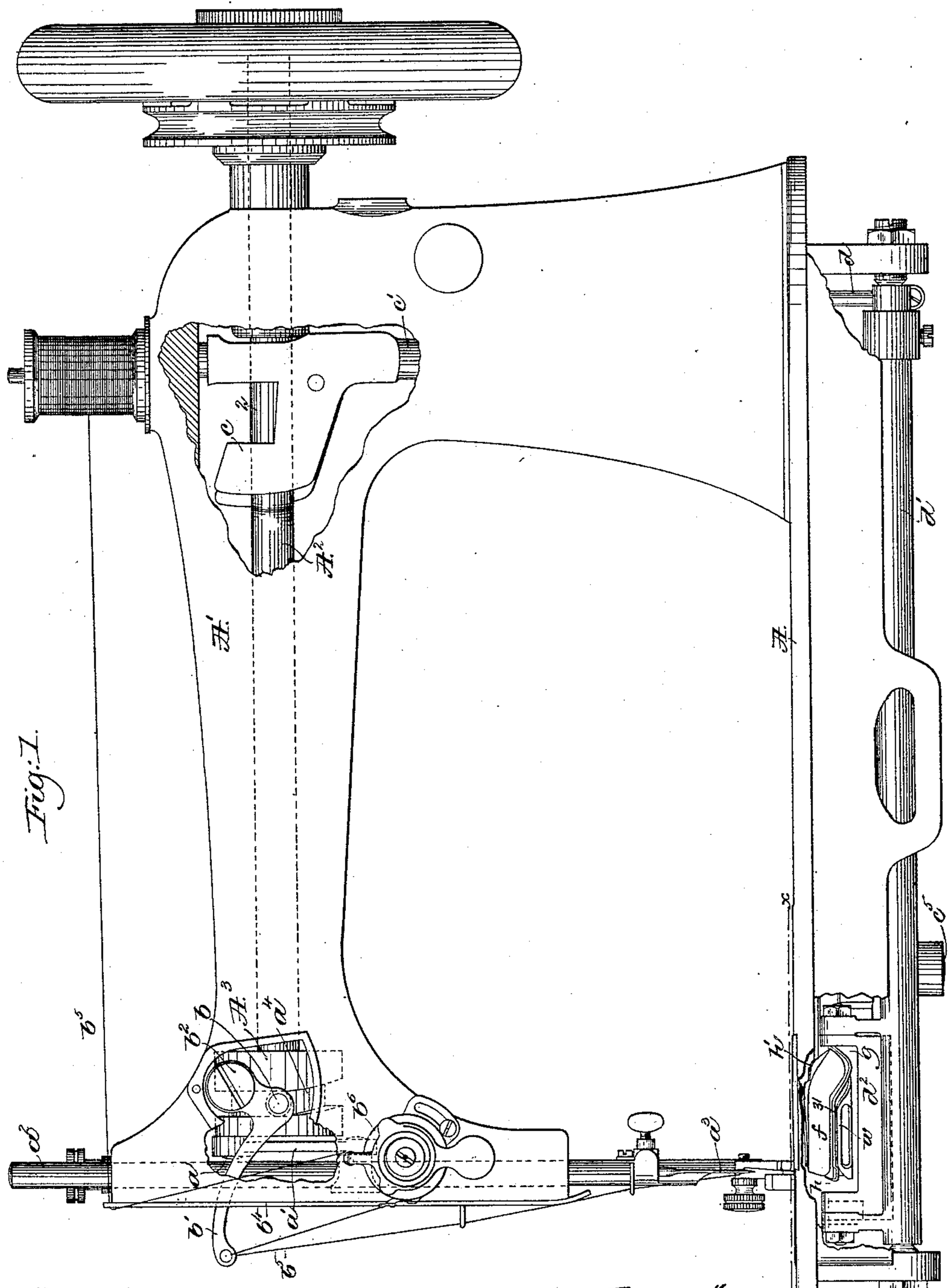
(No Model.) 3 Sheets—Sheet 1.

P. DIEHL.

SHUTTLE AND SHUTTLE CARRIER FOR SEWING MACHINES.

No. 437,023. Patented Sept. 23, 1890.



Witnesses.
Frank L. Emery.
Edgar A. Goddin,

Inventor.
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by Crosby & Gregory
Attys.

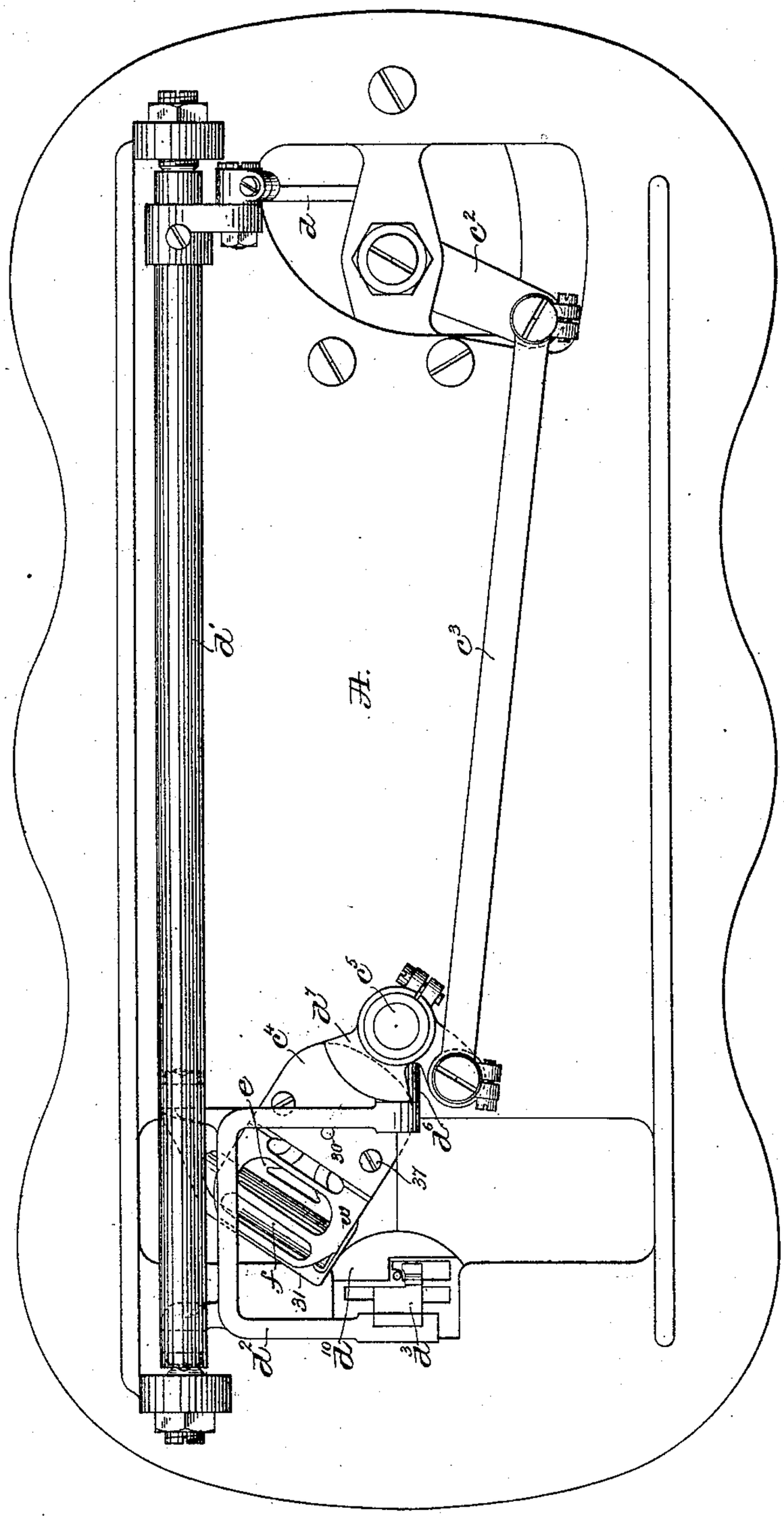
(No Model.) 3 Sheets—Sheet 2.

P. DIEHL.

SHUTTLE AND SHUTTLE CARRIER FOR SEWING MACHINES.

No. 437,023. Patented Sept. 23, 1890.

Fig. 2.



Witnesses.
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(No Model.) 3 Sheets—Sheet 3.

P. DIEHL.

SHUTTLE AND SHUTTLE CARRIER FOR SEWING MACHINES.

No. 437,023. Patented Sept. 23, 1890.

Fig. 13.

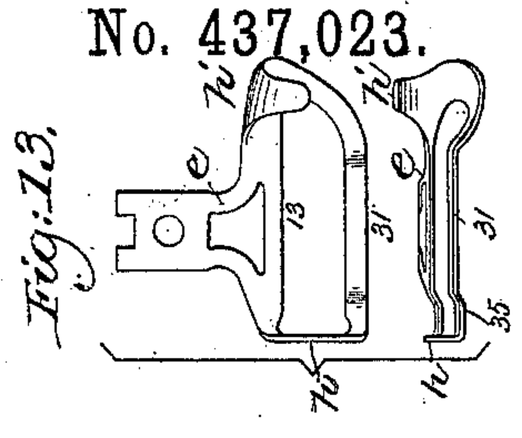

Fig. 9.

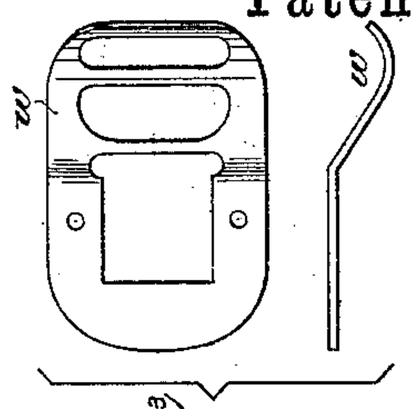

Fig. 12.

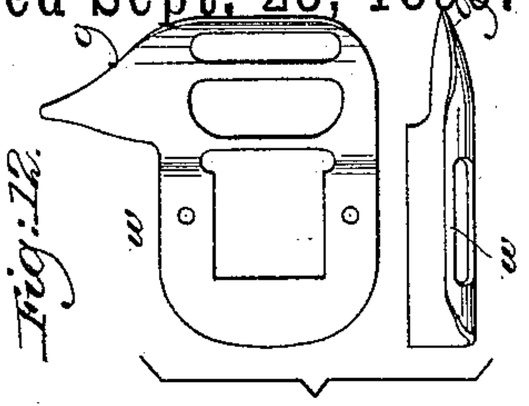

Fig. 5.

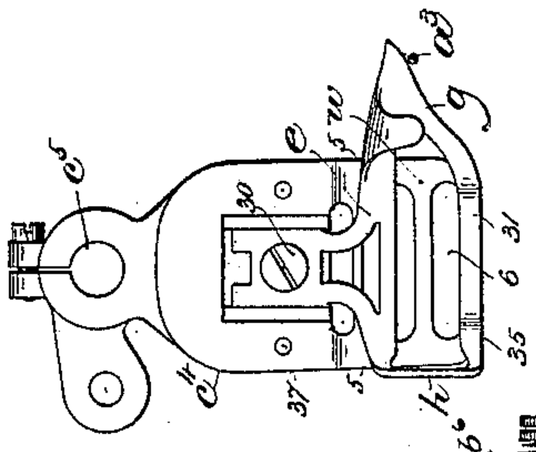

Fig. 6.

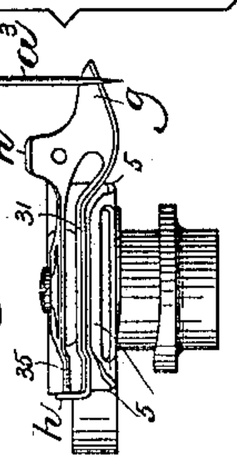

Fig. 7.

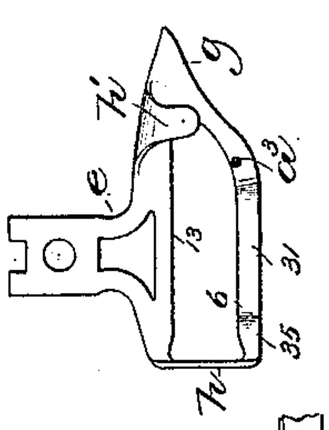

Fig. 8.

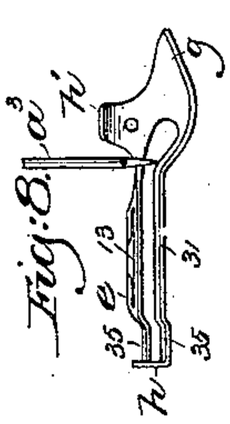

Fig. 3.

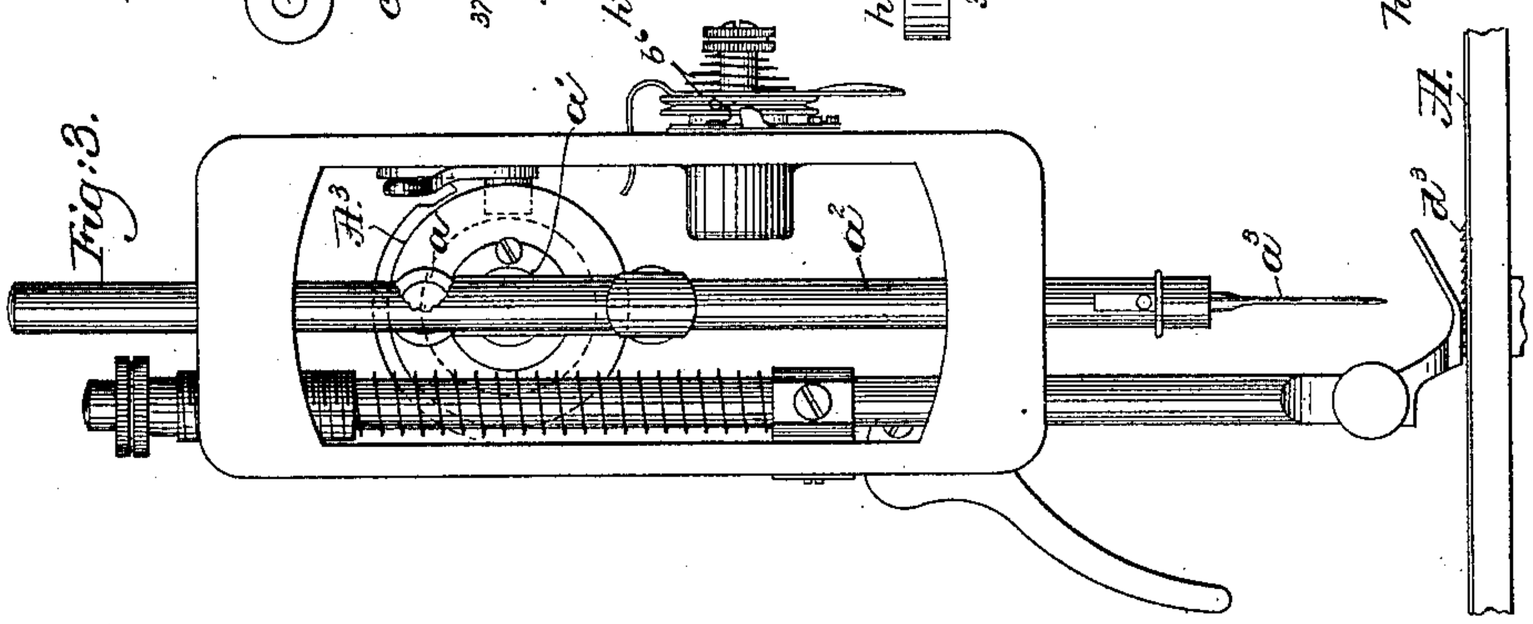

Fig. 4.

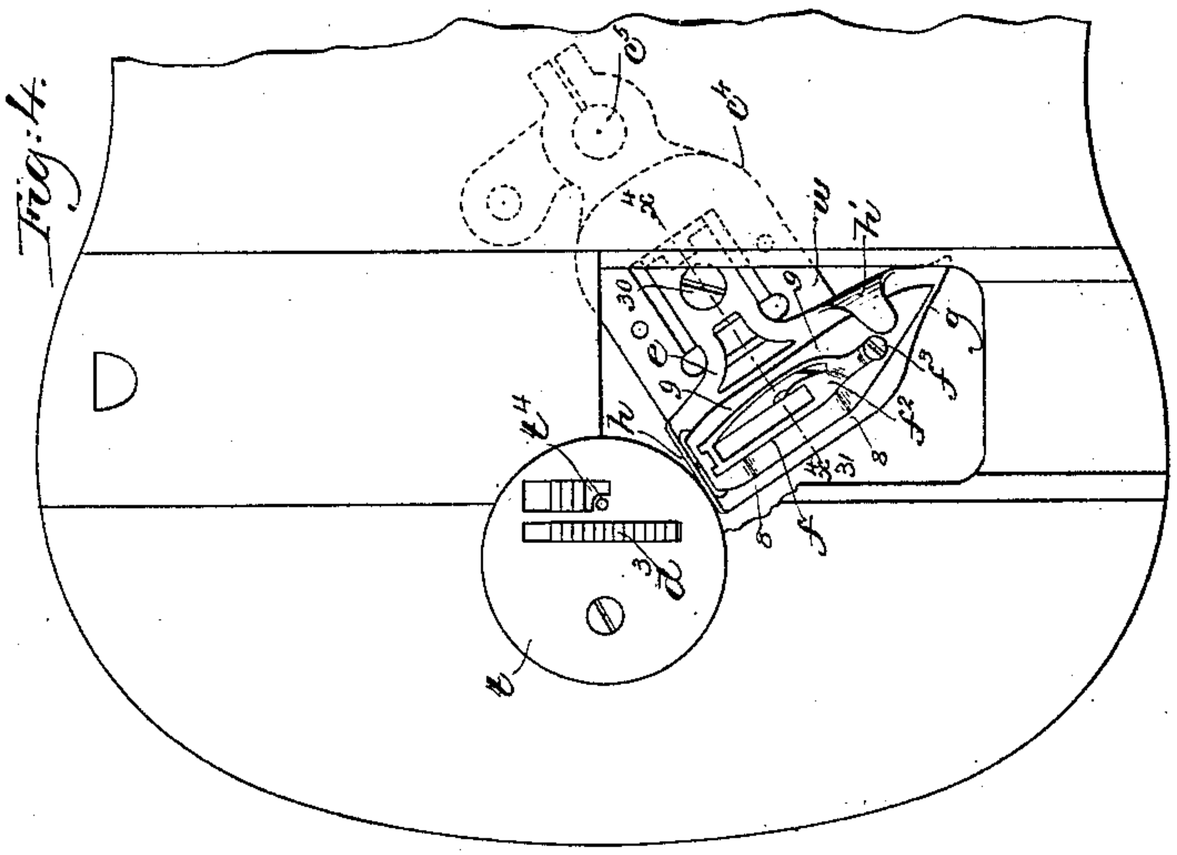

Fig. 11.

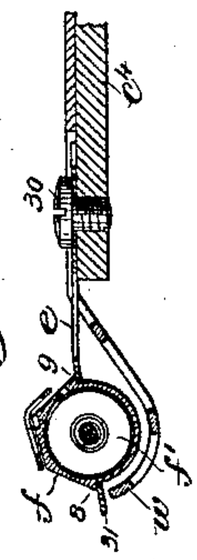

Fig. 10.

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UNITED STATES PATENT OFFICE.

PHILIP DIEHL, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO THE SINGER MANUFACTURING COMPANY OF NEW JERSEY.

SHUTTLE AND SHUTTLE-CARRIER FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 437,023, dated September 23, 1890.

Application filed July 15, 1889. Serial No. 317,503. (No model.)

To all whom it may concern:

Be it known that I, PHILIP DIEHL, of Elizabeth, county of Union, State of New Jersey, have invented an Improvement in Sewing-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

In the present state of the art to which my invention relates that type of sewing-machine which employs a horizontally-vibrating shuttle-carrier provided with a substantially cylindrical open-ended shuttle is the most popular form of sewing-machine now in use, and a large majority of operators are more familiar with this form of machine than any other. Machines of this class when properly constructed are light-running and comparatively noiseless; the shuttles are conveniently accessible, so that they can be readily removed from the carriers when the shuttle-slides are drawn out; the tension of the shuttle-thread is easy of adjustment, and to regulate this tension it is not necessary to remove the shuttle from its carrier; the shuttles are of the class known as "self-threading," and most operators are familiar with winding the long or cylindrical bobbins used with these shuttles, and it is for these reasons that this type of machine has become so deservedly popular and so familiar to a large majority of operators. But notwithstanding the good points in this type of machine it has as heretofore constructed been open to certain objections, resulting chiefly from the manner in which the shuttle is operated—to wit: by a carrier, which supports it in moving contact with a curved shuttle-race. This contact of the shuttle with the race-face causes considerable friction and results in great wear on the shuttle, and when oil is used to reduce this friction and wear the needle-thread is of course more or less soiled.

My invention has for its object to obviate the objection referred to, and this object I accomplish by providing a horizontally-vibrating shuttle-carrier of such construction that a shuttle-race is no longer necessary, the shuttle being entirely supported and operated by the carrier alone. To this end my improved horizontally-vibrating carrier is preferably formed as an open-work cradle, and has front and rear bars, between which the cylindrical shuttle is held, the front bar of the carrier supplying the place, as a front support for the shuttle, of the race heretofore employed, said front bar being so constructed and the movements of the needle being so timed relative to the movements of the carrier that no interference between the carrier and needle to cause breakage of the latter will arise, all as will hereinafter be more fully described.

In the accompanying drawings, Figure 1 is a side elevation, partially broken out, of a sewing-machine embodying my invention, the needle-bar being fully elevated as when the stitch is being set. Fig. 2 is an under side view thereof. Fig. 3 is an end view with the usual face-plate removed from the head of the machine. Fig. 4 is a partial plan view below the line x x in Fig. 1, chiefly to show the shuttle-carrier and the shuttle therein, one cover-plate being removed. Figs. 5 to 8 are details chiefly to show the shuttle-carrier in different positions relative to the needle a^3. Fig. 9 is a plan view and side elevation of the limiting device detached from the vibrating arm. Fig. 10 is an under side view of the shuttle. Fig. 11 is a cross-section of the shuttle lying in the shuttle-carrier, the section being in the line x^4, Fig. 4, the said figure showing part of the shuttle-lever c^4. Fig. 12 shows a modified form of limiting device or stop; Fig. 13, a modified form of shuttle-carrier.

Referring to the drawings, A represents the bed-plate; A′, the usual overhanging arm, and A^2 the rotating needle-bar-actuating shaft therein.

The needle-bar a^2, carrying the eye-pointed needle a^3, derives its vertically-reciprocating movements from a needle-bar-actuating mechanism consisting essentially of the crank-pin a, connected to the hub A^3, and joined by a link a' to a lug on a collar secured to the said needle-bar, the latter sliding in usual vertical bearings in the head of the arm A′.

The periphery of the hub A^3 has a groove a^4, in which enters a roller or other stud b of a take-up lever b', pivoted at b^2 on a part of the overhanging arm and extending outwardly in the usual manner through a slot in the face-plate b^4 of the head, the said take-up having an eye, as represented in Fig. 1, for the reception of the needle-thread b^5 running from the tension device b^6 to the eye of the needle. The tension device b may be of any usual construction.

The shuttle-operating mechanism is or may be essentially the same as in United States Patent No. 326,821, consisting, as herein shown, of the shaft A^2, having a crank portion 2, which acts between two like wings c of a vertical rock-shaft c', having (see Fig. 2) an arm c^2, which by a link c^3 is connected to a short arm of a shuttle-lever c^4, to which my improved shuttle-carrier e is attached in any suitable manner, as by a screw 30, the said lever being shown as pivoted to vibrate about a stud c^5 at the under side of the bed-plate. The shaft A^2 will also in practice have a suitable cam or eccentric to act upon the upper end of a lever, as d, which may be substantially as in United States Patent No. 374,662, the said lever being connected at its lower end to a feed-actuating rock-shaft d', to which is joined a yoke or frame d^2, one part of which has attached to it a toothed feed block or dog d^3, while another part of the said feed-yoke has a lug, as d^6, which is acted upon by a cam d^7 on or forming part of the lever c^4.

The shuttle-carrier e, preferably made of spring metal, as sheet-steel, is shaped to present a narrow front bar 31, a back bar or support 13, a lip, as h, and a horn, as h', and the said carrier will preferably have a downwardly-bent and rearwardly-inclined nose, as g, (fully shown in Figs. 5 to 8,) the said nose being of such shape and length with relation to the shuttle as to rest directly opposite the needle when the latter is fully down, as represented in Figs. 5 and 6, which also show the relative positions of the needle and carrier when the latter is fully retracted, the said nose steadying the needle for the entrance of the point of the shuttle into the loop of the needle-thread thrown out from the eye of the said needle.

In order to hold the shuttle in such a manner that the loops of needle-thread will not be nipped at the under side of the shuttle, but will pass freely beneath the same, the carrier e is preferably formed with a central open space 6, Fig. 7, and to adapt the shuttle f to hang in this space and to be entirely supported by the front and back bars 31 and 13 of the open-work carrier said shuttle is provided with longitudinal flanges or ribs 8 and 9, Figs. 10 and 11, to engage the said bars and thus suspend the shuttle in the carrier. With this open-bottomed carrier it is of course impossible for dirt to collect therein to soil the needle-thread or to retard the passage of the loops thereof along the under side of the shuttle, and with the open-work carrier constructed as above described the only points of contact between the shuttle and carrier will be where the flanges or ribs 8 and 9 rest on the front and back bars 31 and 13 of the carrier and where the shuttle is brought into contact at alternate intervals with the horn h' and the heel-lip h of the carrier.

It is of course necessary for the shuttle in its vibrating movements to pass close to the vertical path in which the needle reciprocates, so that the nose of the said shuttle can enter the loops thrown out by the said needle, and in supporting a shuttle entirely in a horizontally-vibrating carrier it will therefore be necessary for the front bar of the carrier to cross the path of the needle a', the position of which relative to the carrier as the shuttle is entering a loop of needle-thread is shown by Figs. 7 and 8. The needle-bar a^2, operated from the rotating crank-pin a, has a uniform or regular up-and-down motion without the dwell or "dip" usually given to needle-bars employed in shuttle-machines; but in the present instance it will be clear that when the needle has descended to its lowest point it immediately begins its upward movement and continues the same uninterruptedly to its highest point. In order to avoid any collision between the front bar 31 of the shuttle-carrier and the needle which crosses the path of said bar the latter is elevated at its central portion, as shown more clearly in Fig. 8, its front end curving downward as it joins the nose g. From this construction, owing to the regular or practically continuous movement imparted to the needle, it results that when the latter has first thrown out its loop in the initial portion of its ascent the depressed forward portion of the said bar 31 will be low enough to be clear of the needle, which will be above the said forward portion of said bar, as denoted by Fig. 7, and as the carrier moves forward the needle ascends with sufficient rapidity so that by the time the elevated or shuttle-supporting part of the said bar 31 reaches the path of the needle the latter will be out of way of said bar, and no contact between the latter and the needle can therefore occur. It will therefore be apparent that with the use of a horizontally-vibrating shuttle-carrier which entirely supports the shuttle—or, in other words, which has a front bar which steadies the shuttle in front (thus performing the office of the discarded shuttle-race)—a needle-bar so operated as to have no dwell or dip is desirable; and although I have herein shown the needle-bar as having a regular motion imparted thereto from a rotating crank-pin, it will be understood that this result might be effected by a suitably-constructed cam adapted to lift the needle-bar fast enough so that the point of the needle will be raised sufficiently to enable the shuttle-supporting part of the front bar 31

of the shuttle-carrier to pass beneath the needle as the shuttle is passed through a loop of needle-thread.

The cylindrical shuttle *f*, with an interior chamber for the bobbin *f'*, is of well-known form and is provided with the open-ended threading-slot 7 (common in self-threading shuttles) and with the tension-spring f^2 and regulating-screw f^3.

To facilitate the clearance of loops of needle-thread from the heel of the shuttle, I preferably depress the heel portions of the front and back bars of the carrier *e*, as shown at 35, Fig. 8, and I also preferably cut or round out the inner faces of said bars slightly next to the heel-lip *h*, as shown in Fig. 7, for the same purpose.

To cause the shuttle to lie normally against the front bar 31 of the shuttle-carrier by gravity, the elevated or shuttle-supporting portion of said bar is preferably arranged somewhat lower than the back bar 13, as clearly shown in Fig. 10, the shuttle thus normally lying against the said front bar so as to be in proper position to enter the loops of needle-thread with certainty, so that all danger of skipping stitches is thereby avoided.

To make the machine as nearly noiseless as possible, the skeleton carrier *e* is preferably formed from thin sheet-steel so as to be elastic or flexible, as an elastic or flexible piece of metal has less resonance than a rigid piece would have. Thus as the shuttle is lifted slightly in the carrier as it passes through the loops of needle-thread, and as it strikes the horn *h'* or the rear bar *h* of the carrier there will be much less chattering or rattling with an elastic or flexible carrier than there would be with a rigid one. This slender elastic carrier *e* is, however, a somewhat delicate device and is liable to be bent or injured by pressure thereon by the operator in adjusting the shuttle-tension when the shuttle is in the carrier, or in placing the shuttle in the carrier or removing it therefrom, and to provide against this danger of injury to the elastic carrier I combine therewith a limiting device or stop *w* of sufficient strength and rigidity to resist any strain to which the shuttle-carrier may be subjected by pressure on the shuttle. This limiting device or stop *w* is attached to the shuttle-lever c^4, and thus moves with the said carrier, and is arranged a proper distance below the latter so that there is just sufficient room, as shown in Fig. 11, for a clear passage of the needle-thread between the shuttle and said limiting device, so that a slight downward pressure on the shuttle will cause the latter to come in contact with the limiting device or stop, and further bending of the carrier will thereby be arrested and any injury thereto be avoided. I do not desire to limit my invention to the exact form or shape herein shown of the limiting device or stop *w*.

The nose *g* which steadies the needle to prevent the shuttle from injuring the same, instead of being formed on the carrier, as shown in Figs. 5 to 8, may be formed on the limiting device or stop *w*, as shown in Fig. 12, and in such case the shuttle-carrier will be of the construction shown in Fig. 13.

The throat-plate *t* is provided with the usual opening t^4 for the passage of the needle, and also with openings in which the feed-dog d^3 works.

From the foregoing it will be apparent that I am enabled to provide a horizontally-moving shuttle-carrier of proper construction to entirely support and carry a cylindrical shuttle, thus avoiding the objections incidental to the use of a shuttle-race for the shuttle to work against, my improved carrier being of such a character that the noise incidental to the rattling of the shuttle in the carrier is reduced to a minimum.

I claim—

1. In a sewing-machine, the combination, with a vertically-reciprocating needle-bar and needle, and a substantially cylindrical shuttle, of a horizontally-vibrating shuttle-carrier having a front bar, as 31, to support the face or outer side of said shuttle, and being thereby adapted to carry and hold the same without a race, the said front bar being connected at both ends to the body of the said carrier.

2. In a sewing-machine, the combination, with a vertically-reciprocating needle-bar and needle and a substantially cylindrical shuttle, of a horizontally-vibrating elastic or flexible shuttle-carrier having a front bar, as 31, to support the face or outer side of the said shuttle, and being thereby adapted to hold and carry the same without a race, the said front bar being connected at both ends to the body of the said carrier.

3. In a sewing-machine, the combination, with a vertically-reciprocating needle-bar and needle and a substantially-cylindrical shuttle having longitudinal flanges or ribs on its opposite outer sides, of a horizontally-vibrating shuttle-carrier having a central open space to receive the said shuttle, and front and back longitudinal supporting-bars on which the said flanges or ribs on the said shuttle may rest.

4. In a sewing-machine, the combination, with a vertically-reciprocating needle-bar and needle and a substantially cylindrical shuttle having longitudinal flanges or ribs on its opposite outer sides, of a horizontally-vibrating shuttle-carrier having a central open space to receive the said shuttle, and front and back longitudinal supporting-bars on which the said flanges or ribs on the said shuttle may rest, the said front bar being lower than the said rear bar to cause the shuttle to lie closely against the former, as set forth.

5. In a sewing-machine, the combination, with a vertically-reciprocating needle-bar and needle and a substantially cylindrical shuttle having longitudinal flanges or ribs on its

opposite outer sides, of a horizontally-vibrating shuttle-carrier having a central open space in which the said shuttle may hang, and front and back longitudinal supporting-bars on which the said shuttle flanges or ribs may rest, the forward end portion of the said front supporting-bar being depressed below the central or shuttle sustaining part thereof to afford a proper clearance for the said needle.

6. In a sewing-machine, the combination, with a vertically-reciprocating needle-bar and needle and mechanism for imparting thereto uniform or substantially continuous movements, of a shuttle having longitudinal side flanges or ribs and a horizontally-vibrating shuttle-carrier having a central open space in which the shuttle may hang, and front and back longitudinal supporting-bars on which the said shuttle flanges or ribs may rest.

7. In a sewing-machine, the combination, with a vertically-reciprocating needle-bar and needle and a shuttle having longitudinal flanges or ribs on its opposite outer sides, of a horizontally-vibrating elastic or flexible shuttle-carrier having a central open space in which said shuttle may hang, and front and back longitudinal supporting-bars on which said flanges or ribs on said shuttle may rest.

8. In a sewing-machine, the combination, with a vertically-reciprocating needle-bar and needle and a shuttle having longitudinal flanges or ribs on its opposite outer sides, of a horizontally-vibrating elastic or flexible shuttle-carrier having a central open space in which said shuttle may hang, and front and back longitudinal supporting-bars on which said flanges or ribs on said shuttle may rest, and a rigid limiting device or stop, as *w*, placed below said shuttle-carrier and movable therewith.

9. In a sewing-machine, the combination, with a vertically-reciprocating needle-bar and needle and a substantially cylindrical shuttle, of a horizontally-vibrating shuttle-carrier having a front bar, as 31, to support the face or outer side of said shuttle, and a forwardly-extending needle guiding and guarding nose, as *g*, movable with said carrier and of sufficient length to project past or beyond said needle when said carrier is at the extreme limit of its backward throw.

10. In a sewing-machine, the combination, with a vertically-reciprocating needle-bar and needle and a substantially cylindrical shuttle having longitudinal side flanges or ribs, of a horizontally-vibrating shuttle-carrier having an open space in which said shuttle may hang, and front and back shuttle-supporting bars to receive said flanges or ribs, and a forwardly-extending needle guiding and guarding nose, as *g*, movable with said carrier and which projects past or beyond said needle when said carrier is at the extreme limit of its backward throw.

11. In a sewing-machine, the combination, with a vertically-reciprocating needle-bar and needle and a substantially cylindrical shuttle having longitudinal side flanges or ribs, of a horizontally-vibrating shuttle-carrier having an open space in which said shuttle may hang, and front and back shuttle-supporting bars to receive said flanges or ribs, and a forwardly-extending needle guiding and guarding nose, as *g*, formed on said carrier and which extends past or beyond said needle when said carrier is at the extreme limit of its backward throw.

12. In a sewing-machine, the combination, with a vertically-reciprocating needle-bar and needle and a shuttle having longitudinal side flanges or ribs, of a horizontally-reciprocating shuttle-carrier having a central open space to receive said shuttle, and front and back shuttle-supporting bars 31 and 13, respectively, to receive said ribs or flanges, said bars having depressed thread clearances 35 at the heel of the said carrier.

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

PHILIP DIEHL.

Witnesses:
JOSEPH G. COLEMAN,
CHR. FRIEDERICH.