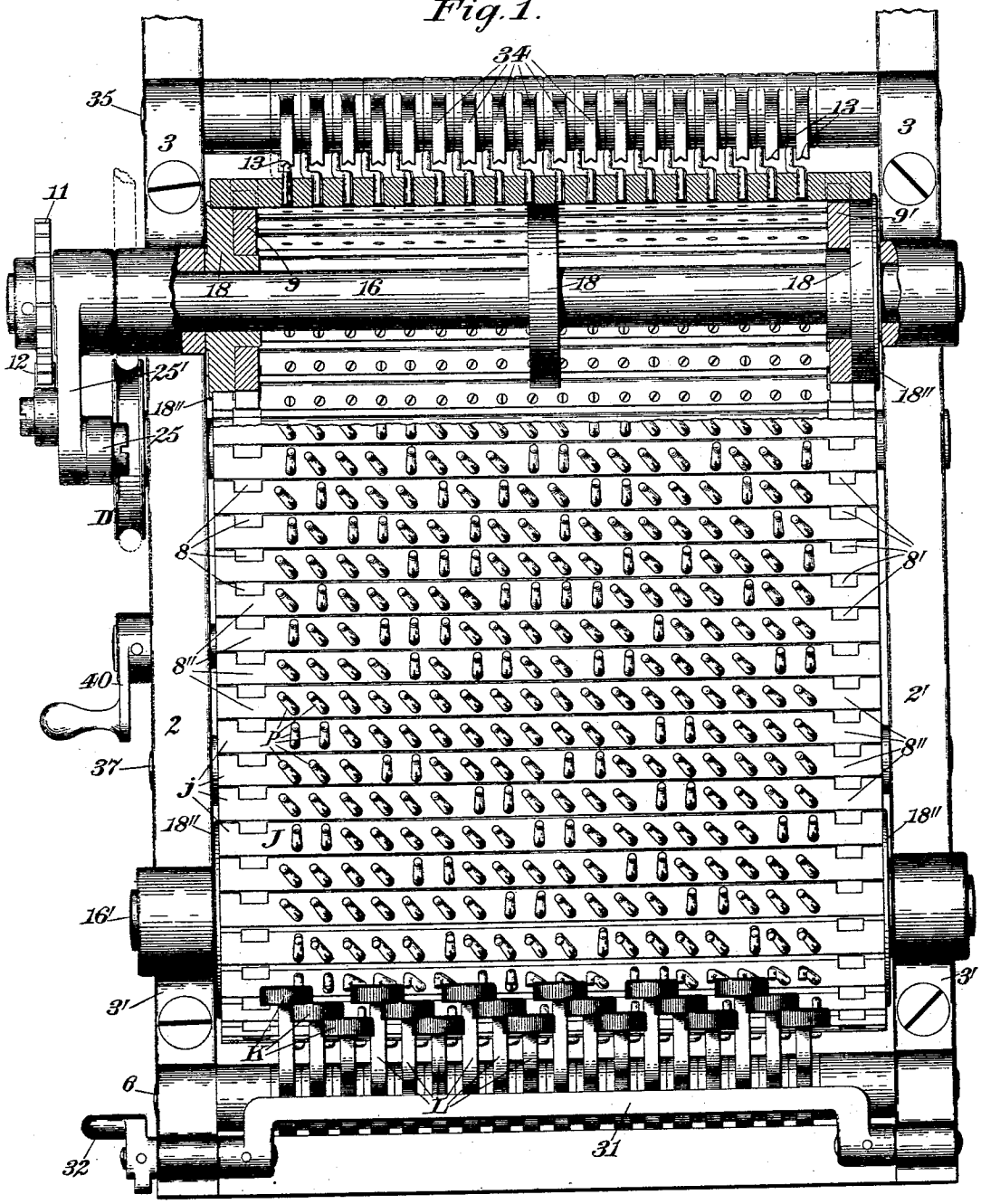
(No Model.) 3 Sheets—Sheet 1.

F. H. RICHARDS.

JACQUARD MECHANISM.

No. 573,621. Patented Dec. 22, 1896.

Fig. 1.



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JACQUARD MECHANISM.

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Fig. 2.

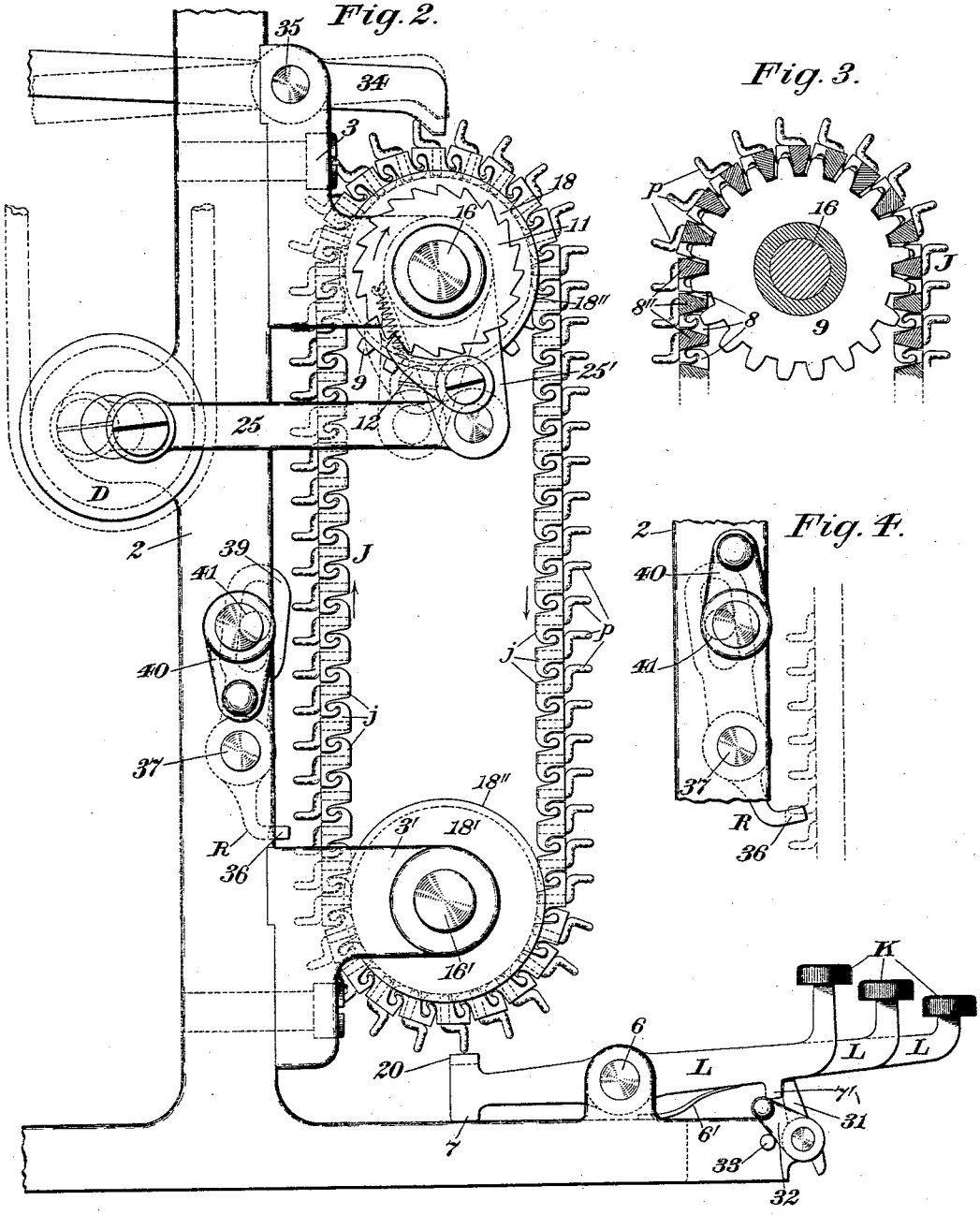

Fig. 3.

Fig. 4.

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Fig. 6.

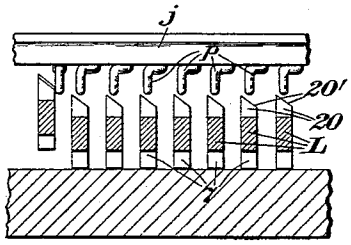
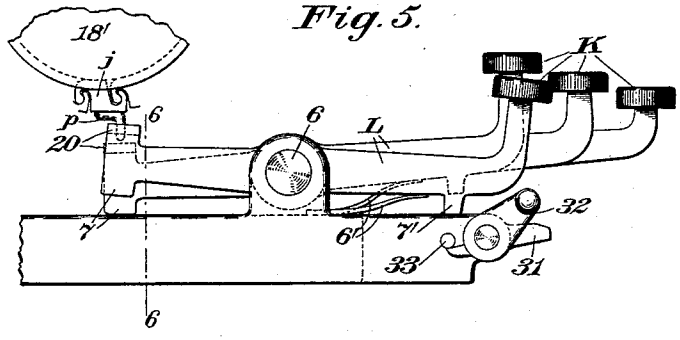


Fig. 5.



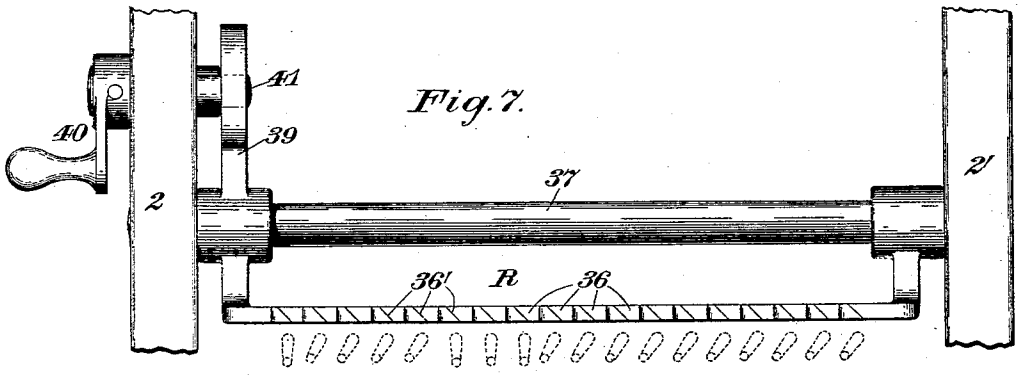


Fig. 7.

Fig. 8

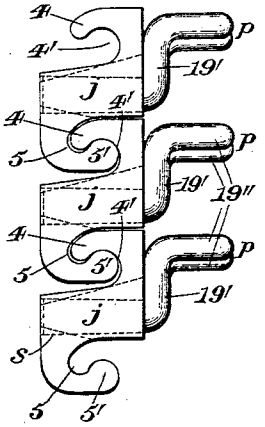


Fig. 9.

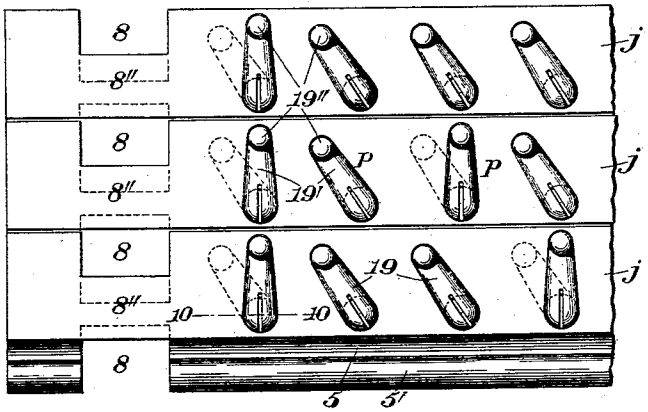


Fig. 10.

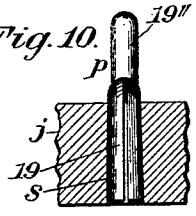
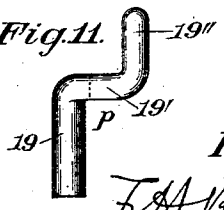


Fig. 11.



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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

JACQUARD MECHANISM.

SPECIFICATION forming part of Letters Patent No. 573,621, dated December 22, 1896.

Application filed June 4, 1896. Serial No. 594,248. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Jacquard Mechanism, of which the following is a specification.

This invention relates to Jacquard mechanism, and especially to such a mechanism adapted for use in connection with key-operated devices, and by means of which indications may be selectively recorded on a jacquard or carrier and the latter operated to actuate a suitable driven apparatus controlled by said recorded indications.

The main object of the invention is to provide a mechanism having a device which may be set in one position to record an indication, and when in that position will serve as an actuator for imparting movement to suitable means controlled thereby, and which when in any other position will neither record an indication nor operate as an actuator for such means. This settable device I term an "indicating-actuator," as it not only indicates that the operation of another device or mechanism may take place, but forms the means for operating such device or mechanism.

Another object of the invention is to provide, in connection with an indicating-actuator such as that just described, suitable setting means whereby such actuator may be readily moved to its working position whenever it is desired to employ the same to record an indication on the jacquard or carrier.

For the purpose of practically utilizing the indicating-actuators just described in a Jacquard mechanism in which a pattern or combination of indications can be set up the jacquard carrying said actuators is preferably in the form of an endless belt having the actuators disposed in parallel rows, each row of which is controlled by a setting-actuator.

An important feature of my present invention is the provision of such a jacquard-belt made up of sections or links, preferably interchangeable, each carrying the same number of indicating-actuators disposed in corresponding positions, so that when any one section or link of the belt is broken or becomes worn it may be removed and a new one, exactly similar to all the others which the belt contains, substituted.

In the drawings accompanying and forming part of this application, Figure 1 is a sectional front elevation of an apparatus embodying my present invention. Fig. 2 is a side elevation of the same, looking from the left in Fig. 1. Fig. 3 is a vertical longitudinal sectional detail illustrating the driving of the jacquard-belt by a sprocket-wheel, hereinafter more particularly described. Fig. 4 is a detail side elevation of the resetting means shown in Fig. 2 and illustrates the resetting device in position for restoring the set indicating-actuators to their normal unset positions. Fig. 5 is a detail side elevation of the keys and key-operated devices, illustrating the operation of setting the indicating-actuators. Fig. 6 is a sectional view of the same, the section being taken in line 6 6, Fig. 5. Fig. 7 is a detail front elevation of the resetting means. Fig. 8 is an enlarged detail side elevation illustrating the construction of the jacquard-links and the jacquard-pins carried thereby. Fig. 9 is a partial front elevation of the same. Fig. 10 is an enlarged detail sectional elevation, the section being taken in line 10 10, Fig. 9, and illustrating the construction of one of the indicating-actuators or jacquard-pins; and Fig. 11 is an enlarged detail side elevation of one of said pins.

Similar characters designate like parts in all the figures of the drawings.

Any suitable framework may be employed for carrying the several operative parts of my improved mechanism. In the present case this framework is represented comprising a pair of side frames, such as 2 and 2′, having brackets 3 3 and 3′ 3′ bolted thereto and formed with bearings in which shafts 16 and 16′ are represented journaled for rotation. It should be understood that the framework illustrated herein is intended to form part of any suitable machine to which my improved Jacquard mechanism is adapted—for instance, a Jacquard loom.

Each of the shafts 16 and 16′ preferably has secured thereto a series of carrier disks or wheels, the carriers of one series being designated by 18 and those of the other by

18', and the jacquard is adapted to be supported on these carriers for traveling movement around the same, the outer carriers of each series of wheels being illustrated as flanged at 18'' to form guides for preventing side movement of the belt. This jacquard-belt is designated in a general way by J and is shown carrying a plurality of settable jacquard-pins or indicating-actuators, each shiftable from an unset position to a set position, and vice versa. In the preferred form thereof herein illustrated this belt is represented comprising a plurality of yieldingly-connected sections, these sections being in the nature of detachable links having suitable connectors for joining the same to form an endless belt. Moreover, these links are advantageously formed so as to be interchangeable, each of the individual links *j* being represented as having a bar and an eye at one side thereof and an eye and a bar at the opposite side thereof complementary to the bar and eye at the first-mentioned side of the link, the bar at one side being shown herein at 4 and its eye at 4', while the eye and the bar at the opposite side thereof are represented at 5 and 5' as complementary, respectively, to the bar and the eye 4 and 4'. (See Fig. 8.) These bars and eyes are so constructed that each link will be connected and disconnected, preferably, by sliding the same longitudinally of its coöperative link or links, so that such links are slidably detachable from the belt. As the links *j* are interchangeable it will be seen that each of them has complementary connectors at its opposite sides, respectively, the construction being such that each eye is slightly larger than the bar which it is designed to receive and affords sufficient clearance to permit the links to turn slightly relatively to one another in passing, for instance, around the carriers 18 and 18'. The links are represented in the drawings as of sufficient length for carrying a series of indicating-actuators or jacquard-pins, it being obvious that the number of pins carried by each link will depend entirely upon the number of devices to be operated by the Jacquard mechanism, if it is assumed that, as in the present case, each pin of a link controls a different actuated device. In the drawings of my present application each link is shown having eighteen such indicating-actuators, regularly spaced, corresponding pins of the several links having corresponding positions transversely of these members. Each of these indicating-actuators or pins is illustrated seated in a suitable socket in its respective link, each socket preferably extending entirely through the link and being substantially cylindrical, but tapered slightly from its inner side toward the outer side thereof, these sockets being represented at *s* formed in the body portion of the link, so as to avoid weakening the same.

The jacquard-belt is shown in the drawings as driven by a pair of sprocket-wheels, such as 9 and 9', secured to the end carriers 18 and rotated with the shaft 16, these sprocket-wheels having teeth adapted to be received in the usual manner by drive-openings, one series of which is represented at 8 as coöperative with the sprocket-wheel 9 and another series at 8' as coöperative with the sprocket-wheel 9'. The drive-openings of each series are regularly spaced and disposed in corresponding positions transversely of the jacquard-links, these openings being shown intersecting the sides of the links, substantially one half of each sprocket-receiving opening of each series being formed in one side of the link, while the complementary half of the next adjacent opening is formed in the opposite side of such link and in alinement with the first-mentioned half, the complementary portions of these drive-openings forming between them a tooth, such as 8'', adapted to be engaged by the teeth of the sprocket-wheels and to be received in the tooth-spaces of such wheels.

It will be apparent by reference to Figs. 1 and 9 that although the links are recessed to form the drive-openings 8 and 8', yet the links are positively connected with one another at both sides of such openings, so that the strain exerted upon the teeth 8'' by the draft of the sprocket-wheels is not borne directly by such teeth, but is transmitted to the connecting eyes and bars at both sides of the sprocket-receiving openings, and is thus distributed throughout the length of the jacquard-belt.

Any indicating-actuator carried by the jacquard and shiftable from an unset to a set position and vice versa, may be employed for recording on such jacquard the desired indications and for imparting movement to the actuated devices controlled thereby; but in the preferred form thereof I make use of an oscillatory indicating-actuator or jacquard-pin *p*, which by a slight oscillation may be shifted into or out of the path of movement of its respective actuated device. Such an indicating-actuator is shown shiftable transversely of the jacquard and having resilient arms adapted to engage the walls of the sockets *s* in the jacquard. All of these pins are interchangeable, and each is represented having an expansible furcated shank, such as 19, seated in its respective socket *s*, the arms formed by the furcation being resilient, so as to hold the pin snugly in place.

The sockets *s* have been hereinbefore described as tapered toward the outside of the links, and in order to insure a firm hold of the expansible shank on the walls of such sockets the shank 19 is preferably tapered also toward the working-portion or crank thereof which extends outside of the link. This crank is illustrated comprising a head, such as 19'', substantially parallel with the shank, and a transverse neck 19', connecting said head and the shank. As these pins *p* are adapted to be oscillated to carry the heads 19'' to the "working" position at right angles to the width of the belt shown in full lines in

Fig. 9, or to the inclined or oblique "idle" position shown in full and dotted lines in said figure, the shanks of the pins are also substantially cylindrical, though, as just stated, slightly tapered toward the cranks, so as to entirely fill the sockets in the links.

The shaft 16 is shown herein carrying at its left-hand end a ratchet-wheel, such as 11, fixed thereon, and a link 25′, loosely mounted between the ratchet-wheel and a stop-shoulder of the bracket 3. This link is illustrated having pivoted thereon a pawl 12, normally held by means of a light spring in engagement with the teeth of the ratchet-wheel 11. The link 25′ is adapted to be oscillated by means of a crank-rod, such as 25, operated by a main driver, which is shown at D as a continuously-rotative driving-wheel. At each rotation of this wheel it will be apparent that the link 25′ will be oscillated and the ratchet-wheel rotated step by step in the direction indicated by the arrow in Fig. 2, thus moving the jacquard-belt in a circuit around its carriers to present the pins of successive links to the action of the setting means.

As I consider it advantageous to effect the recordation of the indications of any desired combination or pattern by setting means controlled from a keyboard, I have illustrated in the drawings a plurality of keys (designated in a general way by K) for operating corresponding key-levers, such as L, these levers being represented mounted on a carrier-rod, such as 6, at the front end of the apparatus, the key-levers being normally held in the position shown in Fig. 2 by means of suitable springs, such as 6′, while stops are illustrated at 7 and 7′ for limiting the movements of said key-levers in the usual manner. Each lever L is represented having at its inner end a setting-actuator, such as 20, separate from the indicating-actuators and normally out of the path thereof, each actuator 20 being represented in Fig. 6, however, as alined with its respective series of the several transversely-separated longitudinal series of indicating-actuators carried by the jacquard.

It is desirable to provide either the indicating-actuators or the setting-actuators with cam-faces adapted to coöperate with the working faces of the other set of actuators for shifting the indicating-actuators from their unset positions to their set positions, and in the present instance the setting-actuators 20 are shown at 20′ having inclined cam-faces so positioned that when any given lever is operated the setting-actuator carried thereby will be operative by such movement into engagement with the head of the jacquard-pin presented to it to turn said pin, as shown at the left in Fig. 6, to its set position.

The operation of the apparatus hereinbefore described will be readily understood. The rotation of the driver D will cause the jacquard to travel continuously in the direction indicated by the arrows in Fig. 2, the advancing movement being effected step by step by the action of the pawl and the ratchet controlled thereby. If it is desired to set up a combination on the jacquard, the keys K are selectively struck, either singly or several at a time, so as to cause the proper actuators 20 to set the desired number of pins on each link of the jacquard. After all of the pins of the combination have been set the key-levers may be locked against movement by means of a rock-bar, such as 31, carried at the forward part of the base of the apparatus for oscillation into and out of engagement with the under sides of the key-levers. The operation of the locking device is shown controlled by a crank 32, which, when the device is in its working position, is stopped against a suitable abutment, such as the stop-pin 33.

After the pins have been set they will be carried upward by the jacquard toward the top of the framework into operative relation with the means which they are designed to operate. The actuated devices which are shown in the drawings are represented as a plurality of levers—such, for example, as the heddle-levers of a loom—and these levers are illustrated at 34 mounted for oscillation on a carrier-rod 35, supported by the brackets 3 3 at the upper ends of the side frames 2 and 2′, the forward or working ends of these levers being respectively in the paths of the respective pins of each jacquard-link when such pins are in their working or set positions. Moreover, for the purpose of insuring the positive operation of the levers by the pins the actuated devices are preferably formed with channels, such as 13, in their working faces, the walls of these channels serving as guides for preventing disengagement of the pins therefrom until the set pins for actuating the levers to the position shown in dotted lines in Fig. 2 have passed beyond the forward ends of said levers.

It will be apparent that by continuing the travel of the jacquard-belt the combination set up thereon may be used over and over again as long as may be desired; but as new combinations will be required from time to time some means should be employed for resetting the indicating-actuators in their normal positions when the combination recorded thereby is to be changed. I have shown at R means suitable for restoring the set indicating-actuators to their unset positions after the same have operated the desired number of times. This resetting means is preferably shiftable from an idle position to a working position, and vice versa, it being represented herein as a rocking or oscillatory bar or comb having a plurality of resetting members, one for each longitudinal series of indicating-actuators, such members being illustrated at 36 having cam-faces 36′ disposed, when in their working positions, in the respective paths of the set indicating-actuators, so that when the head of a pin comes in contact with a cam-face the pin will be oscillated (see Fig. 4) to its normal oblique posi-

tion relatively to the path of movement of the jacquard-belt. The idle position of the resetting means is shown in Fig. 2, while in Fig. 4 it is represented oscillated into position for restoring the set pins to their normal positions.

As a means for shifting the resetting-comb from its idle position to its working position, and vice versa, said comb is illustrated carried for oscillation by a rod 37, supported by the side frames 2 and 2′ and having a slotted crank-arm 39. For the purpose of actuating the comb between its two positions a crank is represented at 40 carried for rotation by the upright 2 and operating a crank-pin 41, adapted to be received by the slot in the crank-arm 39 in such a manner that when the crank 40 is rotated the comb may be carried to either of the positions shown in Figs. 2 and 4, and thus held either in position to unset the pins or out of the path of the same.

By the employment of mechanism constructed in substantially the manner hereinbefore described a great variety of combinations may be recorded on the traveling jacquard-belt and each combination used for a long period, or else new combinations may be set up continuously on the same relatively short jacquard-belt by unsetting successively the combinations recorded thereon. Hence it will be obvious that a jacquard having settable indicating-actuators has a very wide range of usefulness as compared with the corresponding devices heretofore known in the art.

It is to be understood that my invention is not limited to any particular form of carrier, whether jacquard or otherwise, and that it is not restricted to any specific use.

Having described my invention, I claim—

1. The combination with a carrier-belt, of an oscillatory indicating-actuator mounted on said belt and shiftable from an unset to a set position, and vice versa; and means for mechanically shifting said actuator.

2. The combination with a carrier-belt having sockets therein, of a series of oscillatory indicating-actuators mounted in said sockets and shiftable from an unset to a set position, and vice versa; and means for mechanically shifting said actuators.

3. The combination with a carrier-belt having sockets therein, of indicating-actuators mounted in said sockets and shiftable from an unset to a set position, and vice versa, each of said actuators having an expansible furcated shank; and means for mechanically shifting the actuators.

4. The combination with a carrier-belt composed of detachable links, each link having a series of tapered sockets therein; of a series of oscillatory indicating-actuators, each having a tapered expansible furcated shank seated in its socket and adapted to turn therein; and means for mechanically shifting the actuators from an unset to a set position, and vice versa.

5. The combination with a carrier having a socket therein, of an indicating-actuator shiftable from an unset position to a set position, and vice versa, and having a shank seated in said socket and also having a crank connected to said shank.

6. The combination with a carrier having a tapered socket therein, of an indicating-actuator adapted to be oscillated from an unset position to a set position, and vice versa, and having a tapered shank seated in said socket and also having a crank connected to said shank.

7. The combination with a carrier, of an indicating-actuator mounted on said carrier and normally unset, and shiftable from an unset position to a set position, and vice versa; and means operative for shifting said indicating-actuator from its unset position to its set position.

8. The combination with a carrier, of an indicating-actuator mounted on said carrier and normally unset, and shiftable from an unset position to a set position, and vice versa; and means separate from the indicating-actuator and operative into engagement with said actuator for shifting the same from its unset position to its set position.

9. The combination with a carrier, of an indicating-actuator mounted on said carrier and normally unset, and shiftable from an unset position to a set position, and vice versa; and an actuator separate from the indicating-actuator and operative toward the carrier into engagement with said indicating-actuator for shifting the same from its unset position to its set position.

10. The combination with a carrier, of an indicating-actuator mounted on said carrier and normally unset, and shiftable from an unset position to a set position, and vice versa; and a key-operated setting-actuator separate from the indicating-actuator and operative into engagement with said indicating-actuator for shifting the same from its unset position to its set position.

11. The combination with a carrier, of an indicating-actuator mounted on said carrier and normally unset, and shiftable from an unset position to a set position, and vice versa; and a setting-actuator separate from the indicating-actuator and operative into engagement therewith, one of said actuators having a cam-face coöperative with the other actuator for shifting the indicating-actuator from its unset position to its set position.

12. The combination with a carrier, of an indicating-actuator mounted on said carrier and normally unset, and adapted to be oscillated from an unset position to a set position, and vice versa; and a setting-actuator separate from the indicating-actuator and having a cam-face operative into engagement with said indicating-actuator for oscillating the same from its set position to its unset position.

13. A link having a series of tapered sockets and provided with a series of oscillatory

indicating-actuators having tapered expansible shanks mounted in said sockets and shiftable from an unset to a set position, and vice versa.

14. An indicating-actuator embodying a shank; a head parallel with said shank; and a transverse neck connecting said head and shank.

15. The combination with a carrier, of a plurality of oscillatory indicating-actuators mounted on said carrier and normally unset; means for actuating the carrier; actuated means operative by the set indicating-actuators and in inoperative relation with the unset indicating-actuators; and resetting means for oscillating the set indicating-actuators to their normal positions.

16. The combination with a carrier, of a plurality of transversely-separated longitudinal series of indicating-actuators mounted on said carrier and normally unset; means for actuating the carrier; and a plurality of resetting members, one for each series of indicating-actuators, and each having a resetting cam-face for restoring the set actuators of its respective series of indicating-actuators to their normal positions after operation.

17. The combination with a carrier, of a plurality of transversely-separated longitudinal series of oscillatory indicating-actuators mounted on said carrier and normally unset; means for actuating the carrier; and a plurality of resetting members, one for each series of indicating-actuators, and each having a resetting cam-face for oscillating the set actuators of its respective series of indicating-actuators to their normal positions after operation.

18. The combination with a carrier, of a plurality of indicating-actuators mounted on said carrier and normally unset; means for actuating the carrier; actuated means operative by the set indicating-actuators and in inoperative relation with the unset indicating-actuators; and shiftable resetting means for restoring the set indicating-actuators to their normal positions and movable from an idle position to a working position, and vice versa.

19. The combination with a carrier, of a plurality of indicating-actuators mounted on said carrier and normally unset; means for actuating the carrier; actuated means operative by the set indicating-actuators and in inoperative relation with the unset indicating-actuators; and resetting means for restoring the set indicating-actuators to their normal positions and adapted to be oscillated from an idle position to a working position, and vice versa.

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