2 Sheets.—Sheet 1.

D. MACPHERSON.

Sewing Machine.

No. 92,068. Patented June 29, 1869.

Fig. 1.

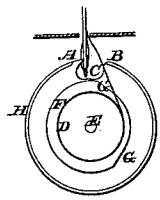


Fig. 2.

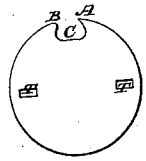


Fig. 3.

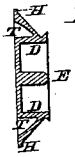


Fig. 4.



Fig. 5.

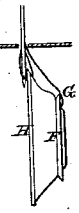


Fig. 6.

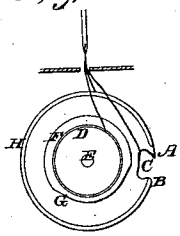


Fig. 7.

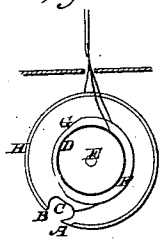


Fig. 8.

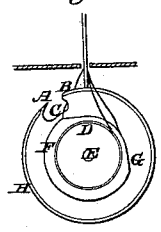


Fig. 9.

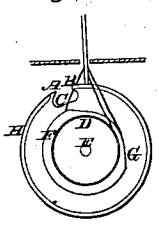


Fig. 10.

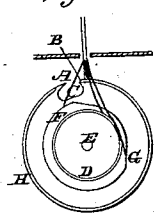


Fig. 11.

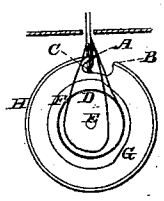


Fig. 12.

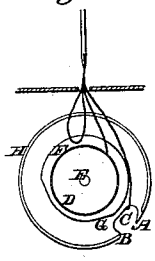


Fig. 13.

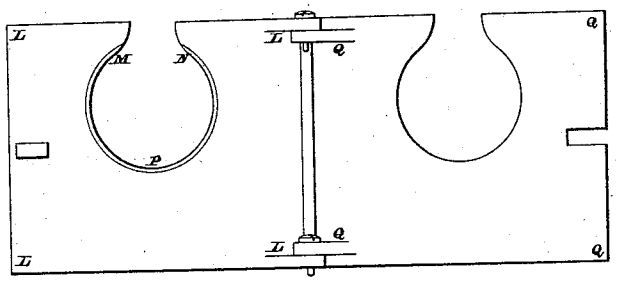
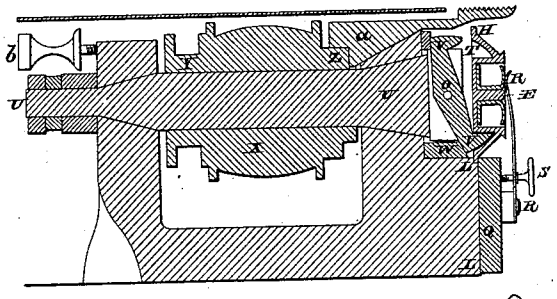


Fig. 14.



Witnesses:
Edward Laing
James Carlisle

Inventor:
Daniel Macpherson

N. PETERS. Photo-Lithographer, Washington, D. C.

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D. MACPHERSON.

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Fig. 15.

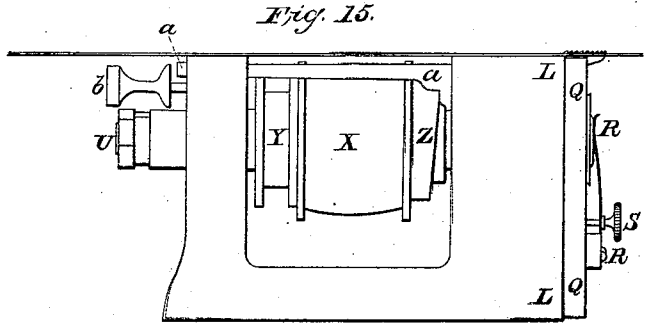


Fig. 16.

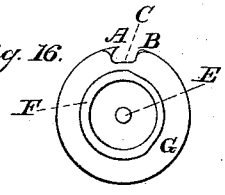


Fig. 17.

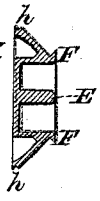


Fig. 18.

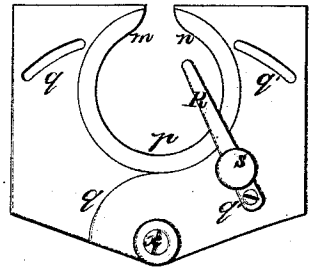


Fig. 19.

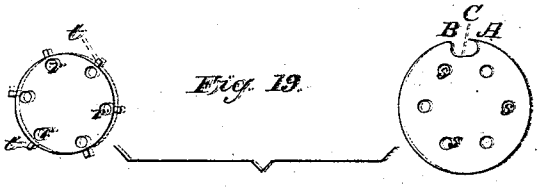
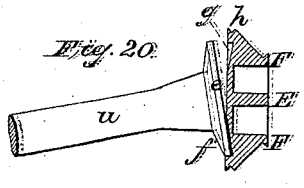


Fig. 20.



Witnesses:
Edward Lane
James Carlisle

Inventor:
Daniel Macpherson

N. PETERS, Photo-Lithographer, Washington, D.C.

United States Patent Office.

DANIEL MACPHERSON, OF EDINBURGH, NORTH BRITAIN.

Letters Patent No. 92,068, *dated June* 29, 1869

IMPROVEMENT IN SEWING-MACHINE.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, DANIEL MACPHERSON, of Edinburgh, North Britain, have invented certain Improvements in Sewing-Machines; and I do hereby declare the following to be a full, clear, and exact description of the same.

My said invention relates to what are generally known as "lock-stitch" sewing-machines, and consists in the construction and use of a shuttle having the general form of the frustum of a cone, provided with a space within it, for holding a bobbin, and receiving a rotary motion on its own axis, whereby the said shuttle and the included bobbin are made to pass through the loop in the upper thread, and thereby produce that kind of stitch known as the lock-stitch, the action of this shuttle being such as to take up the slack of the upper thread, and thus to supersede the use of springs, levers, or other such contrivances, for this purpose; and in order that the said invention may be fully understood, I shall now proceed more particularly to describe the same, and for that purpose shall refer to the several figures on the annexed sheets of drawings, the same letters of reference indicating corresponding parts in all the corresponding figures.

This peculiar shuttle is represented by figs. 1, 2, and 3, on sheet 1 of the accompanying drawings.

Figure 1 is a front elevation of the shuttle;

Figure 2 is a back elevation; and

Figure 3 is a section of the shuttle, taken through its axis.

The outline of the shuttle is nearly an entire circle, as seen in figs. 1 and 2. The back is flat, or nearly so, and the front is protuberant, as seen in the section, fig. 3, or in the profile or edge view, Figure 5, so that the shuttle has the general appearance of the frustum of a cone.

A part of the circumference is cut away between the points A and B, and is hollowed out, so as to form a notch or recess, A C B, to receive and carry round the loop in the upper thread.

The sides of this recess are rounded, so as to make, at A, a moderately sharp point, which is the toe of the shuttle, and at B a bluntish end, which is the heel.

The surface of this notch, and the whole external surface of the shuttle with which the threads may come in contact, are carefully smoothed, and the edges blunted, in order that the threads may glide easily over them without damage.

The sloped part of the protuberance may be conical, as shown in the section, fig. 3, and profile, fig. 5, or it may have a curved outline. I prefer the conical form, as being easily made.

In the protuberant part of the shuttle, a cylindrical or slightly-conical cavity, D D, is made, for receiving the bobbin on which the under thread is wound.

This cavity is not made entirely through the shuttle, but a plate is left, sufficiently strong to carry a centre-pin, E E, on which the bobbin is to turn. By this pin the bobbin is kept more steadily than if it were made to rest entirely on the bottom of the cavity, and on its cylindrical sides.

Around the outer edge of this cavity, a lip or ridge, F F, is formed, so as to produce a circular notch, for retaining, until the proper time, the loop that has been made in the upper thread.

A portion, G G, of this lip or ridge is removed, for the purpose of releasing the loop at the desired instant.

The bobbin which I use along with this shuttle is shown in section in fig. 4. It is provided with a central hole, to fit and turn easily upon the pin E E.

The back, I I, is made flat, or nearly so, and of a diameter slightly less than that of the bottom of the cavity D D.

The front J J is made so much less in diameter than the mouth of the cavity D D, as to permit the lower thread, which is wound on the bobbin, to pass easily out between them, and its edges as well as the outer edge of the cavity D D, are rounded, so as not to cut the thread.

The front of the bobbin is made convex at the part marked K K, and the height of the bobbin, from I to J, is made somewhat less than the depth of the cavity D D, in order that the edge J may be within the plane F F, while the convex part K, as shown in the profile, fig. 5, protrudes a little beyond it. In this way the loop in the upper thread is prevented from slipping into the bobbin.

In fig. 5 the under thread is represented, by a blue line, as proceeding from the bobbin to the cloth, while the loop of the upper thread, represented by a red line, is shown as passing round the circular notch formed by the lip F.

At the upper part, G, of the same fig. 5, the lip is shown as partly cut away.

The action of this shuttle is as follows:

It is made to turn on its own axis, once for each complete stroke of the needle, its outer edge being brought close to the line of motion of the needle, and the two motions, viz, the rotary motion of the shuttle and the reciprocating motion of the needle, are so timed to each other, as that just after the needle has begun to ascend, and has thereby slackened the thread, the toe A comes forward, and, passing between the needle and the now slackened thread, takes up the loop.

I prefer to arrange the machine so that the needle may pass close along the back of the shuttle, as shown in fig. 5, in which the toe A is represented as having just entered the loop. Fig. 1 shows this position of the shuttle, as seen from the front.

As the shuttle turns round, the loop is drawn out by the notch A C B, as shown in Figure 6, and is eventually lodged in the circular notch formed by the lip F

F. This is shown in Figure 7, which shows the shuttle as turned rather more than half round from its first position. The upper thread is there shown as held by the lip F F, and as proceeding, through the notch A C B, to the back of the shuttle, making its appearance again at the upper edge. If the lip F F were continuous, the loop would be permanently held by it.

Figure 8 shows the position of the shuttle, after having made about five-sixths of a revolution.

The needle has now descended, so as again to enter the cloth, which, in the mean time, has been moved forward by the feeding-apparatus, and the upper thread is still held by the lip F F and by the notch A C B.

Figure 9 shows the upper thread, as just about to be relieved from the heel B of the shuttle, and the needle as having now descended to its lowest position. The loop is still held by the lip F F.

Figure 10 shows the loop as disengaged from the heel of the shuttle, and as held only by the lip F F. It is about to be released at the point G, and the toe A is just about to enter the second loop, which is beginning to be opened by the ascent of the needle.

Figure 11 shows the shuttle in the same position as in fig. 1, that is, after having made a complete revolution. The former loop is now disengaged from the lip F F, and has passed over, so as to enclose the under thread. At the same time, the toe of the shuttle has taken up the second loop, the subsequent formation of which draws up the first loop, and thus completes a stitch, having the under thread locked into it.

Figure 12 shows the shuttle after the second loop has been formed, and the first loop considerably drawn up.

In this way, at each revolution, the shuttle and the included bobbin may be said to pass through the loop, or the loop may be said to be passed round them. The formation of the third loop takes up the slack of the second, and thus the sewing goes on.

In order to insure a proper performance of these operations, it is necessary that the shuttle be guided steadily, so that the toe A may pass close to the needle, and at the same time, that the guiding-apparatus may not interfere with the threads.

Various guides may be contrived, but I shall only describe two as good examples, being both simple, easily constructed, effective, and convenient.

The first of these methods of guiding the shuttle is represented in figs. 1, 3, 5, to 13, inclusive.

Round the outer edge of the shuttle a narrow fillet, H H, is formed, having a flat surface toward the point. This fillet is sloped away near A, the toe of the shuttle, and is rounded off at the heel B.

In a plate, L L, Figure 13, which may either be attached to the frame, or may be a part of the frame of the sewing-machine, a circular cavity is formed, somewhat less in diameter than the outer diameter of the shuttle, and a circular bed or socket is made round the edge of it, into which the shuttle may fit, the depth of the bed or socket being such, that the flat surface of the fillet H may be just flush with the surface of the plate L L. This bed is shown at M P N, fig. 13.

At the side next to the needle, a part of the plate L L is cut away, so as to leave an opening, M N, for the working of the needle and threads.

When the shuttle has been placed in this bed or socket, it is retained there by means of the shuttle-cover Q Q, which is a movable plate, having a hole exactly the counterpart of that which is formed in the plate L L.

For the sake of easy removal, I attach the shuttle-cover to the plate L L, by means of a hinge, and secure it, when closed, by means of a slot and button, as shown in fig. 13; but many other arrangements for keeping the shuttle-cover in its place may be contrived. The particular arrangement which may be used for this purpose is not essential to the action of my shuttle.

The bed or socket and the shuttle-cover must be so adjusted as that the shuttle may turn easily, without having any unnecessary shake; and it is advisable to make the openings at N N no wider than is actually needed for the freedom of the threads, in order that there may be as much guiding-surface as possible.

The shuttle-cover Q Q is shown closed upon the shuttle in Figure 14, and also in Figure 15, sheet 2; in the former, in section; in the latter, in side elevation.

When the shuttle-cover is closed, all the protuberant surface of the shuttle, and also all the outer surface of the bobbin, are exposed to view, so that the whole process of forming and disengaging the loop, as already explained, may be seen.

I find this first arrangement to be very convenient. It has, however, two disadvantages: first, that the oil employed to lubricate the parts is apt to soil the thread, if the parts be over-oiled; second, that, in the course of use, the shuttle becomes somewhat loose in the socket.

I have obviated the first disadvantage by removing an extremely minute portion of metal from around the edge of the back of the shuttle. The abstraction of this thin portion removes the point of the toe to a little distance—say one three-hundredth part of an inch—from the needle. It is, therefore, necessary to bend the toe back to the general plane, so that it may come close to the needle. These small details are too minute, however, to be shown in any drawing.

The second method of guiding the shuttle is shown in Figures 16, 17, and 18, sheet 2.

A V-shaped notch, *h*, fig. 17, is made around the edge of the shuttle.

This notch cannot be seen when the shuttle is viewed from the front, nor from the back, excepting near the toe and the heel, where the sloping of the surface brings it into view.

This notch *h* receives the edges of a circular cavity, *m n p*, fig. 18, formed by the junction of the two holding-plates *q q* and *q′ q′*.

These plates are sector-jointed on the pin *x*, at their lower edge, so that they may be opened, to receive the shuttle, and then closed, to retain it.

The centre-pin *x*, of the sector-joint, is screwed into the plate L, of fig. 15; and the holding-plates are kept in their places by clamping-screws passing through notches in the holding-plates.

This second arrangement is free from both the disadvantages of the first. When the shuttle wears, the holding-plates can be closed upon it, so as to hold it with any required degree of tightness, and, at the same time, the oiled surface is out of reach of the thread. It has also this advantage, that the opening at *m n* may be made smaller than when the shuttle-cover is used.

The tension of the upper thread may be regulated by any of the contrivances for that purpose already in use. The under thread may receive its proper tension by means of a washer bound by a screw entering into the pin E E, on which the bobbin turns, this washer bearing upon the outer surface of the bobbin. This is, perhaps, the simplest arrangement; but it has two inconveniences, which are, first, that the taking out and replacing of the bobbin are troublesome; second, that the tension on the under thread cannot be changed without stopping the machine.

In order to avoid both of these inconveniences, I cause a thin spring, R R, figs. 14, 15, 18, attached to the shuttle-cover Q, or to one of the holding-plates *q′*, to press against the convex part, K, of the outer face of the bobbin; and I regulate the pressure of this spring by means of a thumb-screw, S.

This thumb-screw S can be used when the machine is in motion; and the removal of the bobbin is effected by opening the shuttle-cover Q, or by throwing back that one of the holding-plates to which the regulating-spring R is attached.

At each stitch, the loop is drawn through between the spring R and the convex part, K, of the bobbin. This spring thus assists in keeping back the loose loop after it has been disengaged from the part G, and allows it to be drawn gently forward as the next loop is formed.

Thus, what I at first feared would have been an inconvenience, is found to be a great improvement in the action, by preventing the entanglement of the loose loop.

The shuttle and the bobbin may be made of any suitable material, and of separate pieces, joined together, or each of one piece. I prefer to make them both of cast-steel.

Having shown that my shuttle, with its included bobbin, may be so held and guided as that it may be susceptible of the required rotary motion, without the threads being interfered with, I shall now proceed to explain how that rotatory motion may be communicated to it.

The rotatory motion may be obtained from a toothed wheel, *f f*, Figure 20, turning on an axis, *u u*, inclined to the axis E E of the shuttle, and working on internal teeth *g g*, formed within the body of the shuttle.

The depth of the teeth must, in this case, be so arranged as that the tooth on the one side of the nofch A B C be not released until the tooth on the other side has been caught hold of.

The reciprocating motion may be given to the needle in any of the ways already in use. I prefer the simplest reciprocating motion, obtained by means of a crank-pin, or an eccentric-wheel, fixed to a revolving axis, which I prefer to be the axis U U, that gives motion to the shuttle. The tension of the upper thread may be obtained in any of the usual ways, and so also the feed and the length of the stitch. These form no part of my invention.

The advantages of my system over the methods for forming the lock-stitch already known are these:

The action is so simple as to be easily understood, while the whole operation is open to inspection.

The drawing up of the loop of the preceding stitch by means of levers or springs is superseded.

There is no occasion for stopping the needle until the shuttle has passed through the loop.

The lip which retains the loop, and keeps the thread out of reach of the toe, being a rigid substance, the machine can at once be made to suit heavy or light work, within the range of its capability, by means of the screws for regulating the tensions of the two threads.

The tension of the under thread can be altered, while the machine is working, by means of a thumb-screw placed quite conveniently to the operator.

Neither the upper nor the under thread is twisted; and, while the machine may be worked with very great rapidity, it may also be moved as leisurely as may be desired.

I claim as my invention, and desire to secure by Letters Patent—

1. The conical shuttle, having a lip, F, recess D, and central pin E, for supporting a detachable spool, all constructed as described.

2. The combination, with the conical shuttle, of the hinged plates *q q'*, with their curved V-shaped edges adapted to the recess, *h*, of the shuttle, as and for the purpose specified.

3. The combination, with the conical shuttle, constructed as described, of the spring R and set-screw S, when the spring is arranged and bears upon the shuttle, so as to first detain and then release the loose loop of thread, as set forth.

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

DANIEL MACPHERSON.

Witnesses:
EDWARD SANE,
ALEXANDER MORRISON.