to rock the transmitter and thereby effect reciprocation of the harness-frame, each cam having a high portion and a low portion, the distance between the axes of rotation of the cams being sufficient to permit the high portion of one cam to sweep past and close to the low portion of the other cam, and vice versa.

3. In a harness-motion for looms, in combination, a harness-frame, a transmitter, an overhead connection between it and the harness-frame, and means to rock the transmitter and thereby reciprocate said harness-frame, said means including two cams each having concentric high and low portions and rotated in unison in opposite directions, to act wholly at one side of their centers in alternation upon the transmitter above and below its fulcrum, respectively, to rock said transmitter about its fulcrum and thereby effect reciprocation of the harness-frame, said cams being set relatively so that the high portion of one sweeps past and close to the low portion of the other, and vice versa.

4. In a harness-motion for looms, a rocking transmitter having arms oppositely extended from its fulcrum and each provided with a follower, two actuating cams to act in alternation upon the followers and rock the transmitter, the distance between the centers of rotation of the cams being less than the combined length of their high portions, and means to rotate the cams in unison in opposite directions, the coöperating points between the cams and the followers being wholly at one side of the centers of rotation of said cams and respectively above and below the fulcrum of the transmitter.

5. In a harness-motion for looms, a plurality of reciprocating harness frames, a rocking transmitter operatively connected with each frame, said transmitters having a common fulcrum, two actuating cams to coöperate with and rock each transmitter, each pair of cams coöperating with their transmitter at the same side of and substantially opposite the centers of rotation of the cams, and above and below the fulcrum of the transmitter respectively, and means to rotate the cams of each pair in unison and in opposite directions.

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

CHARLES F. ROPER.

Witnesses:
FRANK J. DUTCHER,
OLIVER H. LANE.