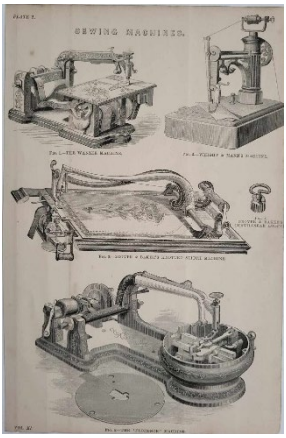
THE SEWING MACHINE

A GLANCE AT ITS HISTORY.

By Wilcox & Gibbs



The history of the Sewing Machine is one of progress. There was first the idea then the rude instrument afterwards the Improvements, in their several stages of development. The possibility of sewing by machinery was practically demonstrated upwards of fifty years ago; yet it required the combined labors of a generation of inventors, to improve the sewing machine so as to make it really a labor-saving instrument.

THE FIRST SEWING MACHINE.

The honor of inventing "The First Sewing Machine," has been claimed by different parties, and for different periods; but justice alike to individual merit, and impartial history, assigns that honor to the Rev. John Adams Dodge, of Monkton, Vt.; who, as early as the year 1818, invented, and with the assistance of John Knowles, an ingenious mechanic of the same town, constructed an instrument which made the "back-stitch," and sewed a perfect seam. No effort was made, however, to introduce it to the public. The journeymen tailors, alarmed and

offended, denounced the "sewing machine" as an invasion of their rights; the public had not then learned to have much confidence in labor-saving machinery of any kind; the rude state of the mechanic arts at that period was against him; and Mr. Dodge, having the pastoral charge of two, and sometimes three churches, found that he must abandon either his invention or the care of his flock. In view of all these difficulties he decided to give up the machine; and thus terminated the first effort of inventive genius to relieve the over-burdened wife and mother from the "drudgery of the needle," Yet this effort of Mr. Dodge is not to be regarded, in its relation to the public welfare, as labor lost; for such was the impression it made upon the public mind, that, from that day forward, inventive genius never lost sight of the sewing machine problem, until it had been successfully solved.

During the next thirty years, the names of Thimonier, Hunt, Greenough, Bean, Corlies and Howe, were successively added to the list of early sewing machine inventors. Each succeeded in producing an instrument that would make a seam, though neither of those instruments, as at first presented to the public, was much of an aid to the seamstress; and it is doubtful if either of them equaled, in originality of invention, or in the perfection of the seam it made, the machine of Mr. Dodge.

INTRODUCTION OF THE SEWING MACHINE

But the honor of introducing the Sewing Machine is generally conceded to the late Mr. Howe, whose machine was patented in 1846. His invention, though doubtless original with him, was in some of its features merely a reproduction of mechanical devices previously invented by others. The "combination of an upper with an under thread," and the use of the "eye-pointed needle" and the "shuttle," were both embraced in the machine of Walter Hunt, of New York, which was invented as early as 1833; while his "feed-device" was in principle the same as that of Mr. Dodge. The original machine of Mr. Howe would sew a straight seam, in short lengths or "reaches;" but it would not sew a continuous, or a curved one. Thus the sewing machine was still very far from perfect; and so it remained, with little improvement, till other inventors came to his aid.

FIRST STAGE IN ITS IMPROVEMENT.

In the years 1851 and 1852, three new sewing machines all based on the same general principles with that of Mr. Howe, but each containing improvements upon his, appeared in the market; and it is from that period that we are to date the first successful application of the sewing machine to practical use. The introduction of these rival machines soon led to active competition in their manufacture and sale. Competition in trade, stimulated also competition in the improvement of their several inventions; and it is but just to give those parties the credit of having carried their improvements, in some points, to a high degree of perfection. In one respect, however, there was a limit beyond which improvement could not be carried; for in each of those machines there was a defect, of a radical character, which could be remedied only by radical means. That defect was, complication; there were too many parts and movements, and too much skill was required to manage the

machines. Though valuable in the workshop, where an engineer was at hand to keep them in order, all were too complicated for universal and successful use in families.

THE "DOUBLE-THREAD THEORY."

The defect to which we have alluded, was the result of a blunder made by Mr. Howe in the introduction of a false theory, and its unfortunate adoption by succeeding inventors. That theory was called the "Double-thread Theory" because it taught the unsound doctrine that two threads are necessary in machine sewing! The history of this theory is interesting and instructive:

Mr. Howe, we are told, first tried to make a single-thread machine, and only gave it up when he found so says Parton, in his "history of the sewing machine" that "he could not do it!" As a last effort he then made trial of two threads, and in this he was more successful. Having only to copy the leading principle of his machine either from the "looms" and "shuttles" of Lowell where he had once been employed, or from the invention of Mr. Hunt, he finally succeeded in making an instrument which would weave a seam. But here a new difficulty presented. Howe was at work for an object the historian says he was "after a fortune;" yet the fortune did not come for the machine could not be sold. Woman, for whose use the sewing machine was chiefly intended, had always been accustomed to the use of a single thread in sewing; and he found that before he could make any progress in the sale of his machine, he must satisfy her that it would really make, with its two threads, as good a seam as she, with her hand needle, could make with one. This required a little management, but he readily hit upon a successful device. The new stitch was of course entitled to a name. So he christened it "Lock stitch;" and though it was less a "locked" stitch than woman's favorite "back-stitch," yet such is the

influence of "a name," that the expedient served its purpose. Even inventors were carried away with it; and for the next ten years they were all led astray on the double-thread track. But the name could not change the nature of the stitch. Woman might be deceived, and inventors misled; yet no expedient could subvert the natural laws. So long as the "extra thread" was retained, the complication remained the same the blunder the same the theory as much at fault as ever.

To an unprejudiced observer, the mistake thus made by those early inventors, when viewed in the light of modern experience, might well seem surprising, had not blunders equally marvellous, been made in other departments of mechanical inventions. Thus, in the application of steam power to railway locomotion, the efforts of all inventors preceding Mr. Stephenson, embracing a period of a quarter of a century, failed, simply because they were all misled by a false theory, a theory which taught that "Cogs," or some other similar means were necessary, to prevent the driving-wheels of the "locomotive" from slipping on the rail, and thus revolving on the axle without moving the carriage an imaginary difficulty against which the natural laws had provided a more effectual safeguard than "cogs" in the simple agency of friction. But experience eventually rectifies all such blunders. "Cogs," as a means of "locking" the "locomotive" to the "rail," were long since abandoned; and experience has also proved that the complicating "extra-thread" is both unnecessary and inefficient, as a means of "locking" a "seam."

THE "NEW THEORY."

The first among inventors to question the soundness of Howe's theory, was Mr. James E. A. Gibbs, of Millpoint, Va. Fortunately for woman, Mr. Gibbs was not a copyist. It was his way to think for himself; and a little reflection satisfied him, that no sewing machine using two threads, and employing a "bobbin" and "shuttle," and the numerous other devices found in

a "loom" for weaving cloth, could ever be made sufficiently simple to meet the wants of all. To him it was plain that where an extra thread is used there must be extra machinery to manipulate that thread; and it was equally plain that the only way to get rid of that extra machinery and its resulting complications, was to remove the cause.

"What," thought he, "is a sewing machine good for, however useful in the hands of a skillful operator, to one who cannot manage it?" "If woman is ever to be emancipated from 'needle bondage', she must have a sewing machine that woman can use." "If the sewing machine is ever to be so simplified that all can successfully use it, the 'under thread' must be rejected and only one thread employed." Such was the reasoning of Mr. Gibbs, which led to the invention of his "New Theory" that of the *Single, Twisted Stitch*; a theory which maintained that a simple "twist of the loop" gives greater security to the seam than an "extra thread," and removes all necessity for its use. But simplicity was not the only quality in which the sewing machine was still deficient: the ability to make a more reliable seam than that of the so-called "lock-stitch," was also necessary; and Mr. Gibbs was not the one to overlook so important a need. His first effort, therefore, was to invent a new, and more reliable stitch to be made of a single thread.

THE SE

LAST STAGE IN SEWING MACHINE IMPROVEMENT.

Mr. Gibbs had not the advantage of a mechanical education. His father, however, was a native of New England, and in the education of the son the primitive art of whittling had not been forgotten. With the root of a young sapling and his trusty knife, he engaged in the great work of inventing a machine which should introduce the "New Theory," and revolutionize the cumbrous system of sewing mechanism then in vogue. In due time success crowned his effort, in the production of a curiously-shaped device, not larger than a gentleman's coat button, which had the capacity of performing, in the making of a stitch, all the offices of thirty or more "parts" in shuttle stitch machines; while it made, of one thread only, a new kind of stitch, more reliable, and every way better as experience has since proved than any made of two. With this new stitch-forming device, he readily succeeded in constructing a machine, which possessed the required simplicity, and presented numerous other advantages which will be described hereafter. The original patent for this machine bears date June 2, 1857.

INTRODUCTION OF THE WILLCOX & GIBBS MACHINE.

But Mr. Gibbs, before he could reap the reward of his skill and labor, had yet another task to perform one more difficult to him than the invention of his machine; that was, its introduction. He could invent and construct, but he had not the means to introduce a new sewing machine before the public; and his next effort was to find some party possessing the requisite means and business capacity, who would aid him in this work. At length he made the acquaintance of Mr. James Willcox, then of Philadelphia a gentleman whose experience in the sale of double-thread machines, and practical knowledge of their defects, had prepared him to appreciate the merits of Mr. Gibbs'

invention. The result of this acquaintance was an arrangement, by which the control of the invention passed into the hands of Mr. Willcox; and in the year 1859, two years after the date of its patent, he had the machine in the market.

The improvements which have since been added, are chiefly due to the genius and labors of Mr. Willcox, and his son Charles H. Willcox, Mechanical Engineer of the Willcox & Gibbs Sewing Machine Company; and are secured by sundry patents, bearing the following dates: December 15, 1857; October 11, 1859; July 31, 1860; March 19, 1861; July 22, 1861; October 8, 1861; March 22, 1864; July 26, 1864; August 9, 1864; September 27, 1864; and another also, September 27, 1864.

The commercial history of this machine is before the public. With prejudices to overcome and opposition to meet such as no similar invention has ever had to encounter it has gone steadily forward, and realized a success which has, we believe, no parallel in the early history of any other sewing machine.

ELEMENTARY PRINCIPLES OF SEWING MACHINE MECHANISM, AND SEWING MACHINE STITCHES.

SEWING may be described as the process of uniting two or more pieces of cloth or other goods, by means of thread passed through and through them, in such manner as to hold the pieces firmly together. A continuous line of thread thus interwoven with two or more pieces of goods, is called a *Seam*. A section of a seam extending from one perforation of the goods to the next, is called a *Stitch*. And the method of constructing the stitch, embracing the number of threads used and the mode of interlocking them, constitutes the *kind of stitch* produced.

In sewing by machinery, as well as by hand, various kinds of stitches are made, and various systems of mechanism are required to make them. To facilitate our investigation of these several stitches and systems, and the principles on which they

are respectively based, we introduce here, for the purpose of illustration, and as a standard of comparison, the well-known "Back-Stitch," the kind most employed for general use in hand-sewing. This stitch is made of a single thread, by passing it through the goods in the manner represented in the following diagram, fig. 1. The completed Back-stitch Seam is shown in fig. 2:

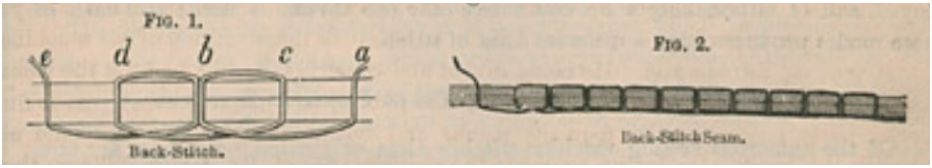


FIG. 1. Back-Stitch. FIG. 2. Back-Stitch Seam.

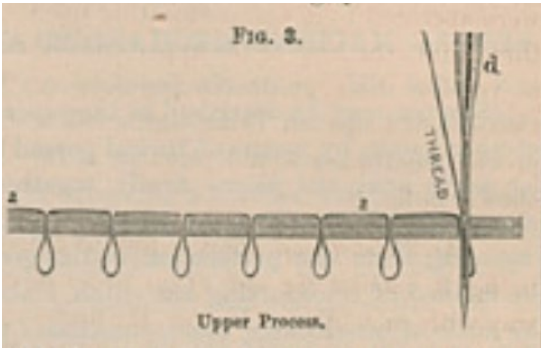
In hand-sewing, the entire process of making a stitch, so far as the action of the needle is concerned, is effected by a single, three-motioned thrust downward, forward, and upward the entire needle passing through the goods and coming out again on the upper side, carrying the thread with it. In the formation of this stitch, the needle is entered at *a*, fig. 1, and comes out at *b*; it is then set back half way to the place of beginning and entered at *c*, coming out at *d*; again it is set back to *b*, and passed in like manner to *e*; and so on to the end of the seam. Thus the course of the thread in forming this stitch is such that it gives to the seam a considerable degree of elasticity, a quality indispensable in all kinds of sewing upon woven or other elastic goods. The back-stitch, it will be remembered, is the one for which all the principal sewing machine stitches are substitutes, and experience has proved that the more nearly any of those stitches resembles this in construction, the better it is for the general purposes of sewing.

FORMATION OF THE STITCH IN MACHINE SEWING.

But in sewing by machine at least by any now in use it is impracticable to pass the entire needle through the goods, and two distinct operations become necessary to accomplish the

results produced by the hand-needle in one. Of these operations, the first is performed by mechanism over the goods, and the second by mechanism underneath. The former may therefore be styled the *Upper Process*, and the latter the *Under Process*.

FIG. 3. Upper Process.



The Upper Process. In all sewing machines for general use, the upper process is accomplished by means of an eye-pointed needle, which, descending, perforates the goods and carries the thread down through, to a point within reach of the stitch-fastening mechanism underneath. The needle then rises, leaving a loop or double of the thread projecting downward through the goods, as seen in fig. 3, which shows the result of the upper process, as it would appear if the under process were omitted.

The Under Process. Now to complete the seam commenced in fig. 3, so it will hold the two pieces together, it is evident that those several loops must in some way be firmly united; and it is this uniting and fastening of the loops, which constitutes the under process in machine-sewing. Various methods have been invented to accomplish this process. In some machines an additional thread is employed, and such are called "double-

thread" machines. In others the loops are fastened by interlocking them with each other without the aid of an extra thread and such are called "single-thread" machines. There are also different modes of manipulating the under thread where two threads are employed, and of interlocking the loops where only one thread is used; and each of these modes produces, also, a different kind of stitch.

MECHANICAL DESCRIPTION OF THE THREE PRINCIPAL STITCHES.

Of the numerous sewing machine stitches thus originated, only three are now much used. These, named in the order of their invention are, The Shuttle-Stitch, the Double-loop Stitch, and the Twisted-loop Stitch.

The Shuttle-Stitch. Let us suppose a small shuttle, containing a bobbin filled with thread, to be passed through the entire series of loops in fig. 3, the end of the thread being held, so that a line of it shall be left in the loops. It is plain that if the upper thread were now drawn, with sufficient force to close up all the loops,

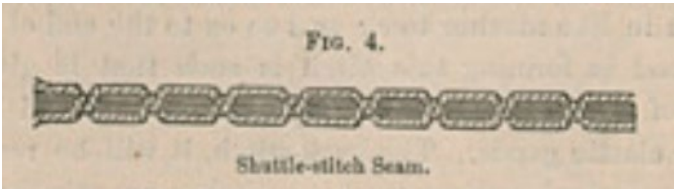
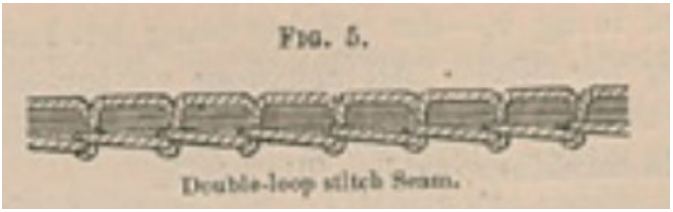


FIG. 4. Shuttle-stitch Seam.

the two pieces of fabric would then be united by the row of stitches, or Seam thus formed; and the *Stitch* thus made would be a Shuttle Stitch. In making this stitch, however, by machine, the shuttle is passed through a single loop at a time, that loop being drawn up before proceeding to the next. A section of such a seam, with the edge of the goods cut away to the stitches to show the course of the two threads in forming the stitch, is exhibited in fig. 4.

The Double-loop Stitch. Again, let us suppose that the under thread, instead of being wound upon a bobbin, and carried in its entire length through each loop,

FIG. 5. Double-loop stitch Seam.



were operated by a non-perforating needle, which should merely thrust a loop of this thread into the loop of the upper one the under loop projecting forward far enough to receive the next descending loop of the upper thread. It is plain that these two sets of loops, on being tightened, would mutually fasten each other; and this process continued would produce a Double-loop stitch Seam, a section of which is shown in fig. 5.

The Twisted-loop Stitch. But to unite the loops and complete the seam begun in fig. 3, without the aid of an under-thread, the loops must be interlocked in some way with each other. If, now, the first loop were twisted, as shown in fig. 6, and then bent forward to receive and be fastened by the next descending loop, the result would be a Twisted-loop Stitch; and this process continued, would produce a Twisted-loop stitch Seam, a section of which is well represented in fig. 7:

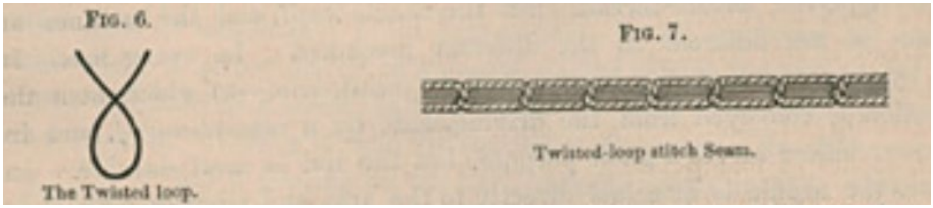


FIG. 6. The Twisted loop. **FIG. 7. Twisted-loop stitch Seam.**

The distinguishing characteristic of this stitch that which constitutes its chief merit is the "twist" in the loop, which produces a friction or bind of the two threads constituting the two opposite sides of the loop at the point of their crossing an effect analogous to that produced by the twist in a rope, on its separate strands. This bind greatly strengthens the hold of each thread on the other, and the hold of the stitch in the goods, and makes the seam more secure against accidental ripping or raveling than any other machine-stitch in use. The mode of constructing this stitch by the machine, is fully described and illustrated on pages 38 and 39.

Other methods of sewing by machinery with a single thread, have been invented and tried, but no other has proved reliable, or otherwise satisfactory. The kind of stitch most employed in those unsuccessful experiments was the old, single tambour, or "chain-stitch;" and this has been so often confounded by parties interested in double-thread machines, with the twisted-loop stitch, that we introduce here illustrations of the "chain-stitch," merely to show the difference in the construction of these two stitches; which, it will be seen by comparing figs. 8 and 9

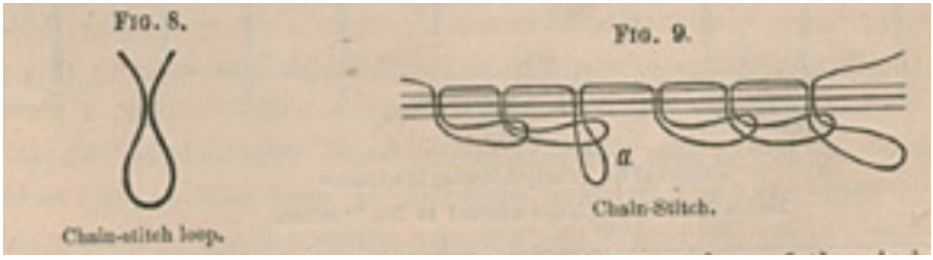


FIG. 8. Chain-stitch. FIG. 9. Chain-stitch seam.

with figs. 6 and 7, are entirely distinct. Fig. 8 shows a loop of the chain-stitch as it goes into the seam, which it will be noticed is not "twisted." A chain-stitch seam is also represented in fig. 9, the stitches being left loose, to show the course of the thread in forming the stitch. All machines yet invented to make the chain-stitch have been liable to miss the loop, as seen at *o* a serious defect in any machine and a fatal one in machines making this stitch.

THE FOUR SETS OF MECHANISM REQUIRED TO MAKE A STITCH.

In addition to the two "processes" already described, two others are required to make a stitch one to draw up the loop, and the other to move along the goods. Hence every sewing machine, whatever be the number of threads employed or the kind of stitch made, must embrace, in addition to the table and the propelling apparatus, four distinct sets of mechanism, each having a separate duty to perform, yet all acting in harmony with each other. These are, The Stitch-Forming Apparatus; the Stitch-Fastening Apparatus; the Tension; and the Feed.

THE STITCH-FORMING APPARATUS.

This comprises the Needle, and the mechanism by which it is operated. The office of the needle in all sewing machines is to perforate the goods and manipulate the upper, or needle-thread. But the needle itself, and the mechanism which operates it, are different in the different machines. In every machine it is worked by the movement of a lever called the needle-arm to which, in some machines, motion is conveyed from the driving-shaft by a connection-rod, and in others by a cam; either serves a good purpose, but the rod is most durable. In some machines the needle is attached directly to the arm, and vibrates with it as it rocks upon its fulcrum or arm-stud; while in others it is attached to the lower end of a needle-bar, which is moved by the needle-arm and works perpendicularly.

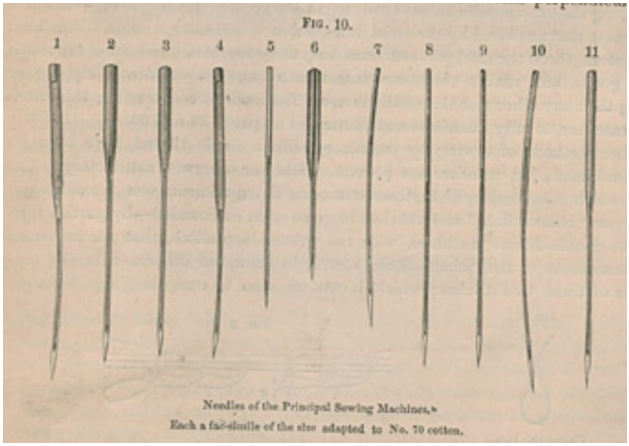


FIG. 10. Needles of the Principal Sewing Machines.

Each is a facsimile of those adapted to No. 10 cotton.

No. 1, Wheeler & Wilson; 2, Howe; 3, Finkle & Lyon; 4, Elliptic; 5, Singer; 6, Willcox & Gibbs; 7, Grover & Baker; 8, Weed; 9, Empire; 10, Florence; 11, Ætna.

The latter method allows the use of a straight needle, like No. 6, fig. 10; while the former requires the needle to be curved, like No. 7 the curvature corresponding with the size of the circle in the arc of which the needle moves; hence the shorter the arm, the more crooked the needle. The straight needle, as every one knows, has important advantages over the curved one, in being stronger and less liable to get bent or broken.

A short needle also, has the same advantages over a long one. The length of the needle, however, is governed by the character of the mechanism employed in fastening the stitch. Thus the shuttle requires a large loop, and a long needle to make it; the under needle of the double-loop stitch machine works with an upper needle somewhat shorter; while the rotating-hook of the twisted-loop stitch machine, works with a needle the blade of which is only about half as long as that of the shortest used in other machines. Fig. 10 exhibits, at a glance, the relative

advantages or disadvantages possessed by each of the principal machines, in the form and length of its needle.

Another point of difference in the mechanism connected with the needle, is found in the mode of attaching it to the arm or bar. In all machines but one, the shank of the needle is either placed in a groove on the side of the arm or bar, where it is held by the head of a screw, as seen in fig. 11; or it is inserted in a tubular cavity within the bar, where it is held by the end of the screw. In either case the shank has a bearing on the back side, its entire length; while on the front side the bearing is very short only the diameter of the head or point of the screw.

FIG. 11. Setting the Needle. Old Method.

All needles fastened in this way are liable to stand aslant, as indicated by the dotted lines, *b* and *c*. Hence it is always necessary, after the needle has been set, to adjust it accurately to the right pitch, as seen at *a*; which is done by springing it, with the thumb and finger, one way or the other, till it stands in the right position. This is a difficult process, requiring both skill and practice; frequently the needle is broken, in trying to adjust it, and still more frequently all efforts to get it exactly right, are unsuccessful. When it is left much out of the way, it is broken on the first attempt to sew; while a slighter variation will often cause the shuttle or the under-needle to miss the loop, and a "dropped stitch" is the result. "Long" stitches, these "drops" are now called by most operators on shuttle-stitch machines; but the change of name does not change their character they are "dropped" stitches still.

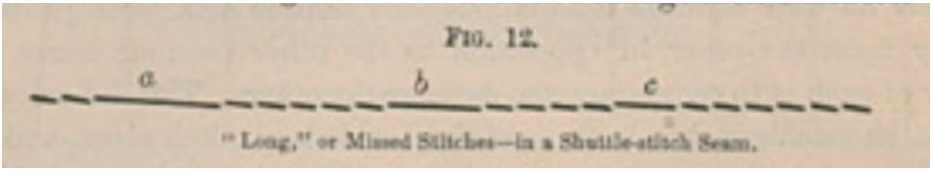
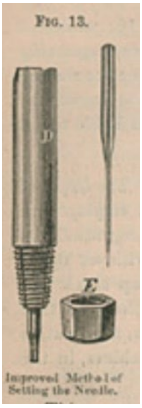


FIG. 12. "Long" or Missed Stitches a Shuttle-stitch defect.

Such misses are often seen on ready-made clothing of the cheaper grades the work of operators who have not the skill, or who cannot afford the time to keep the needle adjusted properly. Fig. 12 is a fair illustration of much work that is done on shuttle-stitch machines, with needles fastened in this way. At *a*, three stitches were missed, at *b* two, and at *c* one.

IMPROVED METHOD OF ATTACHING THE NEEDLE TO THE BAR.

FIG. 13. Improved Method of Setting the Needle.



An improved method of attaching the needle to the bar, is shown in fig. 13. In this method the shank is inserted in a tubular cavity at the lower end of the bar, *D*. The bar is slit, upwards, a little higher than the cavity extends; and the needle is fastened by the nut *E*, applied on the tapering end of the bar. This gives a uniform pressure on all sides of the shank, and no subsequent "adjusting" of the needle is ever required. The advantages of this improvement are at once apparent and very important. Not only is the needle always set with mathematical precision, but any person can set it the skillful as well as the unskillful a child as well as an adult. The mechanism of this

device will be found more fully described and illustrated on pages 35 and 36.

THE STITCH-FASTENING APPARATUS.

This comprises, in all sewing machines making the *Shuttle-stitch*, a Bobbin on which the under thread is wound, and a Shuttle or its equivalent to carry the bobbin; together with a variety of other parts required to work them. In *Double-loop stitch* machines, it comprises an "Under-Needle" which manipulates the "under thread," and the parts necessary to operate it. In the *Twisted-loop stitch* machine, it comprises the Rotating Hook, and a set-screw to fasten it in its place. This device and its operation are fully described and illustrated on pages 37, 38 and 39. It is in this set of mechanism only, that we find the origin of variety in machine-stitches, and the principal differences in the construction of the different machines. These differences consist mainly in the number and character of its "parts" the number of which, in Shuttle-stitch machines, is from thirty to forty, and in Double-loop stitch machines, from twenty to thirty; while in the Twisted-loop stitch machine, the number of the stitch-fastening parts is only *two*; and these, being permanently attached to the general driving-shaft which operates the other parts as well, add nothing to the number of movements in the machine, a degree of simplicity which plainly admits of no farther simplifying.

THE TENSION.

In all sewing machines using only one thread, the stitch-tightening apparatus is simple, acting directly upon the thread, and producing uniform results. But the tensions of all double-thread machines are necessarily compound. Each thread has its own separate tension, but each tension acts, through its own thread, indirectly upon the other, in opposition to the other tension; hence the constant tendency of each is to counteract and derange the other. This difficulty is greater in shuttle-

stitch machines than in those of the double-loop stitch class; and it is greater, also, in those of the former class using the "hook" and "stationary bobbin," than in those using the "reciprocating shuttle."

THE FEED.

There are two methods employed, in different machines, for feeding the goods; one of which is best adapted to leather, and the other to cloth. The former is called the "wheel feed," and is rotary in its action; the latter is called the "four-motion feed," and is reciprocal in its action. All family sewing machines of any reputation now use the latter feed, of which an illustrated description will be found on page 42.

RELATIVE ADVANTAGES OF THE THREE PRINCIPAL STITCHES.

Either of the three principal stitches will make, when properly constructed, a serviceable seam; yet each has advantages for certain purposes, and disadvantages for others. The Shuttle-stitch, when made with the "lock," as it is called, or crossing of the two threads, exactly in the centre of the fabric, has the advantage of presenting nearly the same appearance on both sides; but in practice it is always difficult, and sometimes impossible to keep the upper and under tensions so adjusted as to make the "lock" where it should be. If the tension on the upper thread be too light, the under thread will not be drawn up, but will lie straight on the under surface, producing the "mail-bag" stitch, as seen in fig. 14; or, if the upper tension be too heavy, the "lock" will be brought to the upper surface, as shown in fig. 15. In either case the seam has no elasticity, and the straight thread is liable to break, from

FIG. 14. The Mail-Bag Stitch. FIG. 15. The Mail-Bag Stitch reversed.

the least strain of the goods, when the unbroken thread opposite the break, having no support, lies loose on the surface as in fig. 16. The accurate adjustment of the tensions

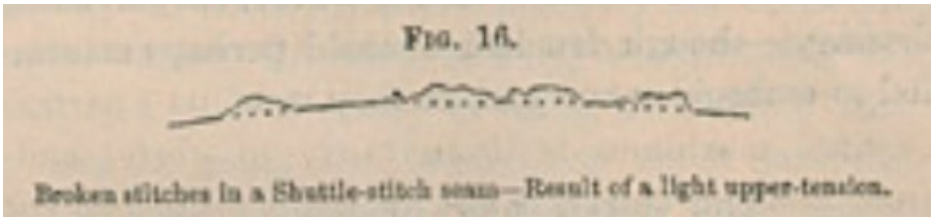


FIG. 16. Broken stitches in a Shuttle-stitch Result of a light upper-tension.

in this class of machines is always a difficult task, so difficult that only skillful and experienced operators are able to produce results approaching uniformity, and on thin goods the most expert often fail. Indeed the equilibrium of those tensions is so delicate, and so easily disturbed, that even when they are perfectly adjusted, a trifling inequality in the size of the thread, or a slight irregularity in the movement of the treadle, will cause the "lock" to vary from the centre of the goods to one surface or the other, as in fig. 17. To obviate this difficulty it is customary with

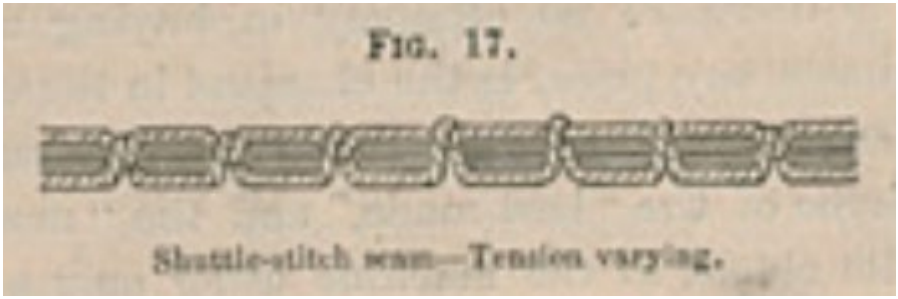


FIG. 17. Shuttle-stitch seam-tension varying.

many operators, in sewing upon thin goods, to adjust the tension so as to make the "mail-bag" stitch, constantly, as in fig.

14. But this expedient, while it secures a fair stitch on one side, impairs the beauty on the other, and destroys entirely the strength and elasticity of the seam.

Another peculiarity of the shuttle-stitch, which must be regarded as a defect, is this: On thin goods, the "lock," even when properly made, is visible, giving to the seam the appearance of having a miniature stitch between each of the regular stitches, as may be understood from fig. 4.

The "lock" has also the effect, especially on linen and other fine goods, of giving to the stitches a zigzag appearance, as seen in fig. 18. But neither

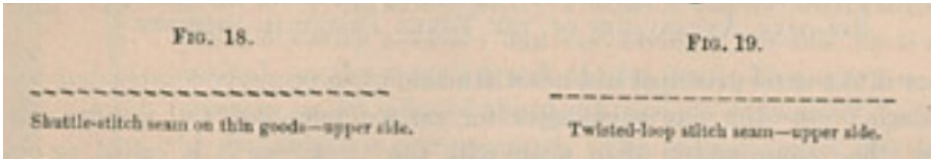


FIG. 18. Shuttle-stitch seam on thin goods upper side.

FIG. 19. Twisted-loop stitch seam upper side.

the twisted-loop stitch, nor the double-loop stitch, has either of these defects. In the double-loop stitch seam the stitches are often irregular, but this is owing to other causes generally the imperfect setting of the needle. The twisted-loop stitch, however, is always laid straight, as in fig. 19. It presents also nearly the same appearance on both sides; though it has underneath a double line of thread, yet the two threads lie flat, and so closely imbedded in the surface of the goods that the seam is as smooth on the under side as the upper. In the double-loop stitch seam, which has three lines of thread on the under side, the third line in each stitch is laid diagonally on the other two; thus producing a ridge or chain, which on hard

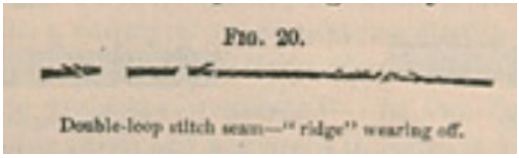


FIG. 20. Double-loop stitch seam ridge wearing off.

or thin goods is liable to wear off, as seen in fig. 20; and when this occurs, the strength of the seam is gone. This stitch has, however, the advantage of making a certain kind of embroidery

though few ladies would perhaps esteem it an "advantage" to be compelled to embroider every seam they sew.

THE QUESTION OF ECONOMY.

This question embraces a variety of considerations, prominent among which are, the first cost of the machine, and the running expenses; the latter including the cost of repairs, needles, thread, and time of operator.

In regard to the first, little need be said, for on that point the public generally are satisfied. All low-priced machines are cheaply made got up to sell, not to wear and experience has proved that such machines are unreliable often out of order and short-lived. There is therefore no economy in buying a low-priced sewing machine; the "best," at almost any price, is the cheapest in the end.

So also in regard to expenses. The best authority on this subject is experience, and she has decided in favor of the "best made," and the "most simple;" qualities now conceded, even by its rivals, to the machine using only a single thread, and making the twisted-loop stitch. In the use of this machine, the expense for repairs is less than one-fourth as much as in that of others, and the expense for needles scarcely anything while the time required to do a given amount of work is one-half less than in using any other machine, see pages 68, 69, 70, and 71. The remaining consideration, the one relating to the expense for thread, is, therefore, the only question about which any diversity, either of opinion or of claim exists.

COMPARATIVE EXPENSE FOR THREAD.

On this point, the advantage is claimed for each of the two leading stitches, the twisted-loop stitch, and the shuttle-stitch. The latter has the advantage in one respect, and the former in another; the shuttle stitch machine putting less thread into a seam, and the twisted-loop stitch machine wasting less at the ends. The facts in regard to the relative cost of thread are simply these:

Each of the three principal stitches has a single line of thread on the upper side of the seam, and a double line in passing through the goods, the only difference being on the under side, where the shuttle-stitch has but one thread, the twisted-loop stitch *two*, and the double-loop stitch *three*. Thus the shuttle-stitch requires for a yard of seam, *exclusive of waste*, one yard less thread than the twisted-loop stitch, and two yards less than the double-loop stitch. But these proportions are materially changed, by the unequal

WASTE OF THREAD,

at the ends of the seam. This waste amounts, in the family use of shuttle-stitch machines, to about twenty-four inches of thread, for every seam, long or short; or six inches on each thread, at each end of the seam. In using double-loop stitch machines, there need be only about five inches waste of each thread at the beginning of a seam, and two inches each at the end, or fourteen inches in all. The twisted-loop stitch machine, with its one thread, wastes still less only three inches at the beginning, and one inch at the end, or four inches to the entire seam. Now in family sewing, a large majority of the seams are short, probably not more than one-half of a yard in average length. Hence the waste in using shuttle-stitch machines, is forty-eight inches of thread to a yard of seam; in using double-

loop stitch machines, twenty-eight inches; and in using the twisted-loop stitch machine, only eight inches. Adding the several amounts of thread thus wasted to the amounts respectively used, we find that the twisted-loop stitch machine consumes, in the aggregate, some four inches less thread than the shuttle-stitch machine, and fifty-six inches less than the double-loop stitch machine to every yard of seam sewed.

But the question of economy in the use of thread involves yet other considerations which are not to be overlooked. A certain amount of thread is indispensable in a seam, to give it the necessary amount of elasticity; and any saving of thread, at the expense of necessary elasticity, is not economy but waste. Taking the "back-stitch," which, like the twisted-loop stitch, has two lines of thread underneath as our standard of the amount of thread necessary to make a reliable seam, we are led to the conclusion that the shuttle-stitch seam contains too little thread; the double-loop stitch seam, more than is needed; and the twisted-loop stitch seam, just the amount required.

To all these items of economy in favor of the twisted-loop stitch machine, is still to be added a saving in the wear and tear of woman's nerves and muscles, health and patience, which cannot be estimated in dollars and cents. And all these gains, it will be remembered, have been secured by the substitution of a simple "twist" in the stitch, for the complicating "under-thread" which this examination into the philosophy of sewing mechanism has demonstrated to be no longer necessary.