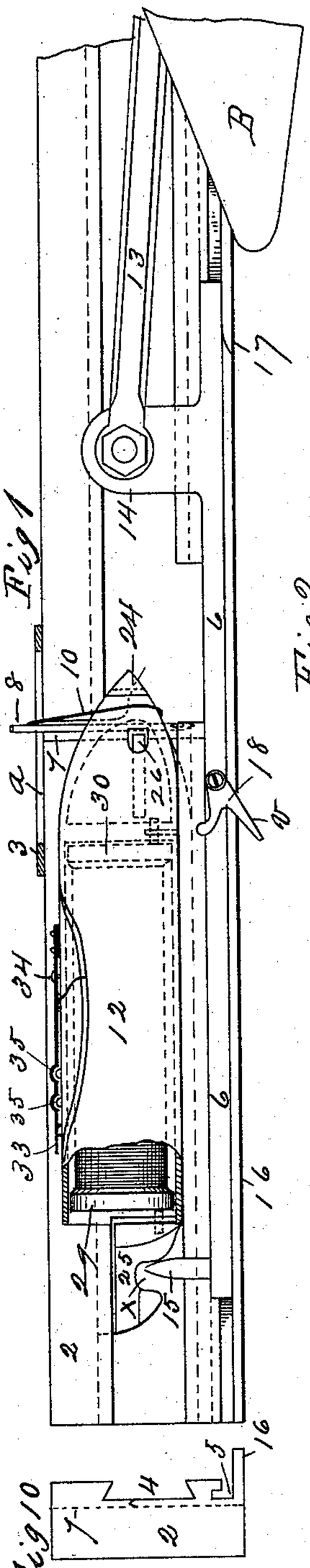
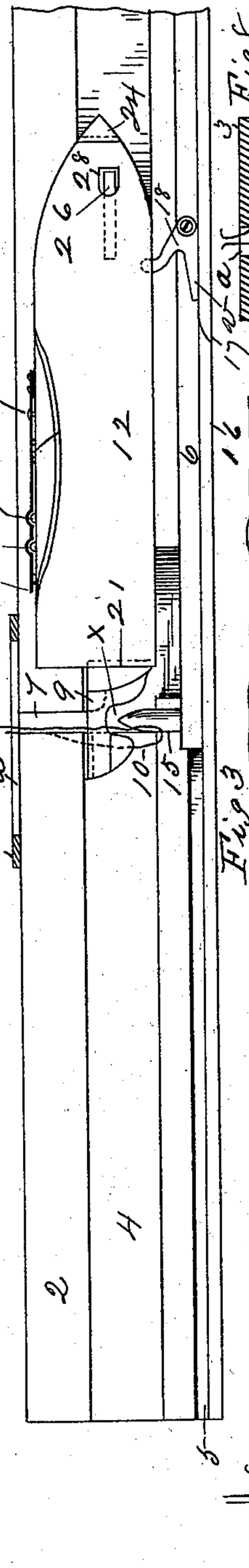
(No Model.)

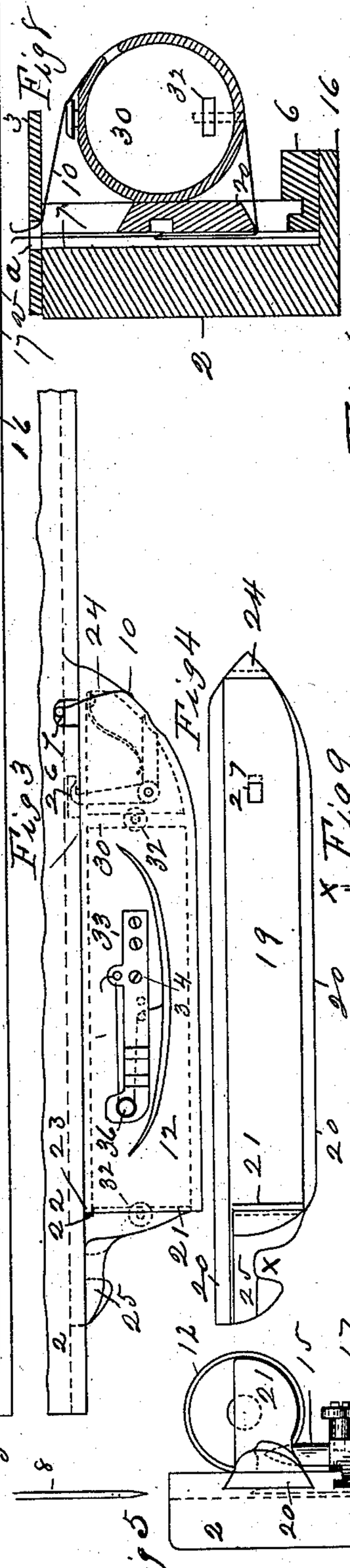
W. E. BENNETT.

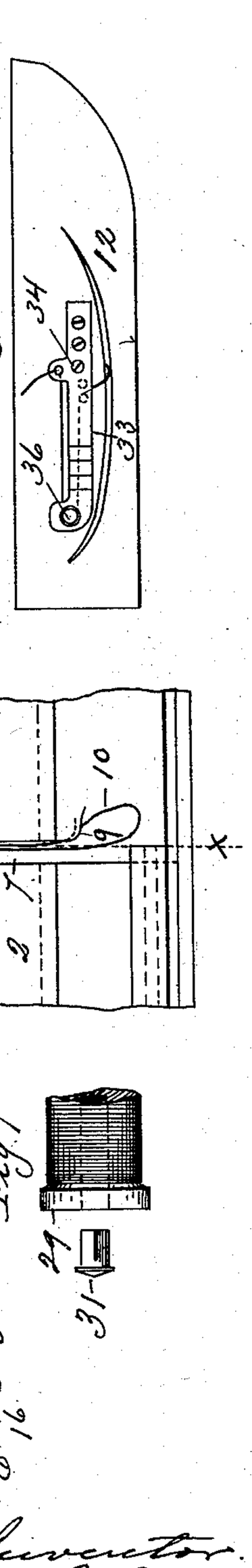
SHUTTLE AND SHUTTLE OPERATING MECHANISM FOR SEWING MACHINES.

No. 384,230. Patented June 12, 1888.









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UNITED STATES PATENT OFFICE.

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SHUTTLE AND SHUTTLE-OPERATING MECHANISM FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 384,230, dated June 12, 1888.

Application filed January 10, 1887. Serial No. 223,867. (No model.)

To all whom it may concern:

Be it known that I, WALTER E. BENNETT, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Shuttle-Operating Devices and Shuttles for Sewing-Machines, of which the following is a specification.

This invention relates to sewing-machines, and pertains particularly to improvements in shuttle-operating devices for said machines; and the invention consists in the peculiar construction and arrangement of the shuttle-carrying mechanism and certain details of construction connected with the shuttle and bobbin, all as hereinafter fully described, and pointed out in the claims.

In the drawings forming part of this specification, Figure 1 is a side elevation of the shuttle-raceway of a sewing-machine, showing the shuttle-carrier and shuttle (the side of the latter being partly broken away) and a portion of the needle and cloth-plate embodying my improvements, said figure showing the shuttle just entering the thread-loop. Fig. 2 is also a side elevation of said shuttle-raceway, showing the shuttle and its operating parts and the position of the shuttle and said parts after it has passed through the loop. Fig. 3 is a plan view of a portion of the shuttle-raceway and of the shuttle and shuttle-carriage, showing means for attaching the shuttle to the carriage. Fig. 4 is a side elevation of the shuttle-carriage. Fig. 5 is an end elevation of the shuttle-raceway, the shuttle, and shuttle-carriage, showing a portion of a cam-finger on the shuttle-carrying bar and a part of a needle. Fig. 6 is a plan view of the shuttle. Fig. 7 is a side elevation of one end of the shuttle-bobbin and its end-thrust plug. Fig. 8 is a transverse section of the shuttle-raceway on line *x x*, Fig. 9, and of the shuttle and shuttle-carrier. Fig. 9 is a side elevation of that portion of the shuttle-raceway in which the vertical needle-slot is formed. Fig. 10 is an end elevation of the shuttle-raceway.

In the drawings, 2 is the shuttle-raceway of the sewing-machine, the latter being of the class which are constructed with a needle-arm extending horizontally over the shuttle-raceway of the machine, whereby ample room is afforded, both vertically and horizontally, between the shuttle-raceway and the needle-arm for inserting material upon which the machine is to operate. A cloth-plate, 3, is attached to the upper side of the shuttle-raceway, and said plate, having a suitable longitudinal needle-slot, *a*, therein, is shown in section in Figs. 1, 2, and 8. The shuttle-raceway is provided with a longitudinal groove, 4, in its side, of dovetail form, as shown, and with a groove, 5, (see Fig. 10,) in which the shuttle-carrying slide-bar 6 moves. A vertical needle-groove, 7, is formed in the side of the shuttle-raceway deeper than the base of the said slot 4 therein, as shown in Fig. 3, and as indicated by a dotted line in Fig. 10, the needle 8 having a vertical movement, by the usual means, in said groove between the shuttle and the side of the shuttle-raceway. The said needle-groove 7 in the shuttle-raceway 2 has a thread-hook, 9, formed on one side thereof, as clearly shown in Fig. 9, with which one thread of the loop 10 engages, to retain the latter in position when the shuttle 12 enters it, as in Figs. 1 and 3, and passes through it. Said hook 9 is formed by cutting away a part of one side of the groove 7 and slightly undercutting the curved edge of the hook, as shown in dotted line in Fig. 9, so that the thread can enter.

The shuttle-raceway 2 is shown in Fig. 1 in connection with an adjoining part, B, of the frame of the machine, and in said figure a portion of the connecting-rod 13 is shown pivoted to an arm, 14, on the slide-bar 6, on which is a vertical pin, 15, which engages in a notch, *x*, in the shuttle-carriage. Said connecting-rod is suitably attached to a moving part of the machine, whereby it and the slide-bar 6 are given a longitudinal reciprocating motion.

The lower laterally-projecting edge, 16, of the shuttle-raceway 2 is partly cut away to leave a projecting part, 17, thereon, with which the lower arm, *v*, of a species of bell-crank lever, 18, engages when it is carried against said projection 17 by the slide-bar 6, on which it is pivoted, as shown in Fig. 1. The latter figure shows the position of the arms of said lever 18 when approaching the projection 17, and Fig. 2 shows the changed

position thereof after the said arm *v* has ridden over said projection.

The shuttle-carriage 19 is illustrated in side elevation in Fig. 4 detached from the shuttle-raceway, and, as shown in Figs. 5 and 8, it has on its rear side a dovetail rib, 20, which enters the groove 4 in the shuttle-raceway of the machine, so that said carriage slides in and is guided and supported by said groove during its reciprocating movements, which it derives from the aforesaid connection with the slide-bar 6.

At the rear end of the shuttle-carriage 19 is an extension, 25, in which said notch *x* is formed, and adjoining said extension is a laterally-projecting abutment-plate, 21, against which the rear end of the shuttle rests, as clearly shown in Fig. 5. At the junction of the plate 21 with the rib 20 of the shuttle-carriage a notch, 22, is formed, in which a short projection on the rear end of the shuttle engages, as shown in Fig. 3, whereby that end is held in engagement with the carriage. The forward end of the shuttle-carriage is provided with a socket, 24, in which the nose of the shuttle enters to the extent indicated by a dotted line in Fig. 1, whereby that end of the shuttle is held to the carriage. The length of the carriage between the base of the socket 24 and the inner side of the abutment-plate 21 is slightly in excess of the length of the shuttle itself, whereby the shuttle can be placed in the carrier in the position indicated in Fig. 1. In addition, however, to the above-described means for holding the shuttle in engagement with the carriage 19, the shuttle is provided with a pivoted bell-crank lever, 26, (see Fig. 3,) having a hook on the extremity of one arm thereof, which enters a socket, 27, in the carriage 19 and engages with one edge of said socket, as shown in said figure. A spring (shown in dotted lines in Fig. 3) has one end bearing on one of the arms of said bell-crank lever, whereby the said hook is held in engagement with the carriage. The said bell-crank-lever hook is pivoted within the forward end of the shuttle, and that of its arms on which said spring bears extends opposite an opening, 28, through the side of the shuttle. (See Fig. 2.) When the shuttle is placed in the carriage 19, the hook 26 automatically engages with the latter. A pointed instrument passed through the opening 28 in the side of the shuttle and pressed against the said arm of the lever 26 causes the lever to swing on its pivot, thereby disengaging the said hook on the other arm from the carriage and freeing the shuttle, so that it can be taken out of the latter.

The rear end of the shuttle—the latter being of cylindrical form from just back of its point rearward—is left open to provide for the introduction into it of the thread-bobbin 29, and a partition, 30, (indicated by dotted lines in Figs. 1 and 3,) extends transversely across the shuttle, thereby forming one end of the bobbin-chamber therein, the aforesaid abutment-plate 21 on the shuttle-carriage constituting the rear end of said chamber, and said partition and abutment are the points against which the ends of the thread-bobbin are thrown during the rapid longitudinal movements of the shuttle. The thread-bobbin is adapted to rotate freely within the shuttle by the action of drawing the thread therefrom during the sewing operation, the cylindrical borders of the bobbin resting on the inner side of the shuttle. To provide means for preventing any undue friction between the ends of the bobbin and said partition or abutment, a hollow metallic end-thrust plug, 31, having a conical end and a slitted body, whereby said plug is held in the bobbin by spring action, is provided for the end of the latter, and its point only comes in contact with said partition or abutment-plate, thereby preventing friction between them and the ends of the bobbin. A further means for obviating the friction between the ends of the bobbin and said partition and abutment-plate consists in pivoting in said abutment-plate and partition a friction-roller, 32, as shown in dotted lines in Figs. 1 and 3 and in full lines in Fig. 8, against the edges of which the ends of the bobbin are thrown by the above-described movements of the shuttle.

The thread-tension devices of the shuttle do not constitute any part of the improvements which are the subject-matter of this application; but they form the subject of another application, which is filed with this one, dated January 10, 1887, Serial No. 223,866. Said tension devices consist of a flat tension-blade, 33, secured by a screw or screws passing through one end to the side of the shuttle, a third screw, 34, passing through the said blade a little removed from the first-named screws, which serves the purpose of adjusting the position of the free end of the tension-blade relative to two transverse bars, 35, which are fixed on the shuttle under the blade, near its free end, and a pin, 36, (see Fig. 3,) is fixed on the shuttle, whose end projects loosely through said blade near its end.

The blade 33 is made of suitable spring metal and has one or two (two being shown) transverse parallel corrugations, which coincide in position with said transverse bars 35, and the upper sides of the latter enter more or less into said corrugations when said blade springs against them. The said tension-blade is fixed on the shuttle over two thread-guiding pins, whose position is shown in dotted lines in Figs. 3 and 6. Fig. 3 illustrates the manner of leading the thread out of the shuttle through the thread-slot, thence between said two guide-pins under the tension-blade, thence between the corrugations 35 in the blade and the edges of said bars under said corrugations, and then around the pin 36, near the end of the blade, and thence rearwardly through a hole in a laterally-projecting arm on the blade, and thence the thread is led off from the shuttle. The thread-tension is produced by the spring-pressure of the free end of the blade 33 on the thread while the latter lies across the said bars 35, and

is clamped between the projecting parts of the latter and the corrugations in the blade. The normal spring-pressure which is exerted by the corrugated end of the blade upon the thread is regulated by the screw 34, and the corrugated end of the blade is thereby forced to such a position against said transverse bars while the thread is between the latter and the blade as gives the said corrugations such a depth of engagement over the thread as produces the proper resistance to the movement of the latter, or, in other words, as produces the required tension. The tension so regulated is adjusted to a certain normal resistance which the rotation of a thread-bobbin within the shuttle offers to a free delivery of the thread therefrom; but should the said resistance of the thread-bobbin from any cause be increased, the tendency of such added resistance is to cause the thread lying between said corrugations and bars to draw more nearly in a straight line, and therefore the friction upon the thread under the corrugations is lessened more or less. The said action of the thread to draw in a straighter line under the tension-blade by causing the latter to lift a little away from the bars under it tends to so reduce the frictional tension on the thread at that point as to compensate for the aforesaid increased resistance which may from some reason be given to the properly free rotation of the thread-bobbin.

The above-described construction of the shuttle, the shuttle-carriage, and the means for engaging the latter with the slide bar 6, together with the arrangement of bell-crank lever 18 and its mode of operation, provides a simple and effective means for carrying the shuttle and its carriage through the thread-loop 10, and said parts operate as follows, in connection with the above-described loop-hook 9 on the shuttle-raceway 2 of the machine: The needle 8 is what is termed an "open-eyed" needle—that is to say, its eye has an opening through one side of it—and having carried the thread downward to the position shown in Fig. 1, the pointed end of the shuttle and of the shuttle-carriage 19 enter the thread-loop 10, drawing the latter out of the needle-eye and carrying one thread of the loop which is behind the shuttle and in the needle-groove 7 in the shuttle-raceway against the thread-hook 9, whereby one thread of the loop is retained while the shuttle passes through the loop. When the shuttle has reached such a point in its movement through the loop as brings the latter near the rear end of the shuttle, the arm *v* of the bell-crank lever 18 strikes the projection 17 on the edge of the shuttle-raceway, causing said bell-crank lever to have a quick swinging movement, whereby its upper arm is carried quickly against the under side of the shuttle-carriage, thereby shooting it quickly ahead to such extent as is permitted by the distance between the side of the pin 15 and the notch *x* in the shuttle-carriage when the shuttle occupies the position shown in Fig. 1, the position of said pin there shown being that which it occupies when the shuttle is moving through the loop; but to permit the thread-loop to pass unobstructedly over the shuttle as the latter shoots through the loop, without being caught and obstructed by the said pin 15, the said quick movement of the bell-crank lever 18 is provided, whereby at the proper time in the movement of the shuttle, or just as its rear end is passing the needle groove 7, the shuttle is thrown forward, so that the pin 15 occupies the position relative to the notch *x* in the shuttle-carriage which is shown in Fig. 2, whereby a clear passage is formed for an instant between said pin and the adjoining sides of the shuttle-carriage, which permits the latter to shoot through the loop without engaging the latter, the position of the loop after the movement of the shuttle and carriage through it being shown in Fig. 2. After the shuttle has passed through said loop, carrying its thread therethrough, the loop is drawn upward through the cloth-plate and, by the returning action of the slide-bar 6, the shuttle is returned to its starting-point, and the said operations are repeated.

The above-described shuttle-operating mechanism provides a positive engagement of the latter with the shuttle-carriage, whereby the latter and the shuttle are given a movement through the thread-loop; but having combined with the main shuttle-moving devices auxiliary means for instantaneously increasing the shuttle-movement to separate the contact of the shuttle-carriage and its actuating mechism sufficiently to let the thread-loop slide between them, it is immaterial whether the said bell-crank lever, which acts directly to increase the shuttle-movement, engages with the shuttle or with the carriage.

What I claim as my invention is—

1. Shuttle-actuating mechanism for sewing-machines, consisting of a longitudinally-reciprocating bar, 6, having on it a pin engaging with the shuttle-carriage, and having a bell-crank lever pivoted thereon, one of whose arms is capable of swinging against said carriage, a shuttle-carriage having a notch therein in which the end of said pin engages loosely, combined with the shuttle-raceway of a sewing-machine in which said carriage and bar move, having a projection upon one of its walls, against which the second arm of said bell-crank lever is carried by the movement of said bar while the carriage and shuttle are passing through the thread-loop, substantially as set forth.

2. The shuttle 12, having the spring-actuated bell-crank lever 26 pivoted therein, having a hook on one arm thereof, combined with the shuttle-carriage 19, having a socket, 24, to receive the nose of the shuttle, a socket, 27, to receive said hook, and provided with the abutment-plate 21, substantially as set forth.

3. Shuttle-operating mechanism for sewing-

machines, combined with the shuttle-race thereof, consisting of a shuttle-carrying slide-bar having a longitudinal reciprocating motion on a line with said race, a shuttle-carriage seated within said race and having an engagement with said slide-bar, and a bell-crank lever, substantially as described, attached to said bar and having an engagement with a projection upon the wall of the shuttle-race and with the shuttle-carriage while the latter is moving, substantially as set forth.

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