2 Sheets—Sheet 1.

T. WEBB & C. H. HEARTFIELD.

Sewing and Darning Machine.

No. 213,537. Patented Mar. 25, 1879.

Fig. 1.

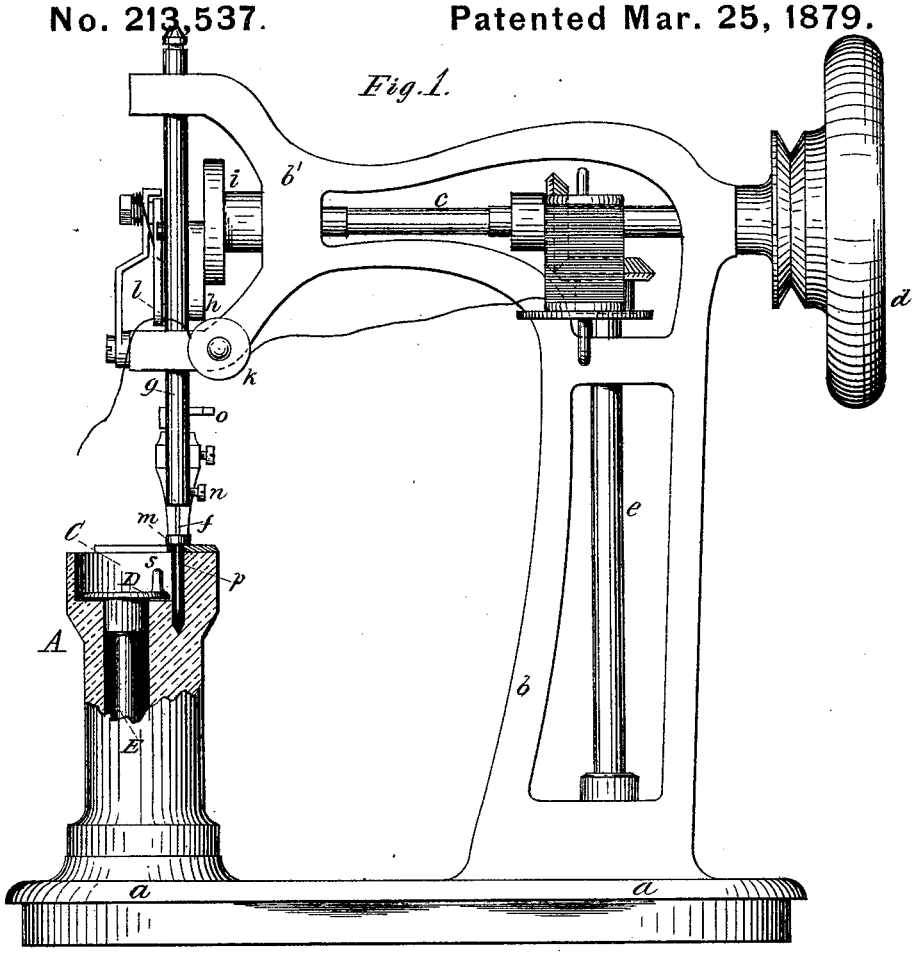
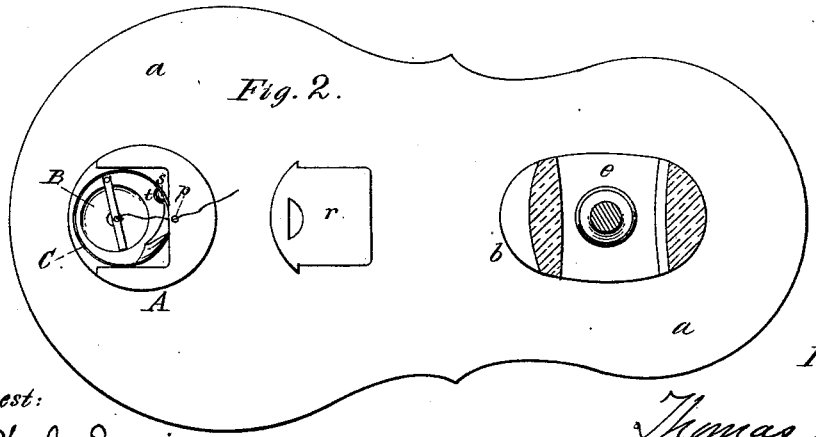


Fig. 2.



Attest:

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A. H. Wales & Son

2 Sheets—Sheet 2.

T. WEBB & C. H. HEARTFIELD.

Sewing and Darning Machine.

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Fig. 3.

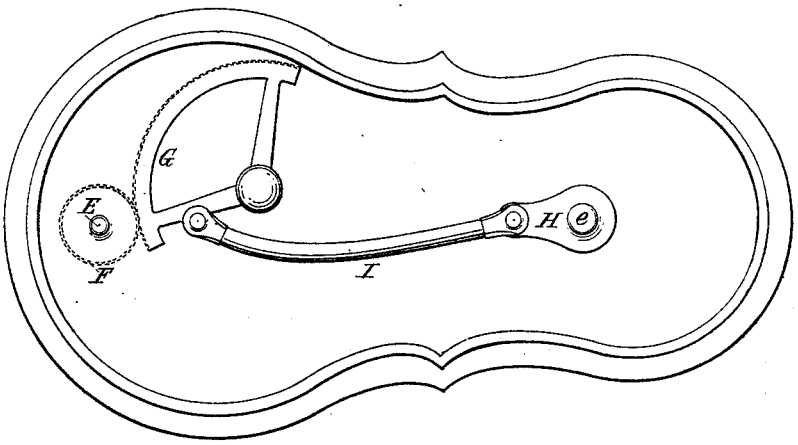


Fig. 4.

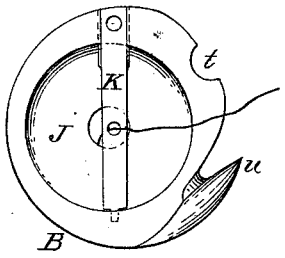


Fig. 5.

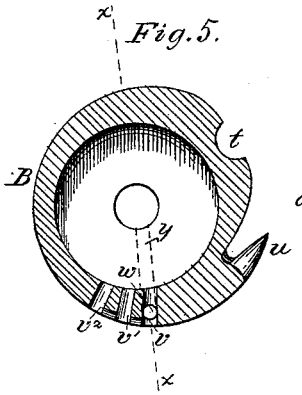
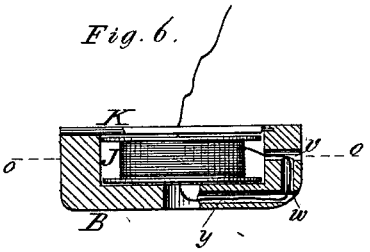


Fig. 6.



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UNITED STATES PATENT OFFICE.

THOMAS WEBB AND CHARLES H. HEARTFIELD, OF NEW YORK, N. Y.

IMPROVEMENT IN SEWING AND DARNING MACHINES.

Specification forming part of Letters Patent No. **213,537**, dated March 25, 1879; application filed September 19, 1878.

To all whom it may concern:

Be it known that we, THOMAS WEBB and CHARLES H. HEARTFIELD, both of New York city, have invented certain new and useful Improvements in Sewing and Darning Machines, of which the following is a specification:

Our invention may be briefly described as a machine which embodies substantially all the elements of a lock-stitch sewing-machine excepting the feed-motion, and which is specially designed and adapted for the darning of stockings and other hollow or flat articles by forming a net-work or texture of connected stitches across the rent or opening to be darned.

The novelty of our invention lies mainly in a specific combination of elements by which a machine adapted for the special purpose of darning stockings is produced; also, in the particular construction of the shuttle, as hereinafter set forth.

In the drawings annexed, Figure 1 presents a side elevation of our improved machine, with the upper part of the work-support shown in section. Fig. 2 is a fragmentary plan view, showing the top of the work-support and its contained shuttle. Fig. 3 is an inverted plan of the base of the machine, showing the mechanism which operates the shuttle; and Figs. 4, 5, and 6 are views of the shuttle on an enlarged scale.

As seen in Fig. 1 the general structure of our improved darning-machine presents the usual sewing-machine form, being composed of a base-plate, *a*, adapted to be fitted in a table-top, as usual, and from which a bracket-arm, *b*, rises. This arm in the usual manner contains the needle-operating mechanism, while the base contains the shuttle-operating mechanism, the feed being omitted.

The needle-operating mechanism may be substantially that of any of the well-known sewing-machines, and does not therefore require special description. I prefer, however, to employ the needle-operating mechanism of the Singer machine, as shown in Fig. 1.

c is the driving-shaft which operates the needle, and which is fitted with the usual fly-wheel *d*, which may be driven by hand or by a belt from a treadle, as usual. This shaft imparts motion to the vertical shaft *e* by the usual miter-gear, as shown, and shaft *e* imparts motion to the shuttle-operating mechanism. *f* is the needle, *g* the needle-bar, and *h* the heart-cam fixed thereto and driven by the crank-disk *i* on the end of the shaft *c*. *k* is the tension, *l* the take-up, and *m* the presser-foot. All these parts operate in the usual way, the needle having the same movement as in the Singer sewing-machine. This difference, however, exists: As no automatic feed is used, the presser-foot is automatically raised from the work after each stitch, so as to allow of the work being fed by the hands of the operator in the direction and at the rate required. This movement of the presser-foot is effected by the upward stroke of the needle-bar, the bar being fitted with a projection, *n*, which strikes an adjustable projecting arm, *o*, on the presser-foot, the presser-foot being thus raised from the work after each stitch, and again forced upon the work by its spring as soon as the needle descends for another stitch. This movement, however, is usual in the darning attachment to ordinary sewing-machines, and is not in itself claimed as novel; but the main novelty of our invention consists in the combination, with this automatically-reciprocating and non-feeding presser-foot and the described needle-operating mechanism, of an isolated pillar-like work-support, arranged beneath the same, containing the shuttle mechanism, and adapted to be placed within the hollow of a stocking, by means of which a machine is produced which is specially designed for the darning of stockings in a rapid, perfect, and convenient manner not heretofore attained, as will be now particularly described.

In Figs. 1 and 2, A indicates the work-support, which consists, as shown, of a projecting cylindrical post or pillar, which rises prominently and rigidly from the base *a*, immediately beneath the needle-bar and presser-foot, and in line therewith, as indicated. The upper end of the pillar is preferably flat, and receives the contact of the presser-foot, and forms the work-supporting table of the machine, as shown. The pillar is of slender form, its upper end being about one inch and five-eighths in diameter, and it has a free or isolated situation upon the base of the machine, as seen in Figs. 1 and 2, and is thus adapted

to be placed within the interior of hollow articles, such as stockings, &c., and at the same time permits the free movement of the stocking in every direction, thus rendering all parts accessible to the action of the machine, so that a rent at any part of the article may be conveniently and rapidly darned.

The pillar A incloses the shuttle B in its upper end, and to admit of its operation in so small a space the shuttle is of circular form, and has an alternate reverse rotary motion at right angles to the needle.

The shuttle rotates in a circular cavity, C, which is formed in the top of the pillar, and eccentric to the axis thereof, and also arranged wholly to one side of the needle, which descends through a throat or hole, *p*, just on a line with the periphery of the shuttle, as seen in Figs. 1 and 2. A slide or cover, *r*, Fig. 2, (shown removed in Figs. 1 and 2,) fitted to the top of the pillar, covers the cavity and incloses the shuttle, as usual, during the operation of the machine.

The shuttle rests upon a rotary disk, D, which forms the shuttle-worker at the base of the circular cavity C, and this disk is provided with a projecting crank-pin, *s*, which engages with a corresponding notch, *t*, in the shuttle, thus forming the necessary driving-connection between the shuttle and its worker. The disk is mounted on the top of a vertical shaft, E, which rises from the base of the machine through the interior of the pillar, as seen in Fig. 1, and its lower end, which projects beneath the base, as shown in Fig. 3, is fitted with a pinion, F, which gears with a toothed sector, G, pivoted on a stud beneath the base of the machine, and to which a reciprocating movement is imparted from the revolving shaft *e* by means of the crank H and connecting-rod I.

It will thus be seen that the movement of this mechanism revolves the shuttle-worker alternately in opposite directions, and the proportion of the gearing is such that each revolution of the crank H imparts a little more than a full revolution in both directions to the shuttle-worker, so as to carry the shuttle entirely through the loop of the needle-thread and enable the nose of the shuttle to pass and repass the looping-point.

The formation of the shuttle is shown more distinctly in the enlarged view, Figs. 4, 5, and 6—Fig. 4 being a plan view with the bobbin in place and the shuttle threaded ready for use, Fig. 6 a cross-section on line *x x*, Fig. 5, and Fig. 5 a sectional plan on line *o o*, Fig. 6, with the bobbin removed. The shuttle, as shown, has the form of a flat circular disk, its outline being a true circle, except at one side, where indentations are made to form the engaging-notch *t* for the shuttle-worker, and also the peripheral hook or shuttle-nose *u*, which, as the shuttle revolves in the machine, as will be understood from Fig. 2, enters the loop of the needle-thread and throws the loop over the shuttle-thread, thus forming the usual lock-stitch in an entirely perfect manner, as will be understood. The bobbin, as indicated at J, has also the form of a flat circular disk or reel, and is socketed in a circular and slightly-eccentric cavity in the upper face of the shuttle, as shown.

The bobbin is formed with deep flanges, between which the thread is wound, and which are a nice fit for the cavity in the shuttle, in which the bobbin is free to revolve, as will be understood from the drawings. The bobbin is formed with a central bore, as shown in Fig. 4, and the base of the shuttle has a circular bore, which is central with the bobbin-socket and bobbin, as shown in Figs. 5 and 6.

The thread passes outward from the periphery of the bobbin-reel through a series of tension-holes in the wall of the shuttle, is returned inwardly at the base of the shuttle, issues upwardly from the central bore of the shuttle and bobbin, and, finally, passes through a small hole in a cross-bar, K, which extends across the top of the shuttle over the bobbin, the thread being thus drawn from the center of the shuttle.

This cross-bar K is flush with the surface of the shuttle, and serves to hold the bobbin in place. The outer end of the bar has a dovetailed formation, and slides in a dovetailed groove on the outer edge of the shuttle, as seen in Fig. 6, while the inner end of the bar is formed with a projecting spur or pin, which is inserted in a hole or notch close to the top of the shuttle on the opposite side. This construction prevents the bobbin from rising out of place, and it hence retains the bobbin in position in the shuttle; but the bar may be slid out of place after the shuttle is removed from the machine to allow of the removal or insertion of the bobbin when required.

As may be observed the formation and arrangement of the tension-holes, as well as the manner of threading the shuttle, is peculiar. First, as seen in Figs. 5 and 6, there is a series of upper radial holes, $v\ v^1\ v^2$, extending from the bobbin-cavity through the wall of the shuttle, through one or the other of which the thread may be passed, according to the tension desired. In this, however, there is no especial novelty, except that these holes open into a groove recessed in the periphery of the shuttle, so that the thread may lie within the outline of the shuttle, and not project beyond it. The last of these radial holes is, however, intersected near its outer end by a vertical hole, *w*, which is extended through the base of the shuttle, as seen in Fig. 6, and this hole is, in turn, intersected at its lower end by a longer radial hole, *y*, which extends from the periphery of the shuttle radially through its base, and opens into the central bore, as shown. The thread is passed from the periphery of the bobbin successively through these series of holes, as shown in Fig. 6, and issues from the top and center of the shuttle. By this construction it will be seen that the course of the thread from the bobbin to its issuance from

the shuttle lies entirely within the outline of the shuttle, so that the thread is not exposed to friction or entanglement during the revolution of the shuttle in the machine.

The described construction of the work-support and shuttle-operating mechanism, as will be observed, enables the same to be included within a space sufficiently small to readily enter the interior of a stocking, and yet operate efficiently. This construction thus forms a machine which is specially adapted for darning stockings and similar hollow articles, which would not be possible with a flat extended work-support, such as that of common sewing-machines, to which darning attachments have been heretofore adapted, but which are capable only of darning flat articles. Our machine is equally adapted for flat or hollow work, as may be observed; and for darning large rents in flat articles of large size the top of the work-pillar may be extended by an attached plate, if required.

The operation of darning is accomplished by starting a line of stitches from one edge of the rent and continuing it, in a connected chain, across to the other edge. This is repeated in a parallel series, first in one direction, and a second series is then stitched at right angles to the first, thus forming a web or texture of connected stitches over the rent, which is much more compact, secure, and neat than hand-darning, and is effected more rapidly and conveniently.

We do not wish to be understood as laying any claim, broadly, to a work-support formed in the shape of a slender pillar, which incloses the shuttle mechanism, and is adapted to be placed within the interior of hollow articles, as this has been used in different forms in machines designed for distinct purposes, nor do we claim, broadly, a circular shuttle arranged to revolve alternately in opposite directions; but what we claim is the special combination and construction of elements by which is produced a novel machine for the distinct purpose described, as below expressed.

What we claim is—

1. A stocking-darning machine formed by the combination of a slender pillar-like work-plate supporter, containing the shuttle and its driver, and adapted to be placed within a stocking, with a reciprocating needle mechanism, and a clamping device, consisting of the work-plate and presser-foot, securely holding the work during the time the needle is in it, the presser-foot, or upper part of the clamp, being arranged to rise clear of the fabric at or near the end of the needle's upward motion, to allow of the stocking being fed by hand with equal ease in all directions, substantially as described.

2. A sewing-machine shuttle of circular form provided with a peripheral hook, and formed with a series of threading-holes, *v w y*, extending, respectively, radially outward, axially downward, and radially inward, in combination with the bobbin socketed in the shuttle, and having a hollow axis or central opening by which the thread passes outwardly from the bobbin, and is returned inwardly to the center of the shuttle and bobbin, from which it issues axially, its course being entirely within the outline of the shuttle, substantially as shown and described.

3. In a sewing-machine, a circular rotating shuttle, B, formed with a peripheral hook, *u*, and with an inner circular cavity, in combination with a disk-bobbin, J, socketed in the circular cavity of the shuttle, and free to revolve therein, with its peripheral flanges in direct contact with the sides of the cavity, the said bobbin being formed with a hollow axis or central opening from which the thread issues, substantially as herein shown and described.

4. The combination, with the circular rotary shuttle B and flat disk-bobbin J, socketed therein, of the sliding cross-bar K, fitted across the top of the shuttle, to retain the bobbin in place, substantially as herein shown and described.

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CHARLES H. HEARTFIELD.

Witnesses:
EDWARD H. WALES,
CHAS. M. HIGGINS.